Public Version
City Adopted August 6, 2015

Floodplain Mitigation Plan

Savannah, GA

July 2015

EXECUTIVE SUMMARY

The purpose of this Floodplain Mitigation Plan is to reduce or eliminate risk to people and property from flood hazards. Every community faces different hazards and every community has different resources to draw upon in combating problems along with different interests that influence the solutions to those problems. Because there are many ways to deal with flood hazards and many agencies that can help, there is no one solution for managing or mitigating their effects. Planning is one of the best ways to develop a customized program that will mitigate the impacts of flood hazards while taking into account the unique character of a community. The plan provides a framework for all interested parties to work together and reach consensus on how to move forward. A well prepared Floodplain Mitigation Plan will ensure that all possible activities are reviewed and implemented so that the problem is addressed by the most appropriate and efficient solutions. It can also ensure that activities are coordinated with each other and with other goals and activities, preventing conflicts and reducing the costs of implementing each individual activity.

The City followed the planning process prescribed by the Federal Emergency Management Agency (FEMA), and this plan was developed under the guidance of a Floodplain Mitigation Planning Committee (FMPC) comprised of representatives of City Departments, citizens and other stakeholders. The FMPC conducted a risk assessment that identified and profiled flood hazards that pose a risk to the City, assessed the City's vulnerability to these hazards, and examined the capabilities in place to mitigate them. The flood hazards profiled in this plan include:

- Climate Change and Sea Level Rise
- Coastal/Canal Bank Erosion
- Dam/Levee Failure
- Flood: 100-/500-year
- Flood: Stormwater/Localized Flooding
- Hurricane and Tropical Storms (including Storm Surge)

This plan identifies activities that can be undertaken to reduce safety hazards, health hazards, and property damage caused by floods. Based on the risk assessment developed for each of the flood hazards identified above, the FMPC identified goals and objectives for reducing the City's vulnerability to the hazards. The goals and objectives are summarized as follows:

Goal 1 – Expand the City's flood hazard communication and outreach program.

Objective 1.1: Engage the Chatham County Schools to develop a flood mitigation curriculum.

Objective 1.2: Demonstrate the flood model to school students and at science nights.

Objective 1.3: Evaluate the City's flood hazard outreach program through development of a CRS Program for Public Information (PPI).

Objective 1.4: Encourage residents to assume an appropriate level of responsibilities for their own flood protection.

Goal 2 – Reduce damage to insurable buildings in repetitively flooded areas.

Objective 2.1: Prioritize stormwater management projects that target repetitive loss areas.

Objective 2.2: Develop a property buyout master plan to identify and purchase repetitive loss properties.

Objective 2.3: Recommend purchase of flood insurance and use of the Increased Cost of Compliance (ICC) provision to mitigate flood damage.

Goal 3 – Protect critical and essential facilities from flood damage.

Objective 3.1: Prioritize critical and essential facilities in need of protection from flood damage.

Objective 3.2: Provide 100- and 500-year flood protection to critical and essential facilities for dry land access.

Objective 3.3: Leverage emergency management and other funding sources to retrofit critical facilities.

Goal 4 – Reduce damage to development through flood resilient strategies and measures

Objective 4.1: Encourage a no adverse impact approach to reduce damage to existing development.

Objective 4.2: Consider increasing riparian impervious surface setbacks to help protect the natural and beneficial functions of the floodplain.

Objective 4.3: Purchase vulnerable lands through available funding mechanisms to protect development and provide park and recreation opportunity for residents.

Objective 4.4: Improve building checklist and technical review process to ensure buildings are constructed in accordance with the flood damage prevention ordinance and meet appropriate insurance standards.

Objective 4.5: Prioritize capital improvement projects to address areas where poor drainage causes substantial flooding.

Objective 4.6: Encourage the location of development outside the areas of special flood hazard (100-year flood zone) and provide standards to minimize public and private losses due to flood conditions in areas of special flood hazard.

In order to meet the identified goals, this plan recommends 43 mitigation actions, which are summarized in the table that follows. Note: ID number does not indicate an order of priority.

ID	Action	Related to Goal	Address Current Development	Address Future Development	Continued Compliance with NFIP	Mitigation Category
Existing Mitigation Actions Carried Forward from 2010 Plan						
1	Comprehensive evaluation of drainage system and implementation of selected projects.	4	✓	✓		Structural Projects
2	Enhance Drainage system maintenance program to unclog storm drains/ clear drainage channels and a public education component on proper yard waste disposal and eliminate brush disposal in canals.	1, 4	✓	✓		Prevention, Natural Resource Protection, Public Information and Outreach
3	Ensure the City's new zoning code limits development in floodplains and wetlands to low density, and that a certain percentage of land remains protected as open space to provide a natural buffer from water bodies.	4	✓	✓		Prevention, Natural Resource Protection
4	Reserve vacant low-lying/flood-prone/wetland areas for open space through acquisition or regulation	4	✓	✓		Prevention, Natural Resource Protection
5	Evaluate FEMA-purchased properties for the highest use in floodwater/stormwater storage.	4	✓	✓		Prevention, Property Protection
6	Require in the revision of the Subdivision Ordinance that all new subdivisions dedicate 20% of land as green space.	4	✓	✓		Prevention, Property Protection
7	Designate GDOT properties that are unused as areas for flood storage.	4	✓	✓		Prevention, Property Protection
8	Reduce future vulnerability of Valambrosa area through acquisition or regulation.	2, 4	✓	✓		Prevention, Property Protection
9	Add additional higher regulations to the Flood Damage Prevention Ordinance that will prohibit enclosures of areas of greater than 300 square feet below the BFE.	4	✓	✓	✓	Prevention, Property Protection
10	Continue acquisition/demolition of high-risk flood-prone properties.	2, 4	✓			Prevention, Property Protection

ID	Action	Related to Goal	Address Current Development	Address Future Development	Continued Compliance with NFIP	Mitigation Category
11	Evaluate the feasibility of a floodproofing program for homes where acquisition is not an option – especially historic structures.	2, 4	✓			Prevention, Property Protection
12	Target repetitive loss structures by conducting a detailed study as outlined in the RLAA.	2	✓			Prevention, Property Protection
13	Target critical facilities for flood mitigation.	3	✓			Prevention, Property Protection, Emergency Services
14	Post flood mitigation information at libraries, post offices, heavily trafficked municipal buildings and community centers. Develop and post "potential high water mark" signs.	1	✓		✓	Public Information and Outreach
15	Continue to enhance newly implemented City website "flood protection information' webpage.	1	✓		✓	Public Information and Outreach
16	Continue coordination with CEMA, NWS and USGS to enhance flood warning system.	4	✓	✓		Emergency Services
17	Continue flood preparedness and outreach activities at local community events	1	✓		✓	Public Information and Outreach
18	Mail information to all structures in the floodplain promoting flood insurance and sound floodplain management practices.	1	✓		✓	Public Information and Outreach
19	Organize public information campaign and organize public cleanups to reduce litter/debris in storm drains.	1	✓		✓	Public Information and Outreach, Natural Resource Protection
20	Conduct public outreach and direct technical assistance – particularly targeting repetitive loss properties and discussion of potential funding.	1, 2	✓		✓	Public Information and Outreach
21	Establish program aimed at providing flood protection assistance to owners of flood-prone properties, including site visits	1,2	✓		✓	Property Protection, Public Information and Outreach

ID	Action	Related to Goal	Address Current Development	Address Future Development	Continued Compliance with NFIP	Mitigation Category
	and advice on retrofitting and other flood mitigation measures.					
22	Educate the public on the use of permeable concrete paving and establishment of rain gardens to reduce flash flooding impacts.	1	✓	✓	✓	Public Information and Outreach
23	Interview and coverage on local news, in newspaper articles and through advertisement to promote flood mitigation.	1	✓		✓	Public Information and Outreach
24	Provide flood mitigation update and outreach to neighborhood groups and other interested parties via an email group address.	1	✓		✓	Public Information and Outreach
25	Organize annual/semi-annual single-focus public workshops/meetings to discuss flood mitigation.	1	✓		✓	Public Information and Outreach
26	Provide flood protection assistance to vulnerable populations (elderly, disabled and low-income individuals) so they can purchase flood insurance.	1	✓		✓	Public Information and Outreach
27	Strategically focus SPLOST funds toward identified drainage improvement projects.	4	✓	✓		Structural Projects
28	Complete AW-501 forms for acquired Repetitive Loss properties to remove from FEMA Repetitive Loss Property list (or classify each as “mitigated”).	2	✓		✓	Prevention, Property Protection
29	Promote flood insurance through community notification to citizens and business personnel by newspapers, letters, and public outreach.	1	✓		✓	Public Information and Outreach
30	Document drainage improvements in SFHAs and request revisions to the applicable FIRM maps to reflect new conditions through the FEMA LOMR process.	4		✓	✓	Prevention

ID	Action	Related to Goal	Address Current Development	Address Future Development	Continued Compliance with NFIP	Mitigation Category
New Mitigation Actions						
1	Remove building code/insurance disconnect through education of builders/realtors and modification of technical review checklist (cross-check NFIP/Insurance/Ordinance/IBC).	4		✓	✓	Prevention, Property Protection
2	Develop outreach strategy to educate building community on new flood maps.	1		✓	✓	Public Information and Outreach
3	Modify Flood Damage Prevention Ordinance to include LiMWA criteria.	4		✓	✓	Prevention, Property Protection
4	Prioritize CIP projects to address flooding in the following areas: Victory Drive, Skidaway & 41st, 37th MLK, Montgomery & 52nd, Abercorn & 65th, Springfield Canal, Cloverdale, Detention Pond @ 52nd Derenne, Bilbo basin and Placentia basin.	2, 4				Structural Projects
5	Complete a study to evaluate the effectiveness of a stormwater utility based on impervious area and its impact on the typical homeowner.	4	✓	✓		Structural Projects
6	Chatham County Emergency Management (CEMA) will provide a prioritized list of critical facilities.	3	✓			Property Protection, Emergency Services
7	The City of Savannah will adopt the CEMA Post-Disaster Mitigation Plan and Pre-Disaster Mitigation Plan.	4	✓			Emergency Services
8	Consider expanding riparian impervious surface setbacks including a 25' setback on coastal marshland and wetlands.	4		✓		Prevention, Natural Resource Protection
9	Support the Chatham County-Savannah MPC Greenway Plan and coordinate with the MPC on the Plan as needed.	4		✓		Prevention, Natural Resource Protection

ID	Action	Related to Goal	Address Current Development	Address Future Development	Continued Compliance with NFIP	Mitigation Category
10	Consider participation in FEMA's high water mark initiative.	1			✓	Public Information and Outreach
11	Coordinate with the Chatham County Resource Protection Land to acquire lands vulnerable to flooding through SPLOST funds.	4		✓		Prevention, Natural Resource Protection
12	Create a Natural Floodplain Functions Plan and a Repetitive Loss Area Analysis	2, 4	✓	✓	✓	Property Protection, Natural Resource Protection
13	Develop a Watershed Master Plan for the City	2, 3, 4	✓	✓		Prevention, Property Protection, Natural Resource Protection

The following table provides the 10-step CRS planning credit activity checklist and the section/page number within this plan that describes the completion of each planning step in more detail.

CRS Planning Credit Activity Checklist

CRS Step	Section/Page
1. Organize to prepare the plan.	
a. Involvement of office responsible for community planning	Section 3.1
b. Planning committee of department staff	Section 3.1
c. Process formally created by the community's governing board	Section 3.2.1
2. Involve the public.	
a. Planning process conducted through a planning committee	Section 3.1 / Table 3-1 / Appendix A
b. Public meetings held at the beginning of the planning process	Section 3.2.1 / Table 3-5 / Appendix A
c. Public meeting held on draft plan	Section 3.2.1 / Table 3-5 / Appendix A
d. Other public information activities to encourage input	Section 3.2.1 / Table 3-6 / Appendix A
3. Coordinate with other agencies.	
a. Review of existing studies and plans	Section 3.2.1
b. Coordinating with communities and other agencies	Section 3.2.1 / Appendix A
4. Assess the hazard.	
a. Plan includes an assessment of the flood hazard with:	Sections 4.1 – 4.2
(1) A map of known flood hazards	Sections 4.1 – 4.2
(2) A description of known flood hazard	Sections 4.1 – 4.2
(3) A discussion of past floods	Sections 4.1 – 4.2
b. Plan includes assessment of less frequent floods	Sections 4.1 – 4.2
c. Plan includes assessment of areas likely to flood	Section 4.2.7
d. The plan describes other natural hazards	----
5. Assess the problem.	
a. Summary of each hazard identified in the hazard assessment and their community impact	Section 4.3
b. Description of the impact of the hazards on:	Section 4.3
(1) Life, safety, health, procedures for warning and evacuation	Section 4.3
(2) Public health including health hazards to floodwaters/mold	Section 4.2.4
(3) Critical facilities and infrastructure	Section 4.3
(4) The community's economy and tax base	Section 1.3.5
(5) Number and type of affected buildings	Section 4.3
c. Review of all damaged buildings/flood insurance claims	Section 4.3
d. Areas that provide natural floodplain functions	Section 1.3.3 / 4.3 / Appendix B
e. Development/redevelopment/Population Trends	Sections 1.3.6 – 1.3.7
f. Impact of future flooding conditions outline in Step 4, item c	Section 4.3 / Appendix B
6. Set goals.	Section 5.2
7. Review possible activities.	
a. Preventive activities	Section 5.3 / Appendix B
b. Floodplain Management Regulatory/current & future conditions	Section 5.3 / Appendix B

CRS Step	Section/Page
c. Property protection activities	Section 5.3 / Appendix B
d. Natural resource protection activities	Section 5.3 / Appendix B
e. Emergency services activities	Section 5.3 / Appendix B
f. Structural projects	Section 5.3 / Appendix B
g. Public information activities	Section 5.3 / Appendix B
8. Draft an action plan.	
a. Actions must be prioritized	Sections 5.4 – 5.5 / Appendix B
(1) Recommendations for activities from two of the six categories	Sections 5.4 – 5.5 / Appendix B
(2) Recommendations for activities from three of the six categories	Sections 5.4 – 5.5 / Appendix B
(3) Recommendations for activities from four of the six categories	Sections 5.4 – 5.5 / Appendix B
(4) Recommendations for activities from five of the six categories	Sections 5.4 – 5.5 / Appendix B
b. Post-disaster mitigation policies and procedures	Sections 5.4 – 5.5 / Appendix B
c. Action items for mitigation of other hazards	Sections 5.4 – 5.5 / Appendix B
9. Adopt the plan.	Section 6
10. Implement, evaluate and revise.	
a. Procedures to monitor and recommend revisions	Sections 7.1 – 7.2
b. Same planning committee or successor committee that qualifies under Section 511.a.2 (a) does the evaluation	Section 7.1.1

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1 INTRODUCTION

1.1 Purpose and Authority

As defined by FEMA, "hazard mitigation" means any sustained action taken to reduce or eliminate the long-term risk to life and property from a hazard event. Hazard mitigation planning is the process through which hazards are identified, likely impacts determined, mitigation goals set, and appropriate mitigation strategies determined, prioritized, and implemented. The purpose of this plan is to identify, assess and mitigate flood risk in order to better protect the people and property of the City of Savannah from the effects of flood hazards. This plan documents the City of Savannah's hazard mitigation planning process and identifies relevant flood hazards and vulnerabilities and strategies the City will use to decrease vulnerability and increase resiliency and sustainability.

This Plan was developed in a joint and cooperative venture by members of a Floodplain Mitigation Planning Committee (FMPC) which included representatives of City departments, federal and state agencies, citizens and other stakeholders. This Plan will ensure Savannah's continued eligibility for federal disaster assistance including the Federal Emergency Management Agency (FEMA) Hazard Mitigation Grant Program (HMGP), Pre-Disaster Mitigation Program (PDM), and the Flood Mitigation Assistance Program (FMA). This Plan has been prepared in compliance with Section 322 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act or the Act), 42 U.S. C. 5165, enacted under Section 104 of the Disaster Mitigation Act of 2000, (DMA 2000) Public Law 106-390 of October 30, 2000, as implemented at CFR 201.6 and 201.7 dated October 2007.

1.2 Background and Scope

The City of Savannah currently participates in the National Flood Insurance Program's (NFIP) Community Rating System (CRS), and qualifies for a Class 6 Rating. The CRS recognizes and encourages community floodplain management activities that exceed the minimum standards. Under the CRS, flood insurance premium rates are adjusted to reflect the reduced flood risk resulting from community activities that (1) reduce flood losses, (2) facilitate accurate insurance ratings, and (3) promote the awareness of flood insurance. As part of the qualification for a Class 6 Rating and having 10 or more repetitive loss properties, Savannah is required to prepare and maintain a Floodplain Mitigation Plan (FMP).

It is the goal of the FMPC to continue to work to make improvements to this plan so as to better serve the citizens of the City of Savannah, and to strive to improve the Class Rating for the City, so that the highest reduction in flood insurance premium rates can be available for its citizens. Through the City's participation in the NFIP and a Class 6 rating with the CRS, owners of properties in the City's Special Flood Hazard Area (SFHA) are entitled to a 20% discount on their flood insurance premiums. In addition, homeowners in non SFHA's receive a 10% discount on flood insurance premiums.

1.3 Community Profile

1.3.1 Overview of the Community

The City of Savannah has a total land area of approximately 103 square miles located in southeastern Georgia, nestled in close proximity to the Savannah River and the Atlantic Ocean. In 2010, the City had an estimated total population of 136,286. As Georgia's first City with a rich history dating back to 1733, the City receives millions of visitors each year with tourism being an active and rapidly growing segment

of the economy. The City's attractiveness as a visitor destination is enhanced by its internationally renowned historic district, abundant accommodations and easy accessibility. It is served by several primary highways including Interstates 95 and 16, as well as the Savannah / Hilton Head International Airport. The City of Savannah is located in Chatham County. Figure 1.1 reflects the City of Savannah and Chatham County location within the State. Figure 1.2 reflects the City of Savannah and all surrounding jurisdictions within the County. Figure 1.3 provides a base map for the City.

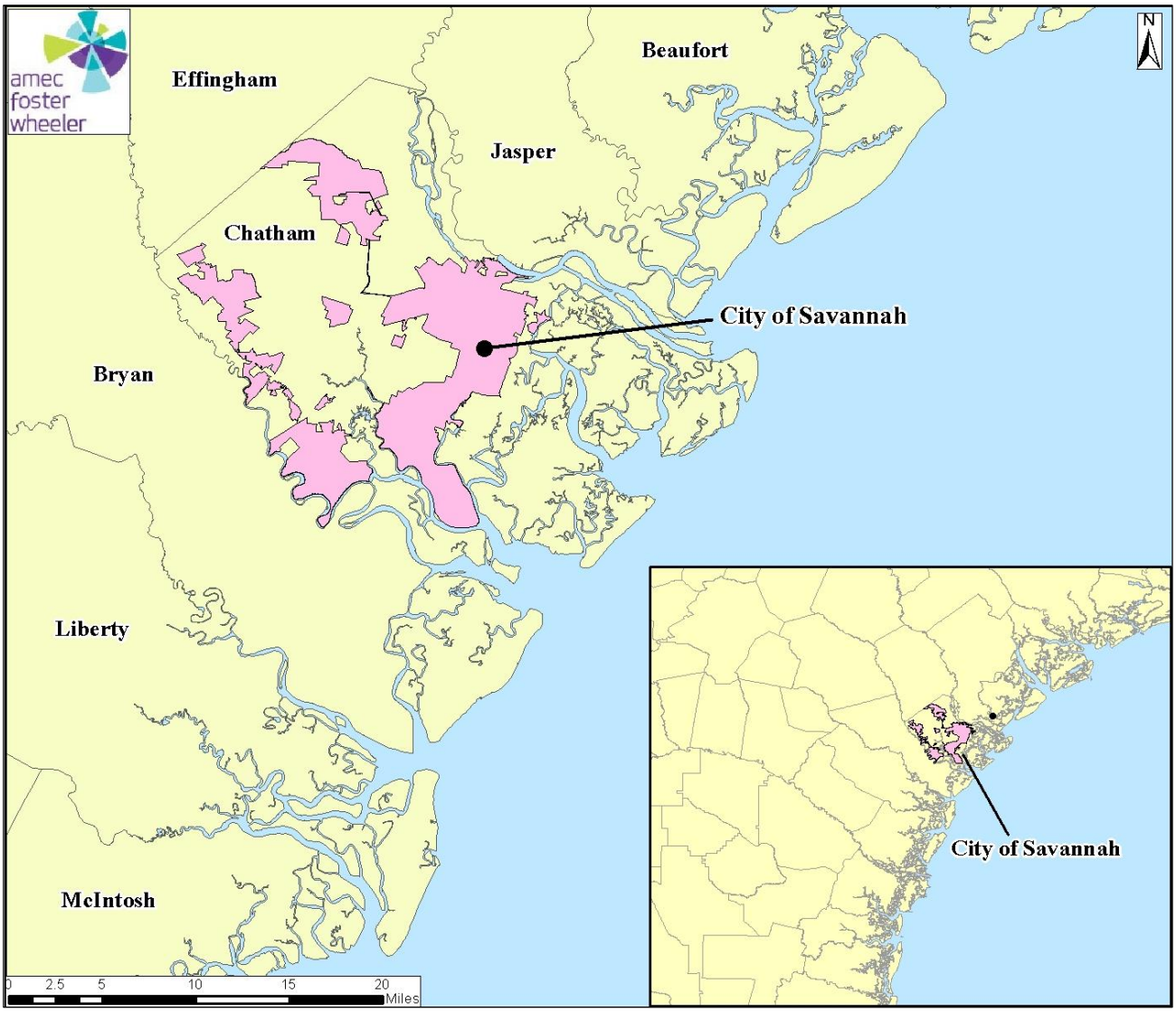
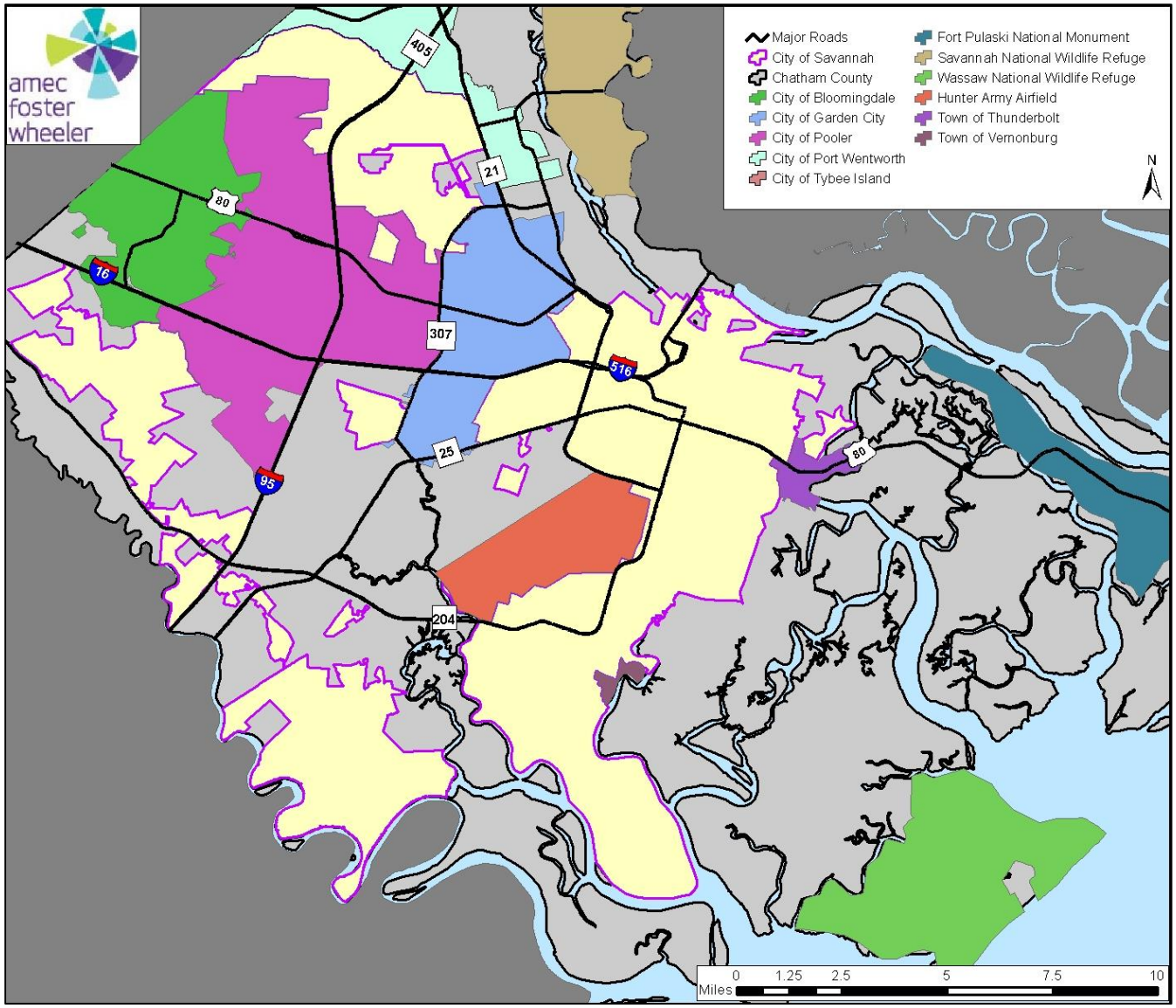
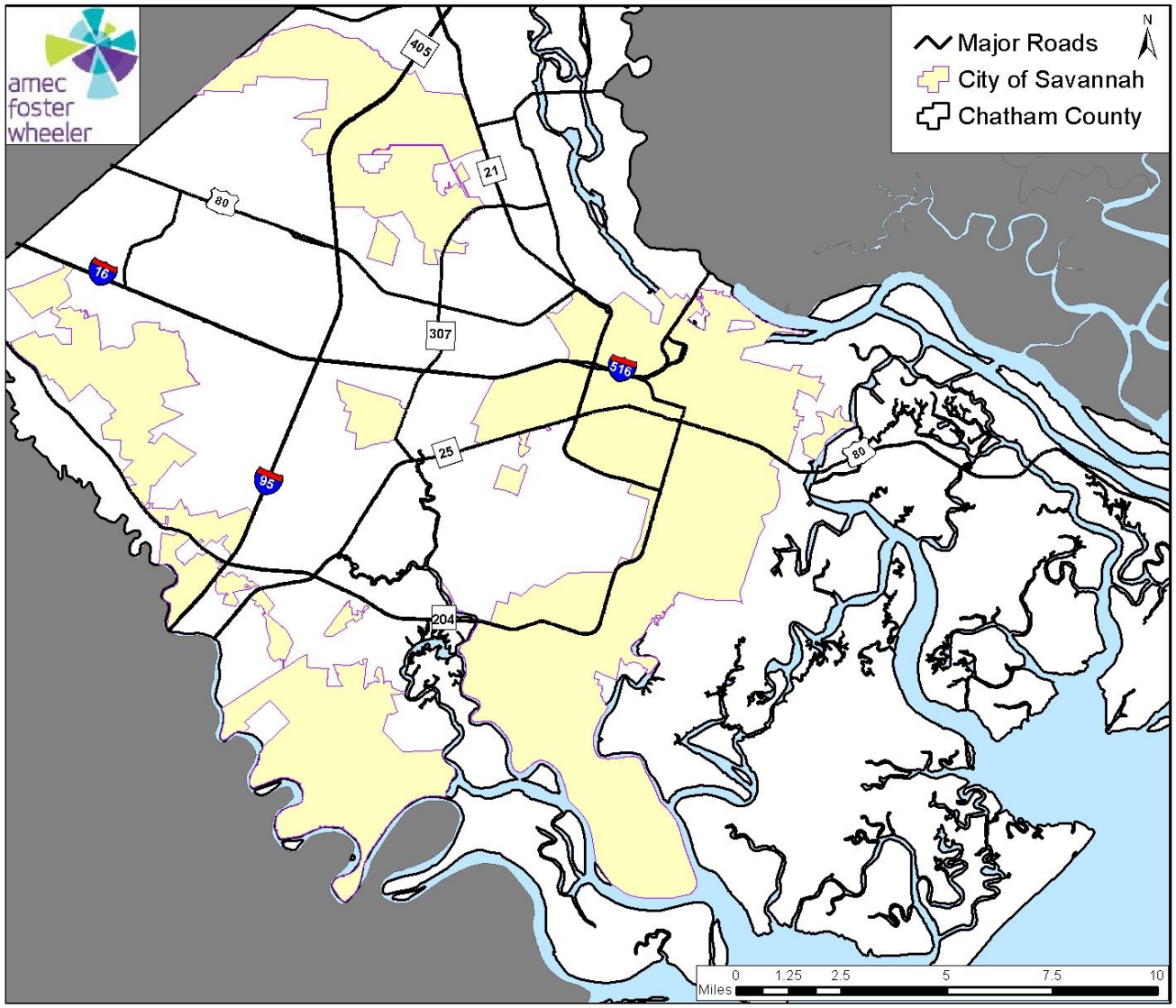


Figure 1.1 - Location Map



Data Source: SAGIS, 2014

Figure 1.2- Chatham County Jurisdictions



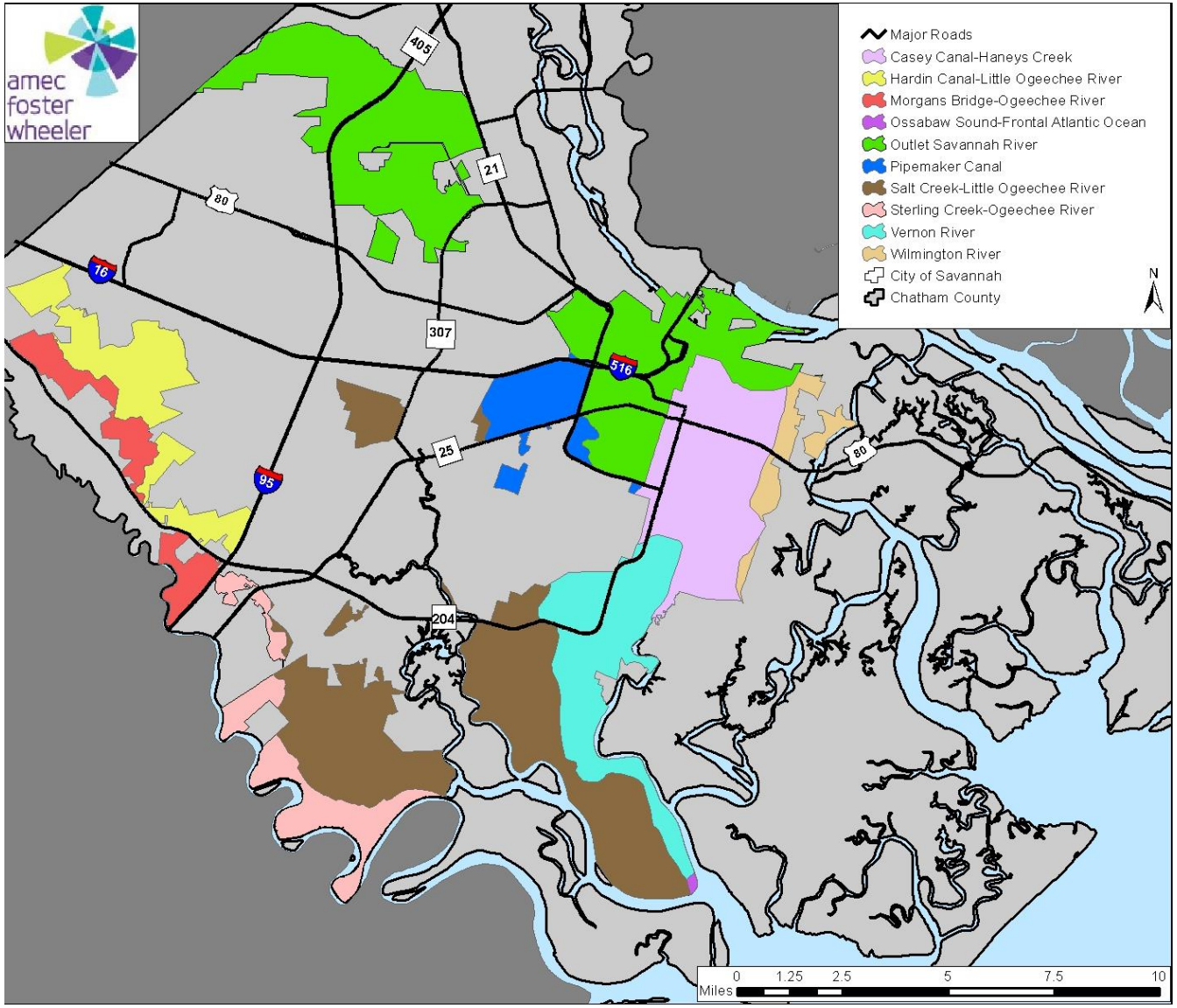
Data Source: SAGIS, 2014

Figure 1.3 – Savannah Base Map

1.3.2 Topography and Climate

The climate in southeastern Georgia is warm and temperate to subtropical. The average temperature in January is 60 degrees Fahrenheit (°F), and is 93°F in July, and the average annual precipitation is approximately 48 inches, with most precipitation occurring in August.

The City is situated on a low coastal plain with much of its surrounding area consisting of tidal marshes. Elevations range from sea level along the coast to approximately 40 feet in downtown Savannah. The Savannah River (north of City) and the Ogeechee River (south of City) have drainage areas extending far beyond the limits of Savannah and Chatham County. Other streams and creeks have chiefly tidal estuaries within the area and include the Little Ogeechee River, Vernon River, Bear River, Wilmington River, Bull River, and numerous tributaries to these. Main openings to the Atlantic Ocean are Ossabaw Sound and Wassaw Sound. Figure 1.4 illustrates the HUC-12 drainage basins within the City of Savannah.



Data Source: SAGIS, 2014

Figure 1.4 - Savannah HUC-12 Drainage Basins

1.3.3 Cultural, Historic and Natural Resources

Historic and Archaeological Resources

There are 10 identified historic neighborhoods within the City of Savannah, listed below in alphabetical order. Eight of these are listed on the National Register of Historic Places. (A ninth district, The Central of Georgia Historic District is Industrial.) Midtown and Ardmore are eligible for listing. Table 1.1 details City of Savannah historic resources.

- **Ardsley Park-Chatham Crescent National Register Historic District**
  This district is bounded by Victory Drive on the north to 55th Street on the south, and by Waters Avenue on the east to Bull Street on the west.

- **Central of Georgia Railroad: Savannah Shops and Terminal Facilities**
  This is an antebellum industrial district, established in the 1850s, and is the nation's oldest surviving and best remaining example of an integrated, comprehensive railroad facility of its period. This district is located at West Broad Street and Railroad Avenue.

- **Cuyler-Brownsville National Register Historic District**
  This district is roughly bounded by Anderson Lane, West 31st Street, Montgomery Street, Victory Drive, Ogeechee Road, and Hopkins Street.

- **Eastside National Register Historic District**
  This district has north and south boundaries of Gwinnett Street and Anderson Street and east and west boundaries of East Broad Street and Cedar Street.

- **Gordonston National Register Historic District**
  This district consists of various sizes and types of residential structures, ranging from brick mansions to small craftsmen style cottages. It is roughly bounded by Skidaway Road, Goebel Avenue, Gwinnett Street, and Pennsylvania Avenue.

- **Daffin Park-Parkside Place National Register Historic District**
  This district is bounded by Victory Drive, Waters Avenue, Bee Street and 51st Street Lane.

- **Savannah Historic Landmark District**
  This district contains park-like squares surrounded by residential, commercial and institutional properties, many of them dating from the City's early years (c1733). It is bounded by East Broad Street on the east, Gwinnett Street on the south, West Broad Street on the west, and the Savannah River on the north.

- **Savannah Victorian District**
  This district consists of wood frame houses dating from the 1870s and 1880s that are a mixture of several Victorian styles of architecture. The boundaries of the Savannah Victorian Historic District are Gwinnett Street on the north, Anderson Lane on the south, Martin Luther King, Jr. Boulevard on the west, and East Broad Street.

- **Thomas Square Streetcar National Register Historic District**
  This district contains primarily historic residential, commercial and community buildings and is

one of the largest historic districts in Savannah. It is bounded by Anderson Lane on the north, Broad Street on the east, Victory Drive on the south and Montgomery Street on the west.

- **Fairway Oaks-Greenview District**
  This district consists of two contiguous suburban and residential subdivision developed between 1950 and the early 1960s on the outskirts of the City.

Table 1.1 - City of Savannah Historic Resource Inventory

NATIONAL HISTORIC LANDMARK DISTRICT 1,730 contributing resources	
Residential	
1. 324 E. State St. National Register 2. 1 W. Macon St. National Landmark 3. 10 E. Oglethorpe Ave. National Landmark	4. 124 Abercorn National Landmark 5. 27 Abercorn St. National Register 6. 121 Barnard St. National Landmark
Commercial	
7. 101 MLK, Jr. Blvd. National Register	
Institutional	
8. 1-3 E. Bay St. National Register 9. 125 Bull St. National Register	10. 501 Whitaker St. National Register 11. 207 E. Gordon St. National Register
CENTRAL OF GA SAVANNAH SHOPS AND TERMINAL HISTORIC DISTRICT	
Industrial	
12. 227 MLK, Jr. Blvd. Gray Building 1856 13. 237 MLK, Jr. Blvd. Cotton Yard gates 1856 14. 233 MLK, Jr. Blvd. Red Building 1887 15. 301 MLK, Jr. Blvd. Terminal 16. Cotton Yard Up, 1853 & Down Freight, 1859 warehouses 17. West Boundary St. Main line (1853) and Dooley Yard (1860) viaducts 18. Motive Power Yard Smokestack, water tank and privies (1855)	19. Motive Power Yard Round House 1926 20. Motive Power Yard Machine Shop 1855 21. Motive Power Yard Blacksmith Shop 1855 22. Motive Power Yard Engine Boiler Room 1854 23. Motive Power Yard Lumber Shed 1855 24. Motive Power Yard Carpentry Shop 1853-1923 25. Motive Power Yard Paint and Coach Shop 1923-1925
SAVANNAH VICTORIAN HISTORIC DISTRICT 799 contributing resources	
Institutional	
26. 912 Drayton 1940	
THOMAS SQUARE STREETCAR HISTORIC DISTRICT 1,113 contributing resources	
Rural	
27. 2422 Abercorn St. 1799 National Register	
CUYLER BROWNSVILLE HISTORIC DISTRICT 909 contributing resources	
Institutional	
28. 644 W. 36th St. National Register	
EASTSIDE/COLLINSVILLE/MEADOWS HISTORIC DISTRICT 492 contributing resources	
ARDSLEY PARK/CHATHAM CRESCENT HISTORIC DISTRICT 1,056 contributing resources	
GORDONSTRON HISTORIC DISTRICT 170 contributing resources	
Residential Resources	
29. 2 Pierpont Circle National Register	

Archaeological and Cultural Resources	
30. Goebel, Gordonston, Edgewood and Pierpont Avenues Gordonston Park	32. Atkinson Avenue canopied road between Gwinnett and Skidaway
31. Henry St. and Atkinson Avenue Pierpont Circle	33. Kinzie Avenue canopied road streetcar right-of-way between Forrest and Pennsylvania Ave.
PARKSIDE HISTORIC DISTRICT 270 contributing resources	
HISTORIC NEIGHBORHOODS (eligible for listing on the National Register**)**	
Ardmore: 196 contributing resources.	
Midtown: 854 contributing resources.	
NEIGHBORHOODS UNDER EVALUATION (for historic status)	
Carver Heights 1946, Stiles Ave, CSX RR, Kennedy park, Gwinnett	
Fairway Oaks, 1950 Waters Avenue and Bacon park Drive	
Pine Gardens, 1940's Pennsylvania Ave, Capitol St.	
Mayfair, 1950 Montgomery Crossroads	
West Savannah, 1890 W. Bay, Louisville Road, I-516	
Hudson Hill, Rankin St., W. Bay St., W Lathrop Ave.	
Paradise Park, 1955 White Bluff Road, Harmon Canal, Dyches Drive	
Windsor Forest, 1955 White Bluff Road on lands of Cedar Grove plantation	
Magnolia Park, 1952 Waters and Derenne	
Liberty City, 1945 Mills Bee Lans Blvd.	
Woodville, 1890 W. Bay, Louisville Rd. Lynes, Pkwy, W. Lathrop	
Kensington Park, 1952 Waters, DeRenne, Habersham Streets	
INDIVIDUAL HISTORIC RESOURCES (within the city limits, not in Historic Districts)	
Rural	
34. Windsor Forest Cedar Grove Plantation	
Residential	
35. 15 East Back Street Coffee Bluff	42. 4901 Skidaway Rd. ca 1910
36. 41 W. Broad St., 1819 National Landmark	43. 3600 Skidaway Rd. Ca 1925
37. 535 W. Charlton St. ca 1888	44. 1220 Wheaton St. ca 1800
38. 342 Purse St. ca 1888	45. 13710 Coffee Bluff Rd. 19th C.
39. 536 W. Jones St. ca 1888	46. 2101 Ogeechee Rd. Pre 1916
40. 1650 E. Victory Dr. a. 1880	47. 2123 Ogeechee Rd. Pre 1916
41. 4702 Skidaway Rd. ca 1940	48. 2231 Ogeechee Rd. Pre 1916
Commercial	
49. White Bluff at Felt Dr. general store	51. 339-345 MLK, Jr. Blvd.
50. 217 MLK, Jr. Blvd. 1906	52. 347-355 MLK, Jr. Blvd.
Industrial	
53. 518 Indian St. Brush Electric Company Plant 1894	57. 646 W. Bay St. Pre 1916
54 666 Indian St. ca 1940	58. 506-508 W. Jones St. ca 1930
55. 648 Indian St. ca 1916	59. 513 W. Jones St.

56. 31 MLK, Jr. Blvd. ca 1939	60. Louisville Rd. Meddin Brothers 1917
Institutional	
61. Old White Bluff Rd. Nicholsonboro Baptist Church, two structures 1870's, 1890. National Register	68. 11305 White Bluff Road old White Bluff School 1907
62. 575 W. Bryan St. First Bryan Baptist Church National Register	69. Ogeecheeton Mt. Zion M.E.Church
63. Savannah State College, Hill Hall 1901 National Register	70. 21 Lorwood Dr. Zion White Bluff Baptist Church and Cemetery 1898
64. Ogeechee Rd & Blossum Dr. Confederate earthworks western defense line ca 1864	71. 613 MLK, Jr. Blvd. St. Philip A.M.E. Church 1911 National Register
65. Ogeechee Rd. Savannah Powder Magazine 1898	72. 5715 Skidaway Road Cohen's Men's Retreat 1933
66. Rose Dhu Island, Confederate Battery 1861	73. Fair and Alfred St. Woodville Lodge Hall
67. Rose Dhu Island, Camp Low ca 1951	
Transportation	
74. 37 MLK, Jr. Blvd. 1919	78. 62 Louisville Rd. Brick gas station
75. 109 MLK, Jr. Blvd. Greyhound Bus Depot ca 1939	79. Louisville Rd. and Lathrop Gas station
76. 77 Selma St. Seaboard Airline R.R. Signal Building 1947	80. Stiles Ave. and Lathrop Savannah and Atlanta RR building
77. 601 Cohen St. Railway Express Agency Garage	
Archaeological and Cultural	
81. Bonaventure Road Bonaventure Cemetery National Register	87. East end of Bolling St. East Savannah Cemetery
82. W. Anderson St. & Ogeechee Rd. Laurel Grove Cemetery North National Register	88. NW cor Skidaway Rd & 52nd St. Oak Grove Cemetery
83. Ogeechee Rd. Laurel Grove Cemetery South National Register	89. Wheaton Street Catholic Cemetery
84. Hunter AAFB Lincoln Cemetery 1926	90. S of Largo Cedar Grove Cemetery
85. Cohen St. Sheftall Family Burial Ground 1765	91. S of Roberts St. Woodville Cemetery ca 1840 & later
86. 601 Cohen St. rear, Jewish Community Cemetery ca 1770	

Source: Chatham County - City of Savannah Comprehensive Plan, 2006

Natural Features and Resources

According to the U.S. Fish & Wildlife Service Information Planning and Conservation System (IPaC), there are a total of **20** threatened, endangered, or candidate species within the City of Savannah planning area as shown below in Table 1.2.

Table 1.2 - Savannah Area Threatened and Endangered Species

	Status	Has Critical Habitat	Contact
Amphibians			
frosted flatwoods salamander (*Ambystoma cingulatum*) Population: Entire	Threatened	Final designated critical habitat	South Carolina Ecological Services Georgia Ecological Services Field Office
Birds			

	Status	Has Critical Habitat	Contact
Kirtland's Warbler (*Setophaga kirtlandii*) Population: Entire	Endangered		South Carolina Ecological Services
Piping Plover (*Charadrius melodus*) Population: except Great Lakes watershed	Threatened	Final designated critical habitat Final designated critical habitat	South Carolina Ecological Services Georgia Ecological Services Field Office
Piping Plover (*Charadrius melodus*) Population: Great Lakes watershed	Endangered	Final designated critical habitat	Georgia Ecological Services Field Office
Red Knot (*Calidris canutus rufa*) Population:	Threatened		Georgia Ecological Services Field Office
Red-Cockaded woodpecker (*Picoides borealis*) Population: Entire	Endangered		South Carolina Ecological Services Georgia Ecological Services Field Office
Wood stork (*Mycteria americana*) Population: AL, FL, GA, MS, NC, SC	Threatened		South Carolina Ecological Services Georgia Ecological Services Field Office
Fish			
Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*) Population: South Atlantic DPS	Endangered		Georgia Ecological Services Field Office
Shortnose sturgeon (*Acipenser brevirostrum*) Population: Entire	Endangered		South Carolina Ecological Services Georgia Ecological Services Field Office
Flowering Plants			
American chaffseed (*Schwalbea americana*)	Endangered		South Carolina Ecological Services
Canby's dropwort (*Oxypolis canbyi*)	Endangered		South Carolina Ecological Services
pondberry (*Lindera melissifolia*)	Endangered		South Carolina Ecological Services Georgia Ecological Services Field Office
Mammals			

	Status	Has Critical Habitat	Contact
North Atlantic right Whale (*Eubalaena glacialis*) Population: Entire	Endangered	Final designated critical habitat Final designated critical habitat	Georgia Ecological Services Field Office
West Indian Manatee (*Trichechus manatus*) Population: Entire	Endangered	Final designated critical habitat	South Carolina Ecological Services Georgia Ecological Services Field Office
Reptiles			
Eastern Indigo snake (*Drymarchon corais couperi*) Population: Entire	Threatened		Georgia Ecological Services Field Office
Gopher tortoise (*Gopherus polyphemus*) Population: eastern	Candidate		Georgia Ecological Services Field Office
Green sea turtle (*Chelonia mydas*) Population: Except where endangered	Threatened	Final designated critical habitat	South Carolina Ecological Services Georgia Ecological Services Field Office
Kemp's Ridley sea turtle (*Lepidochelys kempii*) Population: Entire	Endangered		South Carolina Ecological Services Georgia Ecological Services Field Office
Leatherback sea turtle (*Dermochelys coriacea*) Population: Entire	Endangered	Final designated critical habitat	South Carolina Ecological Services Georgia Ecological Services Field Office
Loggerhead sea turtle (*Caretta caretta*) Population: Northwest Atlantic Ocean DPS	Threatened	Final designated critical habitat	Georgia Ecological Services Field Office

Source: USFWS IPaC System, 2015

Parks, Preserve and Conservation

The natural and scenic amenities of Chatham County offer many recreational and cultural opportunities. Due to the amount of open space in Chatham County being reduced annually, surveys were performed and a resulting countywide Open Space Plan was completed by the MPC in 1996. This plan was drafted to provide direction in providing and conserving adequate amounts of natural open space for Chatham County to enjoy in the years to follow.

As defined in the open space plan, "open space is an area that is valued for active and passive recreation and protection of the natural resources (including natural processes and wildlife) and which provides

public benefit and which is part of one or more of the following categories: developmentally difficult lands, natural resource areas, commercially used natural resources areas, natural amenity areas, recreational areas and urban form areas." Under this definition, there are five areas under Federal jurisdiction and six areas under State jurisdiction within Chatham County that fall within this title of conservation/recreation areas. Additionally, there are a number of recreational and conservation areas within Chatham County that are not under State or Federal jurisdiction. Some of the conservation and recreational areas within Chatham County include the following sites:

- Fort Pulaski National Monument
- Savannah National Wildlife Refuge
- Tybee National Wildlife Refuge
- Atlantic Intracoastal Waterway
- Wassaw Island National Wildlife Refuge
- Skidaway Island State Park
- Marine Extension Center
- Wormsloe Historic Site
- Ossabaw Island
- Little Tybee Island
- Cabbage Island
- Oatland Island Education Center
- McQueen's Island Trail
- Bacon Park
- Lake Mayer
- L. Scott Stell Community Park / The Jim Golden Complex
- King's Ferry Park
- Tom Triplett Park

Water Bodies and Floodplains

Natural and Beneficial Floodplain Functions: Under natural conditions, a flood causes little or no damage in floodplains. Nature ensures that floodplain flora and fauna can survive the more frequent inundations. This is the case with Savannah's local marshes. They are flooded daily during high tide and yet life exists without damaging the environment. Historic floodplain areas are canals, and green spaces such as the Henderson and Bacon Park Golf Course and Lake Mayer. Such areas reduce flood damage by allowing flood waters to spread over a large area. This reduces flood velocities and provides flood storage to reduce peak flows downstream. Natural and historic floodplains reduce wind and wave impacts and their vegetation stabilizes soils during flooding.

Chatham County and the City of Savannah have barrier islands such as Little Tybee, Ossabaw, Cabbage and Wassaw Islands. These islands serve as a natural protective barrier to incoming hurricane forces such as wave attack, and serve to reduce tidal and wind energies. These islands serve as natural aquatic habitats, wetlands, marshes and estuaries.

Wetlands

The coast of Georgia comprises a vast array of wetlands ranging from freshwater non-tidal and tidal wetlands to estuarine wetlands, or saltmarshes. With approximately 100 linear miles of coastline, Georgia boasts approximately 348,000 acres of estuarine tidal marsh. These marshes are ecologically significant as habitat for aquatic organisms, including fish, shellfish, waterfowl, and other wildlife species. In addition to serving as habitat for specific organisms, saltmarshes also function as feeding grounds for

terrestrial vertebrates, as a buffer to protect against coastal storm surge, and as a natural filtration system to improve water quality, transform nutrients and retain sediment.

A unique wetland feature of the Southeastern Coastal Plain is the Carolina Bay. Carolina Bays are oval or teardrop shaped wetlands. Carolina Bays range from 6 to 30 feet deep and from several acres to 6,000 acres in size. Due to varying water levels, the vegetation differs dramatically from one Bay to another. Some are characterized by cypress forests, others marsh and some shrub bogs. Carolina Bays are underlain by a clay layer that keeps the water from draining through the otherwise porous soil of the Coastal Plain.

The benefits of wetlands are hard to overestimate. They provide critical habitat for many plant and animal species that could not survive in other habitats. They are also critical for water management as they absorb and store vast quantities of storm water, helping reduce floods and recharge aquifers. Not only do wetlands store water like sponges, they also filter and clean water as well, absorbing toxins and other pollutants.

Soils and Minerals

Chatham County, has been labeled as the Atlantic Coast Flatwoods area of Georgia. The Atlantic Coast Flatwoods area occurs along the seaward portion of Georgia and covers approximately seven million acres. It is characterized by nearly level topography and poorly drained soils that are underlain by marine sands, loams or clays.

1.3.4 History

English settlers led by James Edward Oglethorpe, a politician, soldier and philanthropist, established the 13th colony of Georgia in 1733. Oglethorpe selected a bluff on the south side of a mighty river as the site of the colony's first city, and he christened the fledgling town Savannah after the Indian name for the waterway. By 1766, Savannah was home to almost 18,000 people and a healthy economy based on the exportation of rice. The city became a major exporter of cotton in the early 1800s. The Civil War left Savannah bankrupt, but a resurgence in cotton production soon had Savannah back on its feet and prospering.

The decline of cotton production and the Great Depression threatened to curtail Savannah's progress in the 1920s and '30s, but the town got a boost when the Union Bag and Paper Company opened a large plant just west of the city. The plant — now a part of the International Paper Company empire and still one of the city's largest employers —helped Savannah through those tough times, as did the presence of the military during World War II. Two large Army Air Corps bases were in operation in Savannah, and one has been retained in the present-day form of Hunter Army Airfield.

1.3.5 Economy

Tourism

With its well-preserved past and many opportunities for outdoor recreation, Savannah draws more than 12 million visitors yearly with 7 million overnight visitors, all spending more than $2.1 billion and stimulating the ongoing development of new hotels, restaurants and shops.

Port

The Port of Savannah is the fourth largest and fastest growing container port in the U.S. In FY2010, it handled more than 2.6 million TEUs (Twenty Foot Equivalent Units), a 9.7 percent increase over the previous fiscal year.

Manufacturing

The Savannah area's manufacturing sector — with a local economic impact of $2.3 billion — produces a variety of consumer goods that range from corporate jets to baked goods to dental equipment. Among the high-profile manufacturers are International Paper, Georgia Pacific and Weyerhaeuser, three giants of the pulp and paper industry; Gulfstream Aerospace, a producer of world-class business aircraft; and JCB, which produces heavy construction equipment.

Military

The City is the site of Hunter Army Airfield, a vital part of the Fort Stewart complex, which is the largest military installation east of the Mississippi River. Boasting the U.S. Army's longest runway in the eastern United States, Hunter serves as a location from which troops and equipment based at Hunter and Fort Stewart can be deployed rapidly throughout the world. Fort Stewart, with headquarters located 40 miles southwest of Savannah in the Liberty County town of Hinesville, is home of the 3rd Infantry Division (Mechanized). The two installations accounted for a payroll of more than $1.38 billion in 2009. Savannah is also home to the 165th Airlift Wing of the Georgia Air National Guard, as well as units of the Coast Guard and other components of the Air Guard.

Wages and Employment

According to the 2009-2013 American Community Survey 5-Year Estimates, the median household income for the City of Savannah is $35,838. 26% of the population is considered to be living below the poverty level. Table 1.3 shows employment and unemployment rates along with industry employment by major classification for the City. Table 1.4 list major employers in the City.

Table 1.3 - Employment and Occupation Statistics for Savannah, GA

Employment Status	Percentage
In labor force	60.4
Employed	51.7
Unemployed	7.2
Not in labor force	39.6
Occupation	
Management, business, science and arts	31.5
Service	24.0
Sales and office	24.8
Natural resources, construction and maintenance	7.1
Production, transportation and material moving	12.7

Source: U.S. Census Bureau 2009-2013 American Community Survey 5-Year Estimates

Table 1.4 - Major Employers in Savannah, GA

Corporation/Organization	Service/Product	# of Employees
Gulfstream Aerospace Corp.	Jet aircraft, aerospace equipment	9,382
Savannah-Chatham County Board of Education	Public schools	4,808
Ft. Stewart/Hunter Army Airfield	Civilian personnel	4,637
Memorial Health University Medical Center	Hospital	4,600
St. Joseph's/Candler Health System	Hospital	3,170

Source: SEDA

1.3.6 Population

The City of Savannah had 136,286 residents at the time of the 2010 U.S. Census, which is a 3.6% increase from the 2000 census. The Savannah population density is 1,321.2 people per square mile,

which is much higher than the state average density of 168.4 people per square mile. Table 1.5 provides demographic profile data from the 2010 Census.

Table 1.5 - Savannah Demographic Profile Data, 2010

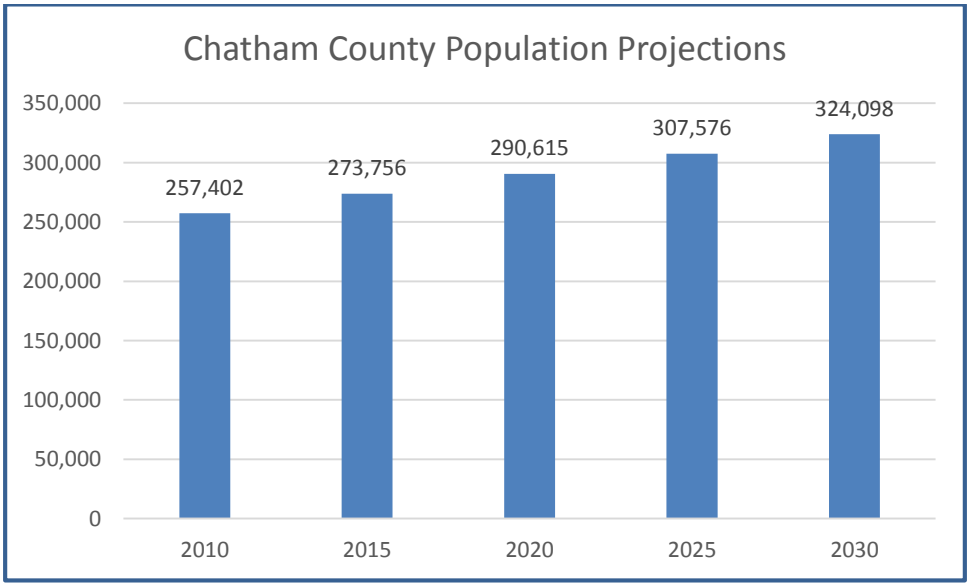
Demographic	Percentage
Gender/Age	
Male	47.9
Female	52.1
Median Age	31.3
Under 5 Years	7.1
65 Years and Over	11.6
Race/Ethnicity	
White	39.9
Asian	2.6
Black or African American	56.7
American Indian/Alaska Native	0.8
Hispanic or Latino	4.7
Education	
High School Graduate or Higher	84.5
Bachelor's Degree or Higher	24.6

Source: U.S. Census Bureau, 2010, www.census.gov

[1]Hispanics may be of any race, so also are included in applicable race categories.

1.3.7 Growth and Development Trends

The Chatham County-Savannah Metropolitan Planning Commission (MPC) has developed a method of estimating population growth based on the number of residential building permits issued during the year. The Chatham County-Savannah MPC projects the population of Savannah to increase to 144,625 (5.8%) by the year 2030. According to the Chatham County Office of Planning and Budget, the population of Chatham County is projected to increase to 324,098 (25.9%) by the year 2030. Population projections for Chatham County are shown below in Figure 1.5.



Source: State of Georgia Office of Planning and Budget, 2010

Figure 1.5 - Population Projections for Chatham County, Georgia

1.4 Plan Organization

The City of Savannah Floodplain Mitigation Plan is organized as follows:

- Chapter 2: Plan Update
- Chapter 3: Planning Process
- Chapter 4: Flood Risk Assessment
- Chapter 5: Mitigation Strategy
- Chapter 6: Plan Adoption
- Chapter 7: Plan Implementation and Maintenance
- Appendix A: Planning Process
- Appendix B: Mitigation Strategy
- Appendix C: References

2 PLAN UPDATE

Requirements §201.6(d)(3): A local jurisdiction must review and revise its plan to reflect changes in development, progress in local mitigation efforts, and changes in priorities, and resubmit it for approval within 5 years in order to continue to be eligible for mitigation project grant funding.

The 2010 Floodplain Mitigation Plan for the City of Savannah contained a risk assessment of identified hazards for the City and a mitigation strategy to address the risk and vulnerability from these hazards. Since approval of the plan by FEMA, much progress has been made by the City on implementation of the mitigation strategy. This chapter includes an overview of the approach to updating the plan, identifies new analyses and information included in this plan update, and highlights key mitigation successes.

2.1 What's New in the Plan

This FMP update involved a comprehensive review, reorganization and update of each section of the 2010 plan and includes an assessment of the success of the City in evaluating, monitoring and implementing the mitigation strategy outlined in the initial plan. Only the information and data still valid from the 2010 plan was carried forward as applicable into this FMP update.

Also to be noted, Section 7.0 Implementation and Maintenance of this plan update identifies key requirements for updating future plans:

- Consider changes in vulnerability due to action implementation;
- Document success stories where mitigation efforts have proven effective;
- Document areas where mitigation actions were not effective;
- Document any new hazards that may arise or were previously overlooked;
- Incorporate new data or studies on hazards and risks;
- Incorporate new capabilities or changes in capabilities;
- Incorporate growth and development-related changes to inventories; and
- Incorporate new action recommendations or changes in action prioritization.

These requirements and others as detailed throughout this plan were also addressed during this plan update process. New information and analyses contained in this plan update include the following:

- Increased flood risk analysis based on the new DFIRM and the most recent Tax Assessor's Data.
- Increased discussion of hurricane, including a greater discussion of storm surge and its effects on the City.
- The Climate Change hazard, with a focus on sea level rise and storm surge, was included as a separate hazard. An in-depth literature search was completed and the SLR and storm surge impacts to the City were analyzed.
- GIS was used, to the extent data allowed, to analyze all priority hazards as part of the vulnerability assessment. This involved utilizing mapped hazard data, combined with the City parcel data.
- Populations at risk to identified hazards were identified utilizing GIS and 2010 Census data. Assets at risk were identified by property type, and values of properties included based on data from the City Tax Assessor's Database. The discussion on growth and development trends was enhanced utilizing 2010 Census data.

- Hazard impacts to future development were analyzed through the development of future development maps and tables by property type based on the City assessor's data.
- Critical facilities were analyzed for all mapped priority hazards. Maps of critical facilities at risk to identified hazards were included in this Update.
- Enhanced public outreach and agency coordination efforts were conducted throughout the plan update process in order to meet the more rigorous requirements of CRS, in addition to DMA requirements.

2.2 2010 FMP Mitigation Strategy Status and Successes

In the 2010 mitigation strategy for the City of Savannah, the FMPC put forward the following goals:

GOAL 1 – CONSTRUCTION PROGRAM

Develop and implement sound mitigation measures for the City's infrastructure, especially its drainage system to minimize damages to property and prevent business interruption and disruption to the City's facilities, infrastructure, and utilities during and following hazard events.

GOAL 2 – LAND USE

Pursue measures that increase protection of sensitive flood-prone areas like wetlands and river or stream corridors. Provide incentives to maintain green space and use existing vacant City land to the highest practical flood storage use.

GOAL 3 – MITIGATION PROJECTS

Pursue mitigation funding from a wide range of sources to reduce potential future flood losses and identify flood vulnerabilities.

GOAL 4 – COMMUNICATION, EDUCATION AND OUTREACH

Improve the City's communication and education capabilities to better prepare for, mitigate, and respond to hazard events. Provide outreach and technical assistance to those at high risk to flooding.

GOAL 5 – CODES AND STANDARDS

Design and implement enhanced building standards for new construction to maximize the protection from high risk flood hazards.

GOAL 6 – LOCAL FUNDING AND INVESTMENTS

Identify local funding instruments that can help citizens afford flood insurance, and establish dedicated sources of revenue for funding flood mitigation actions.

GOAL 7 – LOCAL FLOOD INSURANCE ISSUES

Identify ways to lower flood insurance premiums in flood hazard areas where mitigation has occurred, especially through the implementation of drainage improvement projects that have been proven effective in reducing flood hazard losses.

Past Mitigation Actions Update

The 2010 mitigation strategy contained 49 separate mitigation actions. Of these 49 actions, 14 have been completed, 28 are ongoing, and 7 have not yet been started due to a variety of reasons such changes in priorities, lack of funding, or changes to the projects themselves. Thirty of these projects are still considered viable, and will be carried forward in this plan. More detail on these projects can be found in Chapter 5. The status of the 2010 mitigation actions are shown in Table 2.1 below.

Table 2.1 - 2010 Actions and Status Summary

Action Description	Status			Action in 2015 FMP Update	Progress
	Complete	Ongoing	Not yet Started		
Goal 1 – Construction Programs					
1.1 Comprehensive evaluation of drainage system and implementation of selected projects.		✓		✓	The majority of structural flooding has been resolved; City Council has shifted priorities from structural flooding to street flooding. Study for North Casey received. Study underway for Casey South, Bilbo and Springfield. Funding for additional studies is needed.
1.2 Enhance Drainage system maintenance program to unclog storm drains/ clear drainage channels and a public education component on proper yard waste disposal and eliminate brush disposal in canals.		✓		✓	OPC provides clean water and debris awareness. City continues to strive to maintain much of the storm system each year to meet state requirement and hot spots.
1.3 Evaluate causeways for storm surge sustainability and stability.	✓				Completed. CEMA new Multi Jurisdiction Plan and new Recovery Support Function Plan.
Goal 2 – Land Use					
2.1 Ensure the City's new zoning code limits development in floodplains and wetlands to low density, and that a certain percentage of land remains protected as open space to provide a natural buffer from water bodies.		✓		✓	Local Coastal Stormwater Supplement (CSS) provides regulations for setbacks and awards higher LID practices. Zoning's new ordinance still under review. Delay from administrative and community developers.
2.2 Reserve vacant low-lying/flood-prone/wetland areas for open space through acquisition or regulation		✓		✓	Multiple properties have been purchased and demolished. Moving forward with the submitted HMGP grant to purchase 17 new properties.
2.3 Purchase low-lying land to create stormwater retention areas and/or constructed wetlands	✓				Completed. Current strategy of leaving lands on tax rolls and letting exiting development standards keep green space green continues.
2.4 Evaluate FEMA-purchased properties for the highest use in floodwater/stormwater storage.		✓		✓	City has established multiple community gardens; the City continues to work with neighborhood groups to build additional gardens.

Action Description	Status			Action in 2015 FMP Update	Progress
	Complete	Ongoing	Not yet Started		
2.5 Require in the revision of the Subdivision Ordinance that all new subdivisions dedicate 20% of land as green space.		✓		✓	Unified Zoning Ordinance has halted for further review from the administration and community development reviewers.
2.6 Designate GDOT properties that are unused as areas for flood storage.		✓		✓	I- 516 and I-16 locations are targeted to be used as storage. City continues discussion with GA DOT to maintain as storage for stormwater detention.
2.7 Reduce future vulnerability of Valambrosa area through acquisition or regulation.			✓	✓	Through Map Mod the area was remapped with new flood zone delineation producing AE, X, and SHX zones. The new Risk Map program should delineate the "Coastal A" Zone with maps estimated completing date in 2015. Need to add Coastal A zone language in the City's Flood Damage Prevention Ordinance when maps are adopted.
2.8 Add additional higher regulations to the Flood Damage Prevention Ordinance that will prohibit enclosures of areas of greater than 300 square feet below the BFE.		✓		✓	Unincorporated Chatham County (UCC) has passed language limiting enclosed areas below the BFE in V zones. The City will need to mirror UCC Ordinance.
Goal 3 – Mitigation Projects					
3.1 Continue acquisition/demolition of high-risk flood-prone properties.		✓		✓	Moving forward with the submitted HMGP grant to purchase 17 new properties.
3.2 Evaluate the feasibility of a floodproofing program for homes where acquisition is not an option – especially historic structures.		✓		✓	The 2008 Flood Prevention Ordinance requires structures that are outside the SFHA but flood are subject to Substantial Improvement requirements. Structures that are in the "Historic Area" and are listed in the City's "Flooded Structures" database are tracked and subject to the 50% Rules if a drainage CIP project has not provided 100 year protection. Several permit have been issued in the Historic area. Each application was reviewed for local flooding concern. Only one permit was in an area that a stormwater project could not improve the flood hazard. The structure was elevated one foot above the known flood depth.
3.3 Target repetitive loss structures by conducting a detailed study as outlined in the RLAA.		✓		✓	The City's Real Properties Department has on file a list of houses which needs to be demolished as

Action Description	Status			Action in 2015 FMP Update	Progress
	Complete	Ongoing	Not yet Started		
					GEMA notifies the City of available mitigation funds.
3.4 Target critical facilities for flood mitigation.		✓		✓	Critical facilities are continuing to be checked for compliance with Flood Damage Prevention Ordinance. This year the City Manager and Real Property Services Department rejected several property locations for fire and police stations because the property or access routes fell within the 500 year floodplain.
Goal 4 – Communication, Education and Outreach					
4.1 Post flood mitigation information at libraries, post offices, heavily trafficked municipal buildings and community centers. Develop and post "potential high water mark" signs.		✓		✓	Participated in neighborhood meetings and continued to provide flood protection handouts in public buildings and libraries. Also, participating in local Realtors workshop covering the topic of Biggert Waters Act of 2012 and the benefits of CRS.
4.2 Enhance central call-in number repository for reporting flood problems.	✓				Completed.
4.3 Continue to enhance newly implemented City website "flood protection information' webpage.		✓		✓	City has a new web page. The main page has a Flood Protection topic that leads viewers to the Flood Information page that include links to Historic FIRM, point of interest web links, local flood hazards & information, 510 Plan, Flood ordinance, and outreaches. LOMA are on the SAGIS/City web page, and Elevation Certificates to be completed by the end of 2014.
4.4 Continue coordination with CEMA, NWS and USGS to enhance flood warning system.		✓		✓	As part of the new 510 Plan, Jonathan Lamb and Blair Holloway of the NWS are participating as part of the stakeholder's committee. CEMA are now sending out weekly reports and tweeting warnings and other news concerns.
4.5 Update evacuation plans, including the identification of areas to shelter rather than evacuate non-essential public works supplies and equipment.	✓				Completed. The City's new Critical Facility (6183 North Highway 21) completed. The City is partnering with Armstrong State University and other location to provide building/housing during an event for critical work force. CEMA revised

Action Description	Status			Action in 2015 FMP Update	Progress
	Complete	Ongoing	Not yet Started		
					Multi Hazard Plan included updated severe weather procedures and evacuations routes.
4.6 Continue flood preparedness and outreach activities at local community events		✓		✓	Continued to be done. GIS day November 2014; Home and Guarding Show February 28 - March 2, 2014; Earth Day: Saturday - April 19, 2014: Home Depot Day: Saturday - June 14, 2014.
4.7 Mail information to all structures in the floodplain promoting flood insurance and sound floodplain management practices.		✓		✓	Completed.
4.8 Organize public information campaign and organize public cleanups to reduce litter/debris in storm drains.		✓		✓	OPC featured an article of the Vernon River since the new parkway was opened. Also, working with Jackie Jackson Teel, Laura Walker, and Bill Hodgins to clean marsh lands. OPC highlighted proper disposal of oils and the effects of fertilizer on the marsh in this year's outreach to the community. Promoted the Rivers Alive activity of cleaning the Harden Canal.
4.9 Conduct public outreach and direct technical assistance – particularly targeting repetitive loss properties and discussion of potential funding.		✓		✓	Participated as an instructor at the quarterly Realtor Workshop. Attended multiple neighborhood meetings. Used the Ward's Floodplain Model at two local schools.
4.10 Create school projects that emphasize flood awareness and mitigation.	✓				Completed. Held educational out reaches with the Wards 3-D Floodplain Model at Jenkins High School, Georgia Tech Engineering Summer campers, and Classic Academy School with local ASCE, Savannah State University and Jenkins Technical School program.
4.11 Establish program aimed at providing flood protection assistance to owners of flood-prone properties, including site visits and advice on retrofitting and other flood mitigation measures.		✓		✓	Advertised in the yearly outreaches (OPC, OPA and OPF).
4.12 Educate the public on the use of permeable concrete paving and establishment of rain gardens to reduce flash flooding impacts.		✓		✓	Attended Earth day, neighborhood meetings, and GIS Day to discuss "clean water" principles. Promoted smart watershed practices in the new six page outreach to the community (OPC).
4.13 Interview and coverage on local news, in		✓		✓	June 2011, local TV News WSAV provided a

Action Description	Status			Action in 2015 FMP Update	Progress
	Complete	Ongoing	Not yet Started		
newspaper articles and through advertisement to promote flood mitigation.					special Hurricane Preparedness that include camera visit to Savannah Pumping station and Flood Insurance. WSAV: Interviewed for Hurricane Season to promote Flood Insurance, CRS and BW12. September 15, 2013 article Homeforsale.com concerning BW12, Flood Insurance and CRS. As part of updating the CRS 510 Plan the City held three local meetings that WTOC, WSAV, and WJCL covered.
4.14 Provide flood mitigation update and outreach to neighborhood groups and other interested parties via an email group address.		✓		✓	Neighborhood meetings attended in 2nd district, 3rd district, Mayfair, Magnolia Park, Feiler Terrace, Cloverdale, Summerside, Baldwin Park, Habersham/East 60th Streets area and Waters Ave/Wheaton/Joe St. area.
4.15 Organize annual/semi-annual single-focus public workshops/meetings to discuss flood mitigation.		✓		✓	City continues Town Hall meeting efforts to discuss local flooding concerns.
4.16 Develop flood mitigation information sheets to be periodically submitted in utility bills			✓		Need funding.
Goal 5 – Codes and Standards					
5.1 Support efforts to update flood ordinance including 1-foot freeboard requirement.	✓				Completed.
5.2 Support the definition of critical facility as defined in the newly revised flood ordinance and identify those facilities that need to have flood risk protection upgraded to the 500-year flood. Obtain GIS data layers for facilities outside of current "critical facility" data layers and capture in an update to the FMP.	✓				Completed. The Flood Damage Protection Ordinance requires Critical Facilities and access routes to be protected to the 500 year flood.
5.3 Ensure the development of lots within previously approved subdivisions (e.g., infill) are elevated to above base flood elevation (BFE) in a manner that does not increase potential flooding to adjacent properties (e.g., the development maintains pre-development flood storage and elevation practices that displace flood water such as fill are closely examined).	✓				Completed. The Flood Damage Protection Ordinance requires compensatory storage for all new development in the SFHA.
5.4 Adopt higher and strengthened enforcement of development and building standards. Long-term	✓				Completed. New Stormwater Ordinance of the Coastal Stormwater Coastal Stormwater

Action Description	Status			Action in 2015 FMP Update	Progress
	Complete	Ongoing	Not yet Started		
process to evaluate current standards and develop support for potential increases.					Supplement in effect 2012. Georgia's SOS and City of Savannah scheduled to adopt the 2012 IBC and IRC Codes in 2014.
5.5 Conduct site evaluations to bring Savannah-Chatham Co. School System into mitigation requirements including retrofit of properties with fill along canals			✓		As the school board remodels all the schools or construct new buildings the City Stormwater and Flood Damage Protection Ordinance are being enforced requiring the schools to be better flood resilient. School modifications continue to be evaluated under the City's SPR review process.
5.6 Revise/strengthen stormwater ordinance to enforce development checklist.	✓				Completed. March 22, 2013 City adopted new Coastal Storm water Supplement to take effect on April 1, 2013. CSS continues to be utilized following last year's ordinance upgrade.
5.7 Strengthen and enforce requirements for drainage and roadway standards in all new developments.	✓				Completed. The main changes to the ordinance are as follows: • Added Coastal Stormwater Supplement definitions and minimum standards; • Added clarification of enforcement process; • Added applicability exemption for projects consisting of 5,000 square feet or less of impervious surface or less than one acre of disturbance; • Added exclusions for active development permits;- 5 - • Updated permit review process to Coastal Stormwater Supplement guidance; and • Added watercourse protection provisions.
5.8 Consider and establish a development standard of one foot above highest grade or one foot above the streets back of curb (BOC), whichever is higher for new construction. If the structure's lowest finished floor would be more than three feet below the BOC then the structure's lowest finished floor has to be 3 feet above the highest adjacent grade.			✓		Current Subdivision Ordinance require above street level but not the 3' clause. Flood projection ordinance mandated by state implemented in 2008.
5.9 Push for new development to incorporate both Low Impact Development (LID), No Adverse Impact	✓				Completed. In addition to the Coastal Stormwater Supplement, the current proposed New Zoning

Action Description	Status			Action in 2015 FMP Update	Progress
	Complete	Ongoing	Not yet Started		
(NAI), and Leadership in Energy and Environmental Design (LEED) principles which will likely mitigate flooding.					Ordinance include Leeds and LID. Several hotels utilized the Green Roof ordinance and continue to support the grey water section of the City's and IBC/Plumbing Code.
5.10 Design site improvements to handle the 100-year, 24-hour storm event.			✓		CIP Projects are designed to 100-yr where feasible. Development standard continues at 25-yr.
5.11 Restudy Ogeechee River between I-95 and Chatham County/Effingham County border. Redefine 100-year flood boundary.	✓				Completed. Adopted the Riverine FIRM update on July 7, 2014.
Goal 6 – Local Funding and Investments					
6.1 Establish storm water utility program to provide a dedicated source of revenue to fund storm water projects.			✓		Current Council does not want to impose additional fees on citizens.
6.2 Provide flood protection assistance to vulnerable populations (elderly, disabled and low-income individuals) so they can purchase flood insurance.			✓	✓	Continues to be discussed but lacking funding or grants.
6.3 Strategically focus SPLOST funds toward identified drainage improvement projects.		✓		✓	Focused drainage project lists were furnished to City leaders for use in developing the SPLOST project list for submittal to the County.
Goal 7 – Local Flood Insurance Issues					
7.1 Document drainage improvements in SFHAs and request revisions to the applicable FIRM maps to reflect new conditions through the FEMA LOMR process.		✓		✓	The 2008 Flood Damage Protection Ordinance require changes of water ways or major drainage improvements for the developer/engineer to submit and have approved through FEMA a LOMA prior to a Certificate of Occupancy being issued.
7.2 Identify FEMA mechanisms for restoring preferred risk flood insurance premium rates for Repetitive Loss properties not in the SFHA and protected by recent drainage system improvements.	✓				Completed. Once a structure is on FEMA's Repetitive Loss list the structure can never receive Preferred Risk insurance again.
7.3 Complete AW-501 forms for acquired Repetitive Loss properties to remove from FEMA Repetitive Loss Property list (or classify each as "mitigated").		✓		✓	2011 reviewed and sent to ISO's Sherry Harper. No new structures have since been added to Repetitive Loss Database. Mitigated two structures.
7.4 Promote flood insurance through community notification to citizens and business personnel by newspapers, letters, and public outreach.		✓		✓	On-going, performed annually.

3 PLANNING PROCESS

Requirement §201.6(b): An open public involvement process is essential to the development of an effective plan. In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process shall include:

1) An opportunity for the public to comment on the plan during the drafting stage and prior to plan approval;

2) An opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia, and other private and nonprofit interests to be involved in the planning process; and

3) Review and incorporation, if appropriate, of existing plans, studies, reports, and technical information.

Requirement §201.6(c)(1): The plan shall include the following:

1) Documentation of the planning process used to develop the plan, including how it was prepared, who was involved in the process, and how the public was involved.

This Floodplain Mitigation Plan was developed under the guidance of a Floodplain Mitigation Planning Committee (FMPC). The Committee's representatives included representatives of City Departments, federal and state agencies, citizens and other stakeholders.

Information in this plan will be used to help guide and coordinate mitigation activities and decisions for local land use policy in the future. Proactive mitigation planning will help reduce the cost of disaster response and recovery to communities and their residents by protecting critical community facilities, reducing liability exposure, and minimizing overall community impacts and disruptions. This plan identifies activities that can be undertaken by both the public and the private sectors to reduce safety hazards, health hazards, and property damage caused by floods.

3.1 Local Government Participation

The DMA planning regulations and guidance stress that each local government seeking FEMA approval of their mitigation plan must participate in the planning effort in the following ways:

- Participate in the process as part of the FMPC;
- Detail where within the planning area the risk differs from that facing the entire area;
- Identify potential mitigation actions; and
- Formally adopt the plan.

For the City of Savannah FMPC, "participation" meant the following:

- Providing facilities for meetings;
- Attending and participating in the FMPC meetings;
- Completing and returning the Amec Foster Wheeler Data Collection Guide;
- Collecting and providing other requested data (as available);
- Managing administrative details;
- Making decisions on plan process and content;

- Identifying mitigation actions for the plan;
- Reviewing and providing comments on plan drafts;
- Informing the public, local officials, and other interested parties about the planning process and providing opportunity for them to comment on the plan;
- Coordinating, and participating in the public input process; and
- Coordinating the formal adoption of the plan by the City Council.

The FMPC met all of the above participation requirements. The FMPC included representatives from key City departments, federal and county stakeholders, the insurance and real estate industries as well as citizen volunteers. The participants comprising the Savannah FMPC included the following:

1. Tom McDonald, CFM – City of Savannah Development Services Department
2. Daniel Stowers – City of Savannah Office of Emergency Management
3. Jian Fei – City of Savannah Stormwater Management Department
4. Jim Shirley – City of Savannah Parks and Recreation Department
5. Jonathan Albright – City of Savannah Development Services Department (GIS)
6. Laura Walker – City of Savannah Environmental Affairs Office
7. Patty McIntosh – City of Savannah Community Planning and Development Department
8. Courtney Reich – Ecological Planning Group (Local Small Business)
9. Jeffrey Morris – U.S. Army Corps of Engineers Savannah District
10. Sharyn Baggett/Louis Carrow – American Red Cross
11. Jeffrey Brady – Allstate Insurance
12. Vanessa Miller-Kaigler – Savannah-Chatham County Public School System
13. Ben Farmer – Citizen Volunteer
14. Gloria Williams – Citizen Volunteer

Table 3.1 details the FMPC meeting dates and the FMPC members in attendance. A more detailed summary of FMPC meeting dates including topics discussed and meeting locations follows in Table 3.4. Meeting sign-in sheets have been included in Appendix A.

Table 3.1 - FMPC Meeting Attendance Record

Member Name	Affiliation	Meeting Date				
		08/06/14	11/12/14	12/09/14	12/10/14	02/12/15
Tom McDonald	City of Savannah	✓	✓	✓	✓	✓
Daniel Stowers	City of Savannah	✓				
Jian Fei	City of Savannah	✓	✓	✓	✓	✓
Jim Shirley	City of Savannah	✓		✓	✓	✓
Jonathan Albright	City of Savannah	✓	✓	✓	✓	✓
Laura Walker	City of Savannah		✓	✓	✓	✓
Patty McIntosh	City of Savannah	✓	✓	✓		✓
Courtney Reich	Ecological Planning Group	✓	✓		✓	
Jeffrey Morris	U.S. Army Corps of Engineers	✓			✓	
Sharyn Baggett	American Red Cross	✓				
Louis Carrow	American Red Cross					✓
Jeffrey Brady	Allstate Insurance	✓	✓		✓	✓
Vanessa Miller-Kaigler	Savannah-Chatham Co Schools					
Ben Farmer	Citizen Volunteer					
Gloria Williams	Citizen Volunteer	✓	✓	✓	✓	✓

Based on the area of expertise of each City representative participating on the FMPC, Table 3.2 demonstrates each member's expertise in the six mitigation categories (Prevention, Property Protection, Natural Resource Protection, Emergency Services, Structural Flood Control Projects and Public Information). The City of Savannah Development Services Department is responsible for community land use and comprehensive planning and was an active participant on the FMPC and provided data and information to support development of the plan.

Table 3.2 - City of Savannah Staff Capability with Six Mitigation Categories

Community Department/Office	Prevention	Property Protection	Natural Resource Protection	Emergency Services	Structural Flood Control Projects	Public Information
Development Services	✓	✓	✓		✓	✓
Emergency Management	✓			✓		✓
Stormwater Management	✓	✓			✓	✓
Parks and Recreation			✓			✓
Environmental Affairs	✓		✓		✓	✓
Community Planning and Development	✓	✓	✓			✓

This Section 3 and Appendix A provide additional information and documentation of the planning process that was implemented for the development of this FMP.

3.2 The 10-Step Planning Process

The planning process for preparing the City of Savannah Floodplain Mitigation Plan was based on DMA planning requirements and FEMA's associated guidance. This guidance is structured around a four-phase process:

1) Planning Process;
2) Risk Assessment;
3) Mitigation Strategy; and
4) Plan Maintenance.

Into this process, the City integrated a more detailed 10-step planning process used for FEMA's Community Rating System (CRS) and Flood Mitigation Assistance programs. Thus, the modified 10-step process used for this plan meets the requirements of six major programs: FEMA's Hazard Mitigation Grant Program; Pre-Disaster Mitigation Program; Community Rating System; Flood Mitigation Assistance Program; Severe Repetitive Loss Program; and new flood control projects authorized by the U.S. Army Corps of Engineers.

Table 3.3 shows how the 10-step CRS planning process aligns with the four phases of hazard mitigation planning pursuant to the Disaster Mitigation Act of 2000.

Table 3.3 Mitigation Planning and CRS 10-Step Process Reference Table

DMA Process	CRS Process
Phase I – Planning Process	
§201.6(c)(1)	Step 1. Organize to Prepare the Plan
§201.6(b)(1)	Step 2. Involve the Public
§201.6(b)(2) & (3)	Step 3. Coordinate
Phase II – Risk Assessment	
§201.6(c)(2)(i)	Step 4. Assess the Hazard
§201.6(c)(2)(ii) & (iii)	Step 5. Assess the Problem
Phase III – Mitigation Strategy	
§201.6(c)(3)(i)	Step 6. Set Goals
§201.6(c)(3)(ii)	Step 7. Review Possible Activities
§201.6(c)(3)(iii)	Step 8. Draft an Action Plan
Phase IV – Plan Maintenance	
§201.6(c)(5)	Step 9. Adopt the Plan
§201.6(c)(4)	Step 10. Implement, Evaluate and Revise the Plan

The development of this FMP involved a comprehensive review of all flood hazards specific to the City. Also to be noted, this plan provides an analysis of climate change impacts to the City.

3.2.1 Phase I – Planning Process

Planning Step 1: Organize to Prepare the Plan

With the City of Savannah's commitment to participate in the DMA planning process and the CRS, City officials worked to establish the framework and organization for development of the plan. An initial meeting was held with key community representatives to discuss the organizational aspects of the plan development process.

Invitations to participate on the FMPC were extended to City officials, citizens, and federal, state, and local stakeholders that might have an interest in participating in the planning process. The list of initial invitees is included in Appendix A. The following local stakeholders were invited to participate on the FMPC:

City of Savannah
Development Services Department
Office of Emergency Management
Stormwater Management Department
Parks and Recreation Department
Environmental Affairs office
Planning and Development Department
Board of Education – Risk Management Department
Water Supply

Chatham County
Savannah-Chatham County Emergency Management Agency
Chatham County-Savannah Metropolitan Planning Commission
Savannah-Chatham County Public School System
Chatham County Department of Engineering/Floodplain

Neighboring Communities
Town of Thunderbolt

City of Augusta
Chatham County

State and Federal Government
Georgia Emergency Management Agency
Georgia Department of Natural Resources
FEMA Region IV

Educational Institutions
Armstrong State University
Savannah State University
Georgia Southern University
Savannah College of Arts and Design
Georgia Institute of Technology
Skidaway Institute of Oceanography

Other Stakeholder Representatives
American Red Cross
National Weather Service
Savannah/Hilton Head International Airport
Georgia Association of Floodplain Managers
The Georgia Conservancy
Sierra Club – Coastal Group
Coastal Georgia Audubon Society
Savannah Boy Scouts
Wormsloe State Historic Site
Gulfstream
Keller Williams Reality
Georgia Power Company
Corrish Insurance
WSAV 3
Home Builders Association of Greater Savannah
Savannah Tree Foundation
Baldwin Park Neighborhood Association
Thomas Square Neighborhood Association
Windsor Forest Neighborhood Association

The FMPC kick-off meeting was held on August 6, 2014 at 10:00am in the City of Savannah Development Service Office. The meeting covered the scope of work and an introduction to the DMA, CRS, and FMA requirements. During the planning process, the FMPC communicated through face-to-face meetings, email and telephone conversations. Draft documents were posted on the City's website so that the FMPC members could easily access and review them. The formal FMPC meetings followed the CRS Planning Steps. Agendas and sign in sheets for the FMPC meetings are included in Appendix A. The meeting dates and topics discussed are summarized below in Table 3.4. All FMPC meetings were open to the public.

Table 3.4 - Summary of FMPC Meeting Dates

Meeting Type	Meeting Topic	Meeting Date	Meeting Location
FMPC #1 (Kick-off)	1) Introduction to DMA, CRS and the planning process 2) Organize resources: the role of the FMPC, planning for public involvement, and coordinating with other agencies and stakeholders 3) Introduction to hazard identification	August 6, 2014	City of Savannah Development Service Office
FMPC #2	1) Review/discussion of Flood Risk Assessment (Assess the Hazard) 2) Review/discussion of Vulnerability Assessment (Assess the Problem)	November 12, 2014	City of Savannah Development Service Office
FMPC #3	1) Review of existing Goals from 2008 FMP 2) Development of new Goals for 2014 FMP	December 9, 2014	City of Savannah Development Service Office
FMPC #4	1) Review/status of existing Mitigation Strategies from 2008 FMP 2) Development of new/updated Mitigation Strategies for 2014 FMP	December 10, 2014	City of Savannah Development Service Office
FMPC #5	1) Review "Draft" Floodplain Mitigation Plan 2) Solicit comments and feedback from the FMPC	February 12, 2015	City of Savannah Development Service Office

Planning Step 2: Involve the Public

The planning process officially began with three public meetings held on August 5-7, 2014. The public meetings were purposely located in neighborhoods with known flooding issues. Additional public meetings were held on February 12, 2015 and February 23-27, 2015. Public notices were posted in the local newspaper (Savannah Morning News) inviting members of the public to attend the public meetings as documented in Appendix A. The formal public meetings for this project are summarized in Table 3.5.

Table 3.5 - Summary of Public Meeting Dates

Meeting Type	Meeting Topic	Meeting Date	Meeting Locations
Public Meeting #1	1) Introduction to DMA, CRS and the planning process 2) Introduction to hazard identification	August 5, 2014	W.W. Law Community Center
Public Meeting #2	1) Introduction to DMA, CRS and the planning process 2) Introduction to hazard identification	August 6, 2014	Moses Jackson Community Center
Public Meeting #3	1) Introduction to DMA, CRS and the planning process 2) Introduction to hazard identification	August 7, 2014	Windsor Forest Community Center

Meeting Type	Meeting Topic	Meeting Date	Meeting Locations
Public Meeting #4	1) Review complete "Draft" Floodplain Mitigation Plan 2) Solicit comments and feedback from the public	February 12, 2015	W.W. Law Community Center
Public Meeting #5	1) Public invited to review Draft Plan with City personnel at City office. This service was offered for a period of four days.	February 23-27, 2015	City of Savannah Development Service Office

Involving the Public beyond Attending Public Meetings

Early discussions with the FMPC established the initial plan for public involvement. The FMPC agreed to an approach using established public information mechanisms and resources within the community. Public involvement activities for this plan update included press releases, stakeholder and public meetings, public surveys, and the collection of public and stakeholder comments on the draft plan.

The FMPC found twelve different ways to involve the public beyond attending public meetings. Documentation to support the additional public outreach efforts can be found in Appendix A. The public outreach activities beyond the formal public meetings are summarized below in Table 3.6.

Table 3.6 - Public Outreach Efforts

	Event	Message	Date
1	City of Savannah Website	Public Meeting Dates and information posted for public information	August 1, 2014
2	Public Meeting	Three local television stations provided news coverage of Public Meeting and introduction to the planning process	August 5, 2014
3	Public Meetings	Public Survey requesting public input into FMP planning process distributed at Public Meetings	August 5-7, 2014
4	City of Savannah Website	Public Survey requesting public input into FMP planning process posted on website	August 13, 2014
5	City of Savannah Website	Draft Risk/Vulnerability Assessment posted for public comment	December 9, 2014
6	City of Savannah Website	Hazard Identification and Hazard Vulnerability presentation posted for public information	December 9, 2014
7	City of Savannah Website	Complete Draft Floodplain Mitigation Plan posted for public review and comment	February 10, 2015
8	City of Savannah Building Services Department	Complete Draft Floodplain Mitigation Plan (hard copy) available for public review and comment	February 10, 2015
9	Public Meeting	Local television station provided news coverage of Public Meeting	February 12, 2015
10	WJCL News	Local news story titled "City releases feedback from flooding survey"	February 12, 2015

	Event	Message	Date
11	City of Savannah Website	Public Survey requesting public input into FMP planning process posted using Survey Monkey	February 19, 2015
12	Savannah Morning News	Article advertising website address where Plan could be reviewed plus physical address where a hard copy of the plan could be reviewed	February 23-27, 2015

The public survey which requested public input into the Floodplain Mitigation Plan planning process and the identification of mitigation activities that could lessen the risk and impact of future flood hazard events is shown in Figure 3.1. A summary of the completed survey results has been included in Appendix A.

CITY OF Savannah
DEVELOPMENT SERVICES

PUBLIC SURVEY FOR
FLOOD MITIGATION PLANNING

The City of Savannah needs your help!

The City of Savannah is working to become less vulnerable to flooding and your participation is important to us!

The City is preparing a *Flood Mitigation Plan*. This Plan will identify and assess our community's flood hazard risks and determine how to best minimize or manage those risks and what outreach materials may be necessary to better communicate those risks.

This survey is an opportunity for you to share your opinions and participate in the mitigation planning process. The information you provide will help us better understand your hazard concerns and can lead to mitigation activities that should help lessen the impacts of future hazard events.

Please help us by completing this survey by September 30, 2014 and returning it to:

Tom McDonald, CFM
City of Savannah – Development Services Department
5515 Abercorn St
Savannah, GA 31405

Surveys can also be faxed to: (912) 651-6543 or emailed to tmcdonald@savannahga.gov.

1. **Where do you live?**
   - ❑ City of savannah (City limits)
   - ❑ Other:_____
2. **Have you ever experienced or been impacted by high water or flooding in Savannah?**
   - ❑ Yes
   - ❑ No
   - a. **If "Yes," please explain:**

_____
_____
_____

Page 1 of 3

Figure 3.1 - Public Survey

Planning Step 3: Coordinate

Early in the planning process, the FMPC determined that the risk assessment, mitigation strategy development, and plan approval would be greatly enhanced by inviting other local, state and federal agencies and organizations to participate in the process. A detailed list of agency coordination is provided above under Planning Step 1: Organize to Prepare the Plan.

Coordination involved contacting these agencies through a variety of mechanisms and informing them on how to participate in the plan development process. Coordination with these groups included, holding face-to-face meetings, sending outreach letters, some with follow up phone calls; and making phone calls alone to out of area agencies. All of these groups and agencies were solicited asking for their assistance and input and telling them how to become involved in the plan development process. A copy of each coordination letter can be found in Appendix A.

Coordination with Other Community Planning Efforts and Hazard Mitigation Activities

Coordination with other community planning efforts is also paramount to the success of this plan. Mitigation planning involves identifying existing policies, tools, and actions that will reduce a community's risk and vulnerability to hazards. The City of Savannah uses a variety of comprehensive planning mechanisms, such as a Comprehensive Plan and land development regulations and ordinances to guide growth and development. Integrating existing planning efforts and mitigation policies and action strategies into this plan establishes a credible and comprehensive plan that ties into and supports other community programs. The development of this plan incorporated information from the following existing plans, studies, reports, and initiatives as well as other relevant data from neighboring communities and other jurisdictions.

- Unincorporated Chatham County Flood Mitigation Plan, 2012
- Savannah Flood Hazard Mitigation Plan, 2010
- Chatham County-Savannah Comprehensive Plan, 2006
- Savannah Stormwater Management Design Manual, 2012
- Chatham County Flood Insurance Study, 2014
- Chatham County Pre-Disaster Hazard Mitigation Plan, 2010
- State of Georgia Hazard Mitigation Strategy, 2011
- Savannah Tax Assessor Data, 2014
- Savannah Area Geographic Information System, 2014
- Georgia Coastal Hazards Portal, 2014
- Savannah Flood Damage Prevention Ordinance, 2008
- Savannah Stormwater Management Ordinance, 2012
- Savannah Soil Erosion, Sedimentation and Pollution Control Ordinance, 2009

These and other documents were reviewed and considered, as appropriate, during the collection of data to support Planning Steps 4 and 5, which include the hazard identification, vulnerability assessment, and capability assessment. Data from these plans and ordinances were incorporated into the risk assessment and hazard vulnerability sections of the plan as appropriate. The data was also used in determining the capability of the community in being able to implement certain mitigation strategies. The Capability Assessment can be found in Section 4.4.

3.2.2 Phase II – Risk Assessment

Planning Steps 4 and 5: Identify/Assess the Hazard and Assess the Problem

The FMPC completed a comprehensive effort to identify, document, and profile all flood hazards that have, or could have, an impact on the planning area including an evaluation of climate change and sea level rise. Data collection worksheets were developed and used in this effort to aid in determining hazards and vulnerabilities and where the risk varies across the planning area. Geographic information systems (GIS) were used to display, analyze, and quantify hazards and vulnerabilities. A draft of the risk and vulnerability assessment was posted on the City's website for FMPC and public review and comment.

The FMPC also conducted a capability assessment to review and document the planning area's current capabilities to mitigate risk from and vulnerability to hazards. By collecting information about existing government programs, policies, regulations, ordinances, and emergency plans, the FMPC could assess those activities and measures already in place that contribute to mitigating some of the risks and vulnerabilities identified. A more detailed description of the risk assessment process and the results are included in Section 4 Risk Assessment.

3.2.3 Phase III – Mitigation Strategy

Planning Steps 6 and 7: Set Goals and Review Possible Activities

Amec Foster Wheeler facilitated brainstorming and discussion sessions with the FMPC that described the purpose and process of developing planning goals and objectives, a comprehensive range of mitigation alternatives, and a method of selecting and defending recommended mitigation actions using a series of selection criteria. This information is included in Section 5 Mitigation Strategy. Additional documentation on the process the FMPC used to develop the goals and strategy has been included in Appendix B.

Planning Step 8: Draft an Action Plan

A complete first draft of the plan was prepared based on input from the FMPC regarding the draft risk assessment and the goals and activities identified in Planning Steps 6 and 7. This complete draft was posted for FMPC and public review and comment on the City's website. Other agencies were invited to comment on this draft as well. FMPC, public and agency comments were integrated into the final draft for the GEMA and FEMA Region IV to review and approve, contingent upon final adoption by the City.

3.2.4 Phase IV – Plan Maintenance

Planning Step 9: Adopt the Plan

In order to secure buy-in and officially implement the plan, the plan was reviewed and adopted by the City of Savannah on the dates included in the corresponding resolution in Section 6 Plan Adoption.

Planning Step 10: Implement, Evaluate and Revise the Plan

Implementation and maintenance of the plan is critical to the overall success of hazard mitigation planning. Up to this point in the planning process, all of the FMPC's efforts have been directed at researching data, coordinating input from participating entities, and developing appropriate mitigation actions. Section 7 Plan Implementation and Maintenance provides an overview of the overall strategy for plan implementation and maintenance and outlines the method and schedule for monitoring, updating, and evaluating the plan. The Section also discusses incorporating the plan into existing planning mechanisms and how to address continued public involvement.

4 FLOOD RISK ASSESSMENT

Requirement §201.6(c)(2): [The plan shall include] A risk assessment that provides the factual basis for activities proposed in the strategy to reduce losses from identified hazards. Local risk assessments must provide sufficient information to enable the jurisdiction to identify and prioritize appropriate mitigation actions to reduce losses from identified hazards.

This section describes the Risk Assessment process for the development of the City of Savannah Floodplain Mitigation Plan. It describes how the City met the following requirements from the 10-step planning process:

- Planning Step 4: Assess the Hazard
- Planning Step 5: Assess the Problem

As defined by FEMA, risk is a combination of hazard, vulnerability, and exposure. "It is the impact that a hazard would have on people, services, facilities, and structures in a community and refers to the likelihood of a hazard event resulting in an adverse condition that causes injury or damage."

This flood risk assessment covers the entire geographical area of the City of Savannah, GA. The risk assessment process identifies and profiles relevant hazards and assesses the exposure of lives, property, and infrastructure to these hazards. The process allows for a better understanding of a jurisdiction's potential risk to natural hazards and provides a framework for developing and prioritizing mitigation actions to reduce risk from future hazard events. This risk assessment followed the methodology described in the FEMA publication Understanding Your Risks—Identifying Hazards and Estimating Losses (FEMA 386-2, 2002), which breaks the assessment down to a four-step process:

1) Identify Hazards;

2) Profile Hazard Events;

3) Inventory Assets; and

4) Estimate Losses.

Data collected through this process has been incorporated into the following sections of this chapter:

Section 4.1: **Hazard Identification** identifies the natural flood hazards that threaten the planning area.

Section 4.2: **Hazard Profiles** discusses the threat to the planning area and describes previous occurrences of flood hazard events and the likelihood of future occurrences.

Section 4.3: Vulnerability Assessment assesses the planning area's exposure to natural flood hazards; considering assets at risk, critical facilities, and future development trends.

Section 4.4: Capability Assessment inventories existing mitigation activities and policies, regulations, and plans that pertain to mitigation and can affect net vulnerability.

4.1 Hazard Identification

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

The City of Savannah's FMPC conducted a hazard identification study to determine the natural flood hazards that threaten the planning area.

4.1.1 Results and Methodology

Using existing flood hazard data and input gained through planning meetings, the FMPC agreed upon a list of natural flood hazards that could affect the City. Flood hazard data from the Chatham County Local Mitigation Strategy (LMS), the Georgia Emergency Management Agency (GEMA), FEMA, the National Oceanic and Atmospheric Administration (NOAA), the National Hurricane Center (NHC), National Climatic Data Center (NCDC), the Spatial Hazards Events and Losses Database for the United States (SHELDUS™) and many other sources were examined to assess the significance of these hazards to the planning area. Significance was measured in general terms and focused on key criteria such as frequency and resulting damage, which includes deaths and injuries, as well as property and economic damage.

The flood hazards identified in Table 4.1 were evaluated as part of this plan. Only the more significant hazards with the potential to cause significant human and/or monetary losses in the future have a more detailed hazard profile and are analyzed further in Section 4.3 Vulnerability Assessment.

Table 4.1 Flood Hazard Summary

Hazard	Frequency of Occurrence	Spatial Extent	Potential Magnitude	Significance
Climate Change and Sea Level Rise	Likely	Limited	Limited	Medium
Coastal/Canal Bank Erosion	Highly Likely	Limited	Limited	Medium
Dam/Levee Failure	Unlikely	Limited	Negligible	Low
Flood: 100-/500-year	Occasional	Significant	Critical	High
Flood: Stormwater/Localized Flooding	Highly Likely	Significant	Critical	High
Hurricane and Tropical Storms (including Storm Surge)	Occasional	Extensive	Catastrophic	High

Guidelines:
Frequency of Occurrence:
Highly Likely: Nearly 100% probability within the next year.
Likely: Between 10 and 100% probability within the next year.
Occasional: Between 1 and 10% probability within the next year.
Unlikely: Less than 1% probability within the next year.

Potential Magnitude:
Catastrophic: More than 50% of the area affected.
Critical: 25 to 50% of the area affected.
Limited: 10 to 25% of the area affected.
Negligible: Less than 10% of the area affected.

Spatial Extent:
Limited: Less than 10% of planning area.
Significant: 10-50% of planning area.
Extensive: 50-100% of planning area.

Significance:
Low
Medium
High

Source: Amec Foster Wheeler Data Collection Guide

The following hazard was evaluated by the FMPC and determined to be a non-prevalent hazard that should not be included in the plan:

- Tsunamis - Defined as a long-term (generally 15 to 60 minutes) wave caused by a large scale movement of the sea floor due to volcanic eruption, marine earthquake or landslide. Barely noticeable at sea, the wave velocity may be as high as 400 knots so that it travels great distances and in shoal water reaches heights up to 15 meters. NOAA indicates that the risk of a tsunami in the Savannah planning area is relatively low due to the absence of subduction zones at the edges of plate boundaries to spawn such waves except small subduction zones under the Caribbean and Scotia arcs. Based on historical data, 12% of the world's tsunamis have occurred in the Atlantic Ocean with the majority of those occurring in the northeast.

4.1.2 Disaster Declaration History

The FMPC researched past events that resulted in a federal and/or state emergency or disaster declaration in the planning area for Savannah in order to identify known flood hazards. Federal and/or state disaster declarations may be granted when the Governor certifies that the combined local, county and state resources are insufficient and that the situation is beyond their recovery capabilities. When the local government's capacity has been surpassed, a state disaster declaration may be issued, allowing for the provision of state assistance. Should the disaster be so severe that both the local and state government capacities are exceeded, a federal emergency or disaster declaration may be issued allowing for the provision of federal assistance.

Details on federal and state disaster declarations were obtained by the FMPC from FEMA. Table 4.2 displays flood related major disaster declarations that Georgia has received from FEMA since 1960. This table reflects the vulnerability and historic patterns of flood hazards for Georgia.

Table 4.2 FEMA Major Disaster Declarations for Georgia, 1960-2014

Hazard Type	Disaster #	Date
Floods	110	03/02/1961
Severe Storms, Flooding	150	03/26/1963
Hurricane Dora	177	09/10/1964
Flooding	180	11/04/1964
Flooding	214	03/14/1966
Tornadoes, Flooding	370	04/04/1973
Tornadoes, High Winds, Heavy Rains	460	03/29/1975
Severe Storms, Flooding	507	06/11/1976
Dam Collapse, Flooding	541	11/07/1977
Flooding, Severe Storm, Tornado	857	02/23/1990
Flooding, Severe Storm	880	10/19/1990
Flooding, Severe Storm	897	03/15/1991
Heavy Rain, High Winds, Tornadoes	969	12/01/1992
Tornadoes, High Winds, Heavy Rain	980	03/04/1993
Severe Storm, Tornadoes, Flooding	1020	03/31/1994
Tornadoes, Flooding, Heavy Rain, Tropical Storm Alberto	1033	07/07/1994
Heavy Rains, Tornadoes, Flooding, High Winds	1042[1]	10/19/1994
Hurricane Opal	1071	10/10/1995
Severe Storms, Tornadoes and Flooding	1209[1]	03/11/1998
Hurricane Ivan	1554	09/18/2004
Tropical Storm Francis	1560	09/24/2004
Severe Storms and Flooding	1761	05/23/2008
Severe Storms, Flooding, Tornadoes and Straight-Line Winds	1833	04/23/2009

Hazard Type	Disaster #	Date
Severe Storms and Flooding	1858	09/24/2009
Severe Storms, Tornadoes, Straight-Line Winds and Associated Flooding	1973	04/29/2011

Source: FEMA

[1]Designated Area includes Chatham County

4.2 Hazard Profiles

Requirement §201.6(c)(2)(i): [The risk assessment shall include a] description of the…location and extent of all natural hazards that can affect the jurisdiction. The plan shall include information on previous occurrences of hazard events and on the probability of future hazard events.

The hazards identified in Section 4.1 Hazard Identification, are profiled individually in this section. Information provided by members of the FMPC has been integrated into this section with information from other data sources.

Each hazard is profiled in the following format:

Hazard/Problem Description

This section provides a description of the hazard followed by details specific to the Savannah planning area. Where available, this section also includes information on the hazard extent, seasonal patterns, speed of onset/duration, magnitude and any secondary effects.

Past Occurrences

This section contains information on historical events, including the extent or location of the hazard within or near the Savannah planning area.

Frequency/Likelihood of Future Occurrence

This section gauges the likelihood of future occurrences based on past events and existing data. The frequency is determined by dividing the number of events observed by the number of years on record and multiplying by 100. This provides the percent chance of the event happening in any given year (e.g. 10 hurricanes or tropical storms over a 30-year period equates to a 33 percent chance of experiencing a hurricane or tropical storm in any given year). The likelihood of future occurrences is categorized into one of the classifications as follows:

- ***Highly Likely*** – Near 100 percent chance of occurrence within the next year
- ***Likely*** – Between 10 and 100 percent chance of occurrence within the next year (recurrence interval of 10 years or less)
- ***Occasional*** – Between 1 and 10 percent chance of occurrence within the next year (recurrence interval of 11 to 100 years)
- ***Unlikely*** – Less than 1 percent chance or occurrence within the next 100 years (recurrence interval of greater than every 100 years).

Those hazards determined to be of high or medium significance were characterized as priority hazards that required further evaluation in Section 4.3 Vulnerability Assessment. Significance was determined by frequency of the hazard and resulting damage, including deaths/injuries and property, crop and economic damage. Hazards occurring infrequently or having little to no impact on the Savannah planning area were determined to be of low significance and not considered a priority hazard. These criteria allowed the FMPC to prioritize hazards of greatest significance and focus resources where they are most needed.

The National Oceanic and Atmospheric Administration's National Climatic Data Center (NCDC) has been tracking severe weather since 1950. Their Storm Events Database contains an archive of destructive storm or weather data and information which includes local, intense and damaging events. This database contains 122 flood related severe weather events that occurred in Chatham County between January 1950 and June 2014. Table 4.3 summarizes these events.

Table 4.3 NCDC Severe Weather Reports for Chatham County, January 1950 - June 2014

Type	# of Events	Property Damage	Crop Damage	Deaths	Injuries
Flash Flood	62	$8,370,000	$0	0	2
Flood	0	$0	$0	0	0
Coastal Flood	15	$40,000	$0	0	0
Heavy Rain	2	$0	$0	0	0
Hurricane/Typhoon	4	$0	$0	0	0
Storm Surge/Tide	0	$0	$0	0	0
Tropical Depression	0	$0	$0	0	0
Tropical Storm	36	$14,500	$0	0	0
Waterspout	3	$0	$0	0	0
Total:	**122**	**$8,424,500**	**$0**	**0**	**2**

Source: National Climatic Data Center Storm Events Database, September 2014
Note: Losses reflect totals for all impacted areas within Chatham County.

The FMPC supplemented NCDC data with data from SHELDUS™ (Spatial Hazard Events and Losses Database for the United States). SHELDUS™ is a county-level data set for the United States that tracks 18 types of natural hazard events along with associated property and crop losses, injuries, and fatalities for the period 1960-present. Produced by the Hazards Research Lab at the University of South Carolina, this database combines information from several sources (including the NCDC). With the release of SHELDUS 13.1, the database includes every loss causing event and/or deadly event between 1960 through present. For events that covered multiple counties, the dollar losses, deaths, and injuries were equally divided among the affected counties (e.g., if four counties were affected, then a quarter of the dollar losses, injuries, and deaths were attributed to each county).

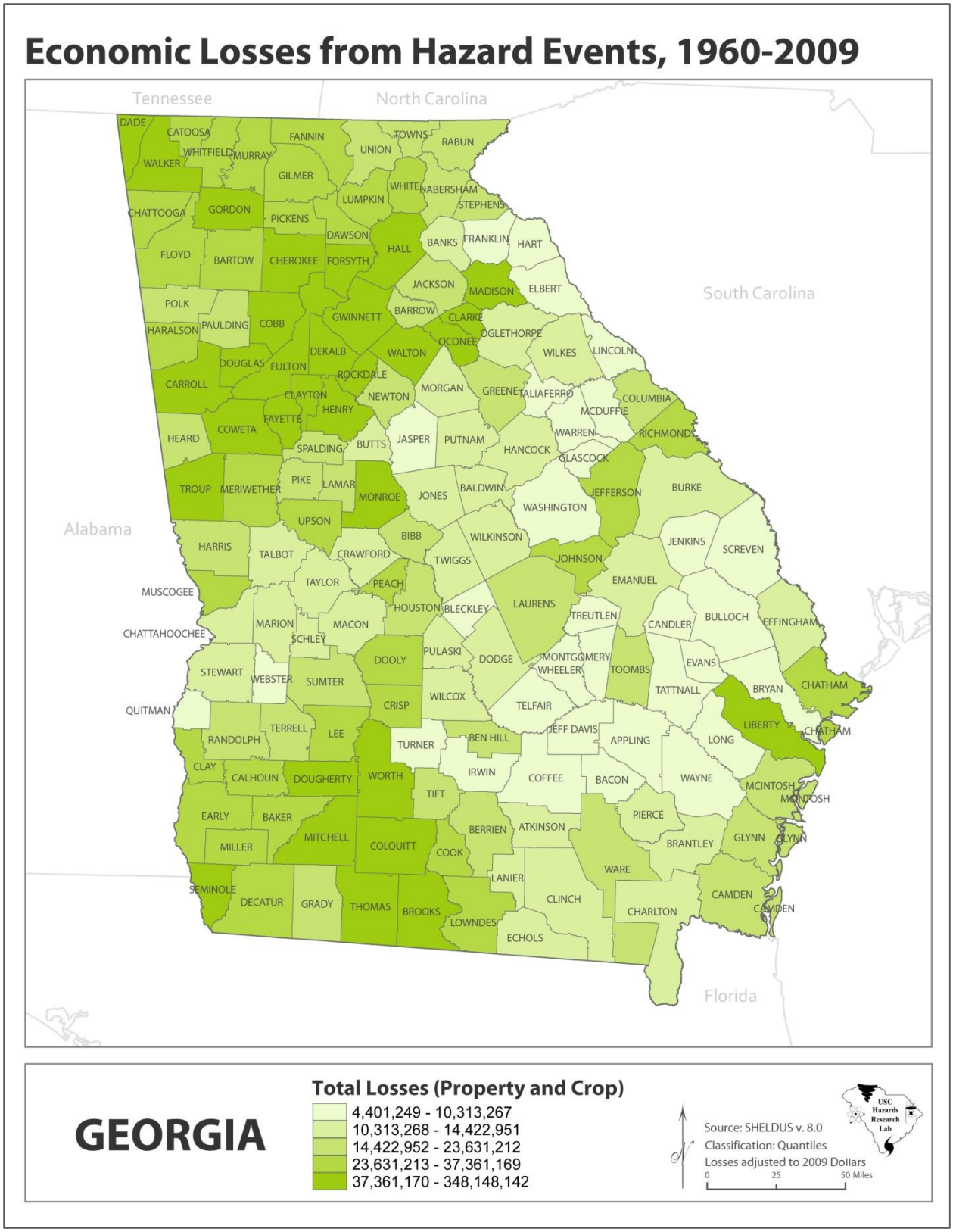
SHELDUS™ contains information on 63 severe weather events that occurred in Chatham County between 1960 and October 2014. Table 4.4 summarizes these events.

Table 4.4 SHELDUS Severe Weather Reports for Chatham County, 1960 - September 2014

Type	# of Events	Property Loss	Crop Loss	Deaths	Injuries
Coastal	6	$9,098.38	$0.00	1	7
Flooding	21	$13,456,431.69	$981.62	0	2
Hurricane/Tropical Storm	12	$3,896,344.25	$24,231.20	0	0
Severe Storm/Thunder Storm	24	$4,381,884.00	$91,263.12	0	0
Total:	**63**	**$21,743,758.32**	**$116,475.94**	**1**	**9**

Source: Hazards & Vulnerability Research Institute (2014). The Spatial Hazard Events and Losses Database for the United States, Version 13.1 [Online Database]. Columbia, SC: University of South Carolina. Available from http://www.sheldus.org
Note: Losses have been adjusted for inflation to 2013 dollars.

The figure below reflects economic losses from hazard events contained within the SHELDUS data set for the entire State of Georgia from 1960 - 2009. Chatham County ranks among one of the highest tiers in the State for total property and crop losses.



Source: SHELDUS v8.0

The following sections provide profiles of the natural flood hazards that the FMPC identified in Table 4.1 Flood Hazard Summary.

4.2.1 Climate Change and Sea Level Rise

Hazard/Problem Description

Climate change refers to a change in the state of the climate that can be identified (e.g., by using statistical tests) by changes in the mean and/or the variability of its properties, and that persists for an extended period, typically decades or longer. Climate change may be due to natural internal processes or external forces such as modulations of the solar cycles, volcanic eruptions, and persistent anthropogenic changes in the composition of the atmosphere or in land use (IPCC, 2014). Climate change is a natural occurrence in which the earth has warmed and cooled periodically over geologic time. The recent and rapid warming of the earth over the past century has been cause for concern, as this warming is very likely due to the accumulation of human-caused green house gases, such as CO_2, in the atmosphere (IPCC, 2007). This warming is occurring almost everywhere in the world, which suggests a global cause rather than changes in localized weather patterns.

Due to sea-level rise projected throughout the 21st century and beyond, coastal systems and low-lying areas will increasingly experience adverse impacts such as submergence, coastal flooding, and coastal erosion. The population and assets projected to be exposed to coastal risks as well as human pressures on coastal ecosystems will increase significantly in the coming decades due to population growth, economic development, and urbanization (IPCC, 2014).

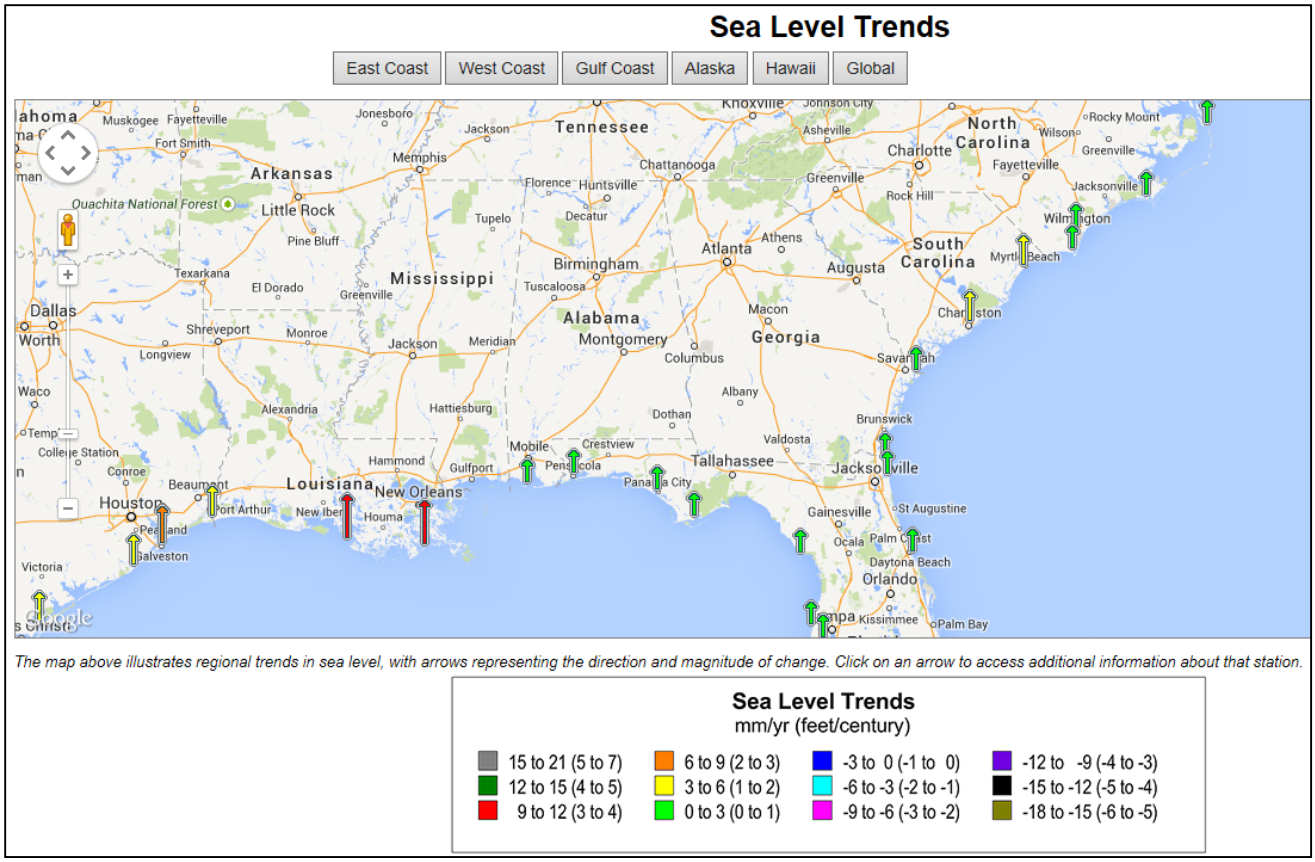
Climate change has the potential to alter the nature and frequency of flood hazards that the City already experiences such as hurricane storm surge, coastal erosion, and stormwater drainage. Sea level rise may also place additional stress on aquifers (saltwater intrusion) and gravity flow stormwater and septic systems to a rising groundwater table. An elevated storm surge due to sea level rise could produce a cascade of consequences affecting things such as land use, infrastructure, facilities, waterway navigation, the local economy, public health and safety, drinking water supplies, and ecosystems.

The potential for climate change influences on each flood hazard summarized in this plan is noted within each of the hazard's "Frequency/Likelihood of Future Occurrence" discussion section.

Past Occurrences

There are generally two separate mechanics involved in global sea level rise. The first is directly attributed to global temperature increases, which warm the oceans waters and cause them to expand. The second is attributed to the melting of ice over land which simply adds water to the oceans. Global sea level rise is likely caused by a combination of these two mechanics and can be exasperated on the local level by factors such as erosion and subsidence. The rate of sea level rise has varied throughout geologic history, and studies have shown that global temperature and sea level are strongly correlated.

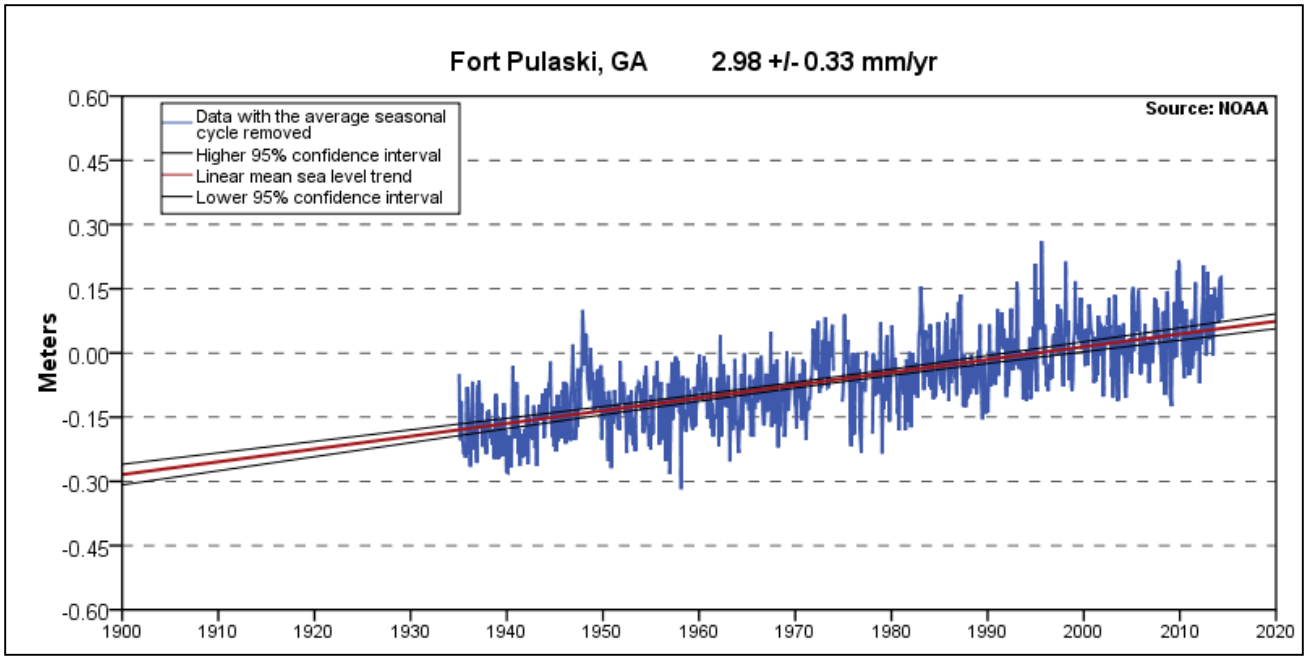
The Center for Operational Oceanographic Products and Services has been measuring sea level for over 150 years, with tide stations operating on all U.S. coasts. Changes in Mean Sea Level (MSL), either a sea level rise or sea level fall, have been computed at 128 long-term water level stations using a minimum span of 30 years of observations at each location. These measurements have been averaged by month to remove the effect of higher frequency phenomena (e.g. storm surge) in order to compute an accurate linear sea level trend. Figure 4.1 illustrates regional trends in sea level from NOAA.



Source: http://tidesandcurrents.noaa.gov/sltrends/sltrends.shtml

Figure 4.1 – Gulf/Atlantic Coast Sea Level Trends

Figure 4.2 shows the monthly mean sea level trend at NOAA's Fort Pulaski, Georgia station without the regular seasonal fluctuations due to coastal ocean temperatures, salinities, winds, atmospheric pressures, and ocean currents. The mean sea level trend is 2.98 millimeters/year with a 95% confidence interval of +/- 0.33 mm/yr based on monthly mean sea level data from 1935 to 2006 which is equivalent to a change of 0.98 feet in 100 years.



Source: http://tidesandcurrents.noaa.gov/sltrends/sltrends.shtml

Figure 4.2 - Mean Sea Level Trend for Fort Pulaski, Georgia

Since 1901, the average surface temperature across the contiguous 48 states has risen at an average rate of 0.14°F per decade (1.4°F per century). Average temperatures have risen more quickly since the late 1970s (0.36 to 0.55°F per decade). Seven of the top 10 warmest years on record for the contiguous 48 states have occurred since 1998, and 2012 was the warmest year on record. Figure 4.3 below, based on data from NOAA and prepared by the EPA, shows how annual average air temperatures have changed in different parts of the United States since 1901. Current science is projecting that the southeastern United States could experience a general increase in average temperatures anywhere from 4.5°F to 9°F in the coming century (Karl et al, 111).

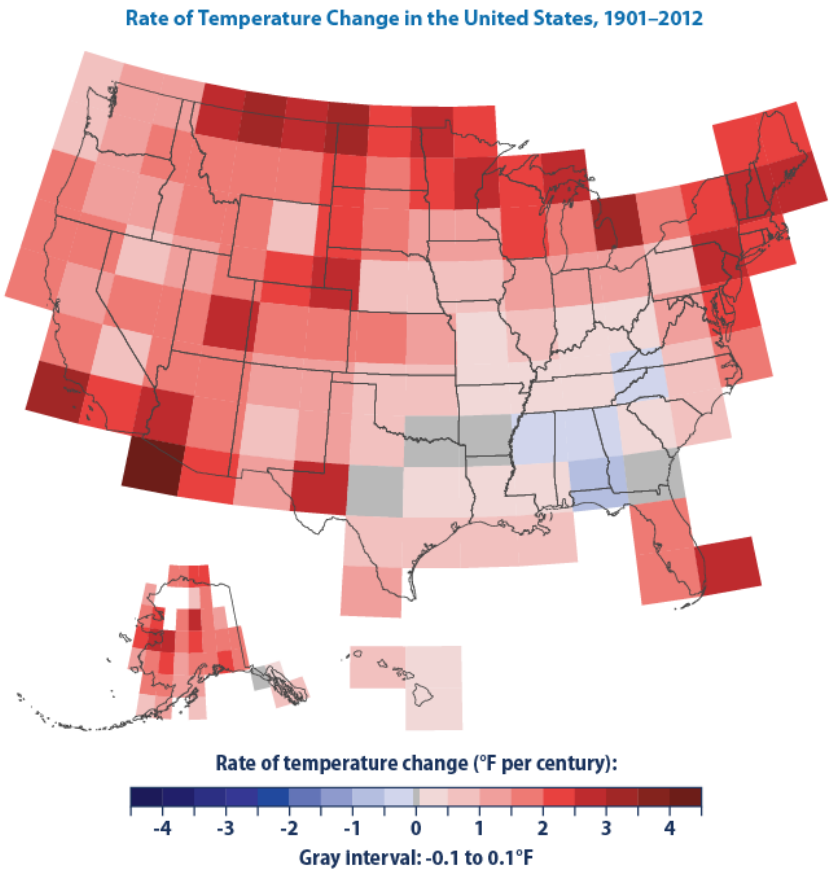


Figure 4.3- Rate of Temperature Change in the United States, 1901-2012

Frequency/Likelihood of Future Occurrence

Likely - Understanding trends in sea level, as well as the relationship between global and local sea level, provides critical information about the impacts of the Earth's climate on our oceans and atmosphere. Changes in sea level are directly linked to a number of atmospheric and oceanic processes. Changes in global temperatures, hydrologic cycles, coverage of glaciers and ice sheets, and storm frequency and intensity are examples of known effects of a changing climate, all of which are directly related to, and captured in, long-term sea level records. Sea levels provide an important key to understanding the impact of climate change along our coasts. By combining local rates of relative sea level change for a specific area based on observations with projections of global sea level rise, communities can begin to analyze and plan for the impacts of sea level rise for long-range planning (NOAA, 2014).

Mean sea level trends measured by NOAA indicate that sea level at Fort Pulaski, GA has increased by one foot over the last 100 years. Scientists expect coastal Georgia to experience at least six inches of sea level rise within the next 50 years and one meter (3.3 feet) of sea level rise is projected by 2110. According to a 2012 report, *Tracking the Effects of Sea Level Rise in Georgia's Coastal Communities*, written by Larry Keating, professor emeritus, and doctoral candidate Dana Habeeb from Georgia Institute

of Technology's School of City and Regional Planning, projections indicate that almost 420 square miles of the Georgia coast will be flooded due to sea level rise by 2110.

Uncertainties in sea level rise projections exist due to natural variability, limitations of existing computer models, and the inability to forecast human response in limiting greenhouse gas emissions. Therefore, projections will need to be reviewed and revised in the future as modeling capabilities improve and major findings in climate science data become available. Ultimately, it is important to understand that sea level rise is not an endpoint but rather a continuing trend, and the City of Savannah should consider and plan for sea level rise in future policy decisions.

4.2.2 Coastal/Canal Bank Erosion

Hazard/Problem Description

Coastal Erosion

Coastal erosion is a process whereby large storms, flooding, strong wave action, sea level rise, and human activities, such as inappropriate land use, alterations, and shore protection structures, wears away the beaches and bluffs along the coast. Erosion undermines and often destroys homes, businesses, and public infrastructure and can have long-term economic and social consequences. According to NOAA, coastal erosion is responsible for approximately $500 million per year in coastal property loss in the United States, including damage to structures and loss of land. To mitigate coastal erosion, the federal government spends an average of $150 million every year on beach nourishment and other shoreline erosion control measures.

Coastal erosion has both natural causes and causes related to human activities. Gradual coastal erosion results naturally from the very slow rise of sea-level. Severe coastal erosion can occur over a very short period of time when the shore is impacted by hurricanes, tropical storms and other weather systems. Sand is moved parallel to the shore by longshore drift and currents. Sand is continually removed by longshore currents in some areas but it is also continually replaced by sand carried in by the same type of currents. Structures such as piers or sea walls, jetties, and navigational inlets may interrupt the movement of sand. Sand can become "trapped" in one place by these types of structures. The currents will, of course, continue to flow, though depleted of sand trapped elsewhere. With significant amounts of sand trapped in the system, the continuing motion of currents (now deficient in sand) results in erosion. In this way, human construction activities that result in the unnatural trapping of sand have the potential to result in significant coastal erosion.

Erosion rates and potential impacts are highly localized. Severe storms can remove wide beaches, along with substantial dunes, in a single event. In undeveloped areas, these high recession rates are not likely to cause significant concern, but in some heavily populated locations, one or two feet of erosion may be considered catastrophic (NOAA, 2014).

Canal Bank Erosion

Streams/canals erode by a combination of direct stream processes, like down cutting and lateral erosion, and indirect processes, like mass-wasting accompanied by transportation. When the channel bends, water on the outside of the bend (the cut-bank) flows faster and water on the inside of the bend (the point) flows slower as shown in Figure 4.4. This distribution of velocity results in erosion occurring on the outside of the bend and deposition occurring on the inside of the bend.

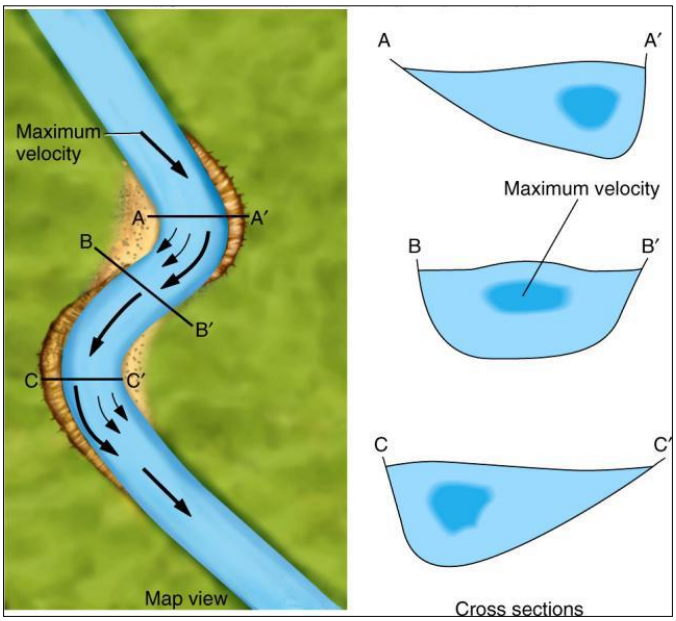


Figure 4.4- Stream Meanders

Stream bank erosion is a natural process, but acceleration of this natural process leads to a disproportionate sediment supply, stream channel instability, land loss, habitat loss and other adverse effects. Stream bank erosion processes, although complex, are driven by two major components: stream bank characteristics (erodibility) and hydraulic/gravitational forces. Many land use activities can affect both of these components and lead to accelerated bank erosion. The vegetation rooting characteristics can protect banks from fluvial entrainment and collapse, and also provide internal bank strength. When riparian vegetation is changed from woody species to annual grasses and/or forbs, the internal strength is weakened, causing acceleration of mass wasting processes. Stream bank aggradation or degradation is often a response to stream channel instability. Since bank erosion is often a symptom of a larger, more complex problem, the long-term solutions often involve much more than just bank stabilization. Numerous studies have demonstrated that stream bank erosion contributes a large portion of the annual sediment yield.

Determining the cause of accelerated streambank erosion is the first step in solving the problem. When a stream is straightened or widened, streambank erosion increases. Accelerated streambank erosion is part of the process as the stream seeks to re-establish a stable size and pattern. Damaging or removing streamside vegetation to the point where it no longer provides for bank stability can cause a dramatic increase in bank erosion. A degrading streambed results in higher and often unstable, eroding banks. When land use changes occur in a watershed, such as clearing land for agriculture or development, runoff increases. With this increase in runoff the stream channel will adjust to accommodate the additional flow, increasing streambank erosion. Addressing the problem of streambank erosion requires an understanding of both stream dynamics and the management of streamside vegetation.

Past Occurrences

Figure 4.5 depicts Chatham County's coastline erosion and accretion changes from 1855 to 2004 as well as historical shoreline movements along the Atlantic Intracoastal Waterway from 1933 to 2004. According to the Chatham County Flood Mitigation Plan, coastal erosion is occurring in the County due to a variety of environmental and human factors, and has become a major cause of concern for the area. However, the areas of coastal erosion concern fall outside of the planning area for the City of Savannah.

Source: Georgia Coastal Hazards Portal

Figure 4.5 - Shoreline Change for Chatham County

Frequency/Likelihood of Future Occurrence

Highly Likely - In general, the low dune elevations along the southeast Atlantic coast make this region more vulnerable to erosion hazards during hurricanes. In the southeast Atlantic regions, waves play a large role in elevating shoreline water levels. While the continuation of coastal erosion along the shoreline in Chatham County is certain, the planning area for the City of Savannah falls outside of the critical areas of concern for coastal erosion.

Climate Change and Coastal/Canal Bank Erosion

Sea-level rise will raise all tide levels, from low tide to storm surge. Wave action at higher tide levels may cause erosion of sandy beaches as well as the banks of tidally influenced canals and rivers. Higher storm surges, which may be accompanied by stronger storm winds, could wash over the tops of sand dunes, flooding the burrows of dune-nesting animals. The combined effects of wind and waves could damage dunes, leaving the beachfront more vulnerable (UF/IFAS Extension, 2013).

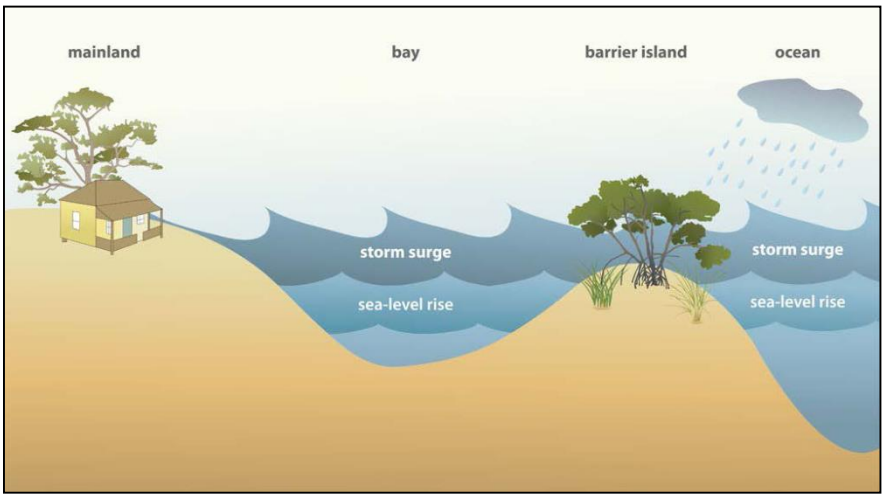


Figure 4.6 - Sea Level Rise and Coastal Erosion of Dunes
Credits: Jane Hawkey, IAN Image Library (ian.umces.edu/imagelibrary/)

According to the Center for Ocean Solutions, there has been a dramatic increase in coastal erosion over the last two decades and this is expected to continue as sea level rises and storm frequency and severity increase. Rather than occurring over the same time scale with sea level rise, erosion of beaches and coastal cliffs is expected to occur in large bursts during storm events as a result of increased wave height and storm intensity. Because of these large events, scientific models predict that shoreline erosion may outpace sea level rise by 50 to 200 fold. Erosion will have significant effects on coastal habitats, which can lead to social and economic impacts on coastal communities. With the reduction of coastal habitats and the ecological services they provide, coastal communities will experience more frequent and destructive flooding, compromised water supplies and smaller or fewer beaches.

4.2.3 Dam/Levee Failure

Hazard/Problem Description

Dam Failure

A dam is a barrier constructed across a watercourse that stores, controls, or diverts water. Dams are usually constructed of earth, rock, or concrete. The water impounded behind a dam is referred to as the reservoir and is measured in acre-feet. One acre-foot is the volume of water that covers one acre of land

to a depth of one foot. Dams can benefit farm land, provide recreation areas, generate electrical power, and help control erosion and flooding issues.

A dam failure is the collapse or breach of a dam that causes downstream flooding. Dam failures may be caused by natural events, human-caused events, or a combination. Due to the lack of advance warning, failures resulting from natural events, such as hurricanes, earthquakes, or landslides, may be particularly severe. Prolonged rainfall and subsequent flooding is the most common cause of dam failure.

Dam failures usually occur when the spillway capacity is inadequate and water overtops the dam or when internal erosion in dam foundation occurs (also known as piping). If internal erosion or overtopping cause a full structural breach, a high-velocity, debris-laden wall of water is released and rushes downstream, damaging or destroying anything in its path. Overtopping is the primary cause of earthen dam failure in the United States.

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

- Prolonged periods of rainfall and flooding;
- Inadequate spillway capacity, resulting in excess overtopping flows;
- Internal erosion caused by embankment or foundation leakage or piping;
- Improper maintenance, including failure to remove trees, repair internal seepage problems, replace lost material from the cross-section of the dam and abutments, or maintain gates, valves, and other operational components;
- Improper design, including the use of improper construction materials and construction practices;
- Negligent operation, including the failure to remove or open gates or valves during high flow periods;
- Failure of upstream dams on the same waterway; and
- High winds, which can cause significant wave action and result in substantial erosion.

Water released by a failed dam generates tremendous energy and can cause a flood that is catastrophic to life and property. A catastrophic dam failure could challenge local response capabilities and require evacuations to save lives. Impacts to life safety will depend on the warning time and the resources available to notify and evacuate the public. Major casualties and loss of life could result, as well as water quality and health issues. Potentially catastrophic effects to roads, bridges, and homes are also of major concern. Associated water quality and health concerns could also be issues. Factors that influence the potential severity of a full or partial dam failure are the amount of water impounded; the density, type, and value of development and infrastructure located downstream; and the speed of failure.

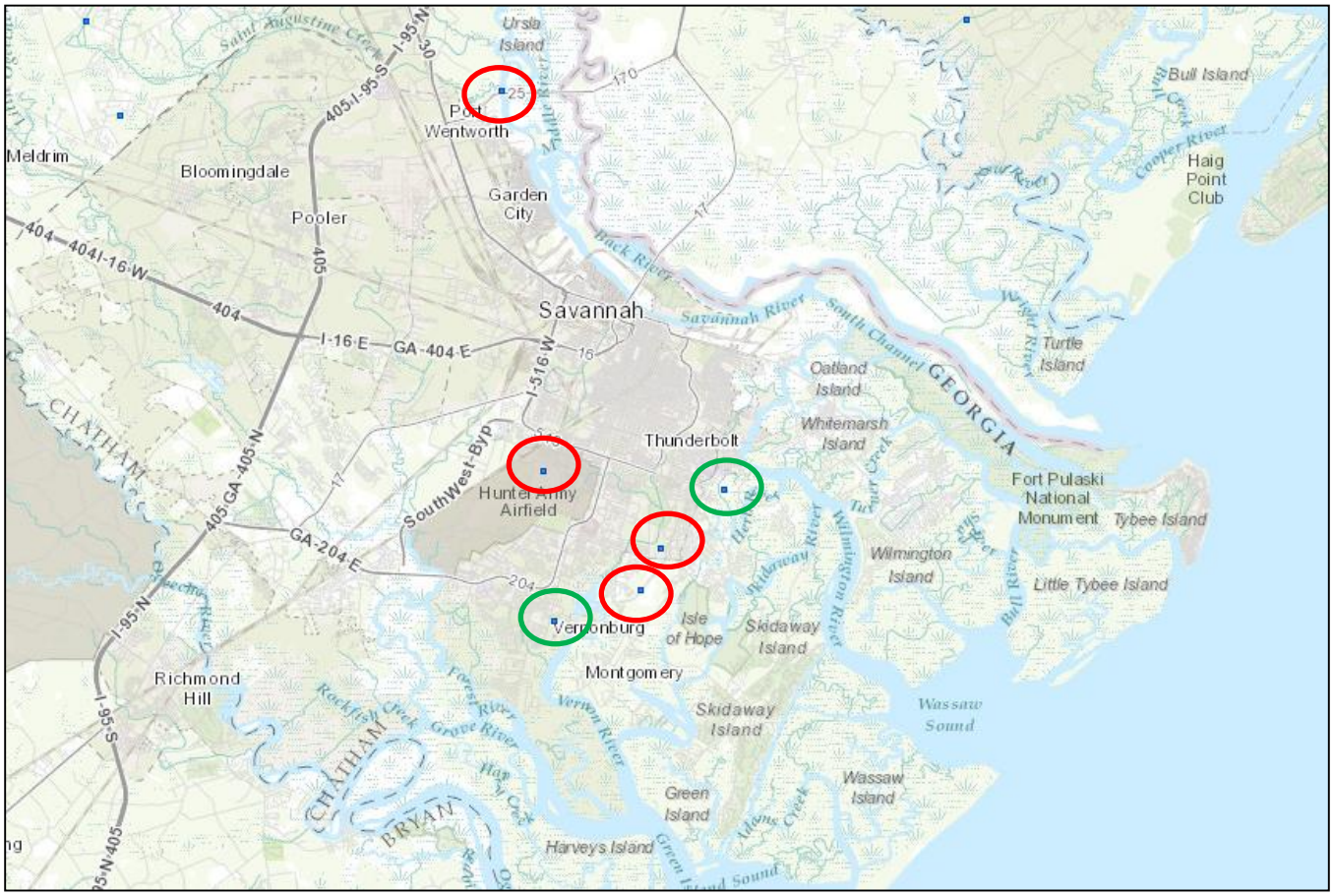
The National Inventory of Dams (NID) is a database of dams in the United States which was developed and is maintained by the USACE. Congress authorized the USACE to inventory dams as part of the 1972 National Dam Inspection Act. Several subsequent acts have authorized maintenance of the NID and provided funding. The USACE collaborates with FEMA and state regulatory offices to collect data on dams. The goal of the NID is to include all dams in the United States which meet at least one of the following criteria:

1. High hazard classification - loss of at least one human life is likely if the dam fails
2. Significant hazard classification - possible loss of human life and likely significant property or environmental destruction
3. Equal or exceed 25 feet in height and exceed 15 acre-feet in storage

4. Equal or exceed 50 acre-feet storage and exceed 6 feet in height

Low hazard dams which do not meet the criteria specified in number 3 or 4 are not included in the NID even if they are regulated according to state criteria. In some states, the number of these dams is several times the number of dams included in the NID.

Figure 4.7 reflects all dams included in the NID that are located in and around Chatham County. The NID lists four dams (circled in red) located within Chatham County. There are two additional dams (circled in green) that geographically appear in Chatham County, but the details of these dams in the NID reveal locations other than Chatham County. Table 4.5 provides details for the four dams located in Chatham County as provided in the NID.



Source: U.S. Army Corps of Engineers, National Inventory of Dams

Figure 4.7- National Inventory of Dams for Chatham County

Table 4.5 - National Inventory of Dams, Chatham County

Dam Name	NIDID	Owner	Height (Ft.)	NID Storage (acre-feet)	Dam Type	River
Forest City Gun Club Lake Dam	GA00928	Forest City Gun Club	9.8	273	Earthen	Unknown
Lake Mayer Dam	GA00927	Chatham County	8.9	382	Earthen	--
Pond 29 Dam	GA82309	Fort Stewart/HAAF	19.0	71	Earthen	Off-stream

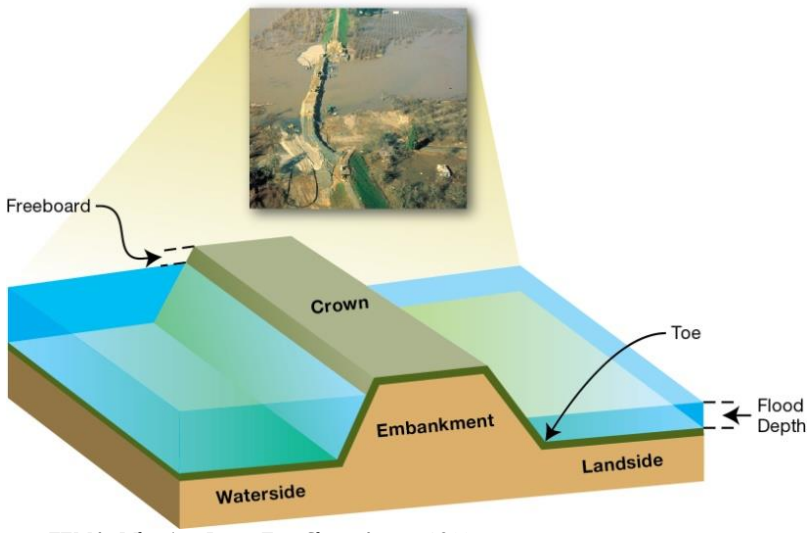
Dam Name	NIDID	Owner	Height (Ft.)	NID Storage (acre-feet)	Dam Type	River
Pond 24 Dam	GA82208	Fort Stewart/HAAF	26.0	45	Earthen	Off-stream

Source: U.S. Army Corps of Engineers, National Inventory of Dams

Levee Failure

FEMA defines a levee as "a man-made structure, usually an earthen embankment, designed and constructed in accordance with sound engineering practices to contain, control, or divert the flow of water in order to reduce the risk from temporary flooding." Levee systems consist of levees, floodwalls, and associated structures, such as closure and drainage devices, which are constructed and operated in accordance with sound engineering practices. Levees often have "interior drainage" systems that work in conjunction with the levees to take water from the landward side to the water side. An interior drainage system may include culverts, canals, ditches, storm sewers, and/or pumps.

Levees and floodwalls are constructed from the earth, compacted soil or artificial materials, such as concrete or steel. To protect against erosion and scouring, earthen levees can be covered with grass and gravel or hard surfaces like stone, asphalt, or concrete. Levees and floodwalls are typically built parallel to a waterway, most often a river, in order to reduce the risk of flooding to the area behind it. Figure 4.8 below shows the components of a typical levee.



Source: FEMA, *What is a Levee Fact Sheet*, August 2011

Figure 4.8- Components of a Typical Levee

Levees provide strong flood protection, but they are not failsafe. Levees are designed to protect against a specific flood level and could be overtopped during severe weather events. Levees reduce, not eliminate, the risk to individuals and structures behind them. A levee system failure or overtopping can create severe flooding and high water velocities. It is important to remember that no levee provides protection from events for which it was not designed, and proper operation and maintenance are necessary to reduce the probability of failure.

There are no levees included in the U.S. Army Corps of Engineers National Levee Database (NLD) that are located within 100 miles of the City of Savannah.

Past Occurrences

There are no past reported dam breaches or levee failures within the City of Savannah.

Frequency/Likelihood of Future Occurrence

Unlikely –There are no high or significant hazard dams located within Chatham County that could impact the City. Furthermore, since there are no significant levees located in or around the City, flooding hazard from future dam or levee failure is unlikely.

Climate Change and Dam/Levee Failure

Given the fact that there are no high or significant hazard dams or levees that would affect the City, climate change is unlikely to change the risk of the City to dam and/or levee failure. However, future levees and sea walls may need to be built to combat the effects of sea level rise and storm surge which would affect future risk.

4.2.4 Flood: 100-/500-year

Hazard/Problem Description

Flooding is defined by the rising and overflowing of a body of water onto normally dry land. Flooding can result from an overflow of inland or tidal waters or an unusual accumulation or runoff of surface waters from any source.

Certain health hazards are also common to flood events. While such problems are often not reported, three general types of health hazards accompany floods. The first comes from the water itself. Floodwaters carry anything that was on the ground that the upstream runoff picked up, including dirt, oil, animal waste, and lawn, farm and industrial chemicals. Pastures and areas where farm animals are kept or their wastes are stored can contribute polluted waters to the receiving streams.

Floodwaters also saturate the ground, which leads to infiltration into sanitary sewer lines. When wastewater treatment plants are flooded, there is nowhere for the sewage to flow. Infiltration and lack of treatment can lead to overloaded sewer lines that can back up into low-lying areas and homes. Even when it is diluted by flood waters, raw sewage can be a breeding ground for bacteria such as e.coli and other disease causing agents.

The second type of health problem arises after most of the water has gone. Stagnant pools can become breeding grounds for mosquitoes, and wet areas of a building that have not been properly cleaned breed mold and mildew. A building that is not thoroughly cleaned becomes a health hazard, especially for small children and the elderly.

Another health hazard occurs when heating ducts in a forced air system are not properly cleaned after inundation. When the furnace or air conditioner is turned on, the sediments left in the ducts are circulated throughout the building and breathed in by the occupants. If the City water system loses pressure, a boil order may be issued to protect people and animals from contaminated water.

The third problem is the long-term psychological impact of having been through a flood and seeing one‘s home damaged and personal belongings destroyed. The cost and labor needed to repair a flood-damaged home puts a severe strain on people, especially the unprepared and uninsured. There is also a long-term problem for those who know that their homes can be flooded again. The resulting stress on floodplain residents takes its toll in the form of aggravated physical and mental health problems.

Sources and Types of Flooding

Flooding within the City of Savannah can be attributed to three sources: 1) tidal flooding resulting from hurricanes and tropical storms; 2) flash flooding resulting from heavy rainfall that overburdens the drainage system within the community; and 3) riverine flooding resulting from heavy and prolonged rainfall over a given watershed which causes the capacity of the main channel to be exceeded.

Coastal (Tidal) Flooding: All lands bordering the coast are prone to tidal flooding. Coastal land such as sand bars, barrier islands and deltas provide a buffer zone to help protect human life and real property relative to the sea much as flood plains provide a buffer zone along rivers and other bodies of water. Coastal floods usually occur as a result of abnormally high tides or tidal waves, storm surge and heavy rains in combination with high tides, tropical storms and hurricanes. While the City of Savannah is not located along an immediate shoreline, it is located in an area that is vulnerable to tidal flooding and storm surge inundation.

The primary factors contributing to coastal flooding in Savannah are its location in a hurricane prone area, its openness to Atlantic Ocean storm surges and unfavorable, shallow bathymetry extending far offshore. Many of the large streams and sounds near the coast have wide mouths and are bordered by extensive areas of low marsh. In addition, the terrain at the coast is generally too low to provide an effective barrier. The offshore ocean depths are shallow for great distances, capable of generating extremely high storm surges with potential devastating impact in Savannah, particularly if driven at times of high tide.

Riverine Flooding: The City of Savannah is located along the banks of the tidally-influenced Savannah River in addition to Wassaw and Ossabaw sounds, with numerous tributaries and manmade canals running throughout its jurisdiction that are very susceptible to overflowing their banks during and following excessive precipitation and coastal storm events. While flash flooding caused by surface water runoff is more common in Savannah, riverine flood events (such as the "100-year flood") will cause significantly more damage and economic disruption for the area. Savannah's floodplains have been studied and mapped by FEMA as Special Flood Hazard Areas (SFHAs).

Flash or Rapid Flooding: Flash flooding is the result of heavy, localized rainfall, possibly from slow-moving intense thunderstorms that cause small streams and drainage systems to overflow. Flash flood hazards caused by surface water runoff are most common in urbanized cities, where greater population density generally increases the amount of impervious surface (e.g., pavement and buildings) which increases the amount of surface water generated. Flooding can occur when the capacity of the stormwater system is exceeded or if conveyance is obstructed by debris, sediment and other materials that limit the volume of drainage.

Flooding and Floodplains

The area adjacent to a channel is the floodplain, as shown in Figure 4.9. A floodplain is flat or nearly flat land adjacent to a stream or river that experiences occasional or periodic flooding. It includes the floodway, which consists of the stream channel and adjacent areas that carry flood flows, and the flood fringe, which are areas covered by the flood, but which do not experience a strong current. Floodplains are made when floodwaters exceed the capacity of the main channel or escape the channel by eroding its banks. When this occurs, sediments (including rocks and debris) are deposited that gradually build up over time to create the floor of the floodplain. Floodplains generally contain unconsolidated sediments, often extending below the bed of the stream.

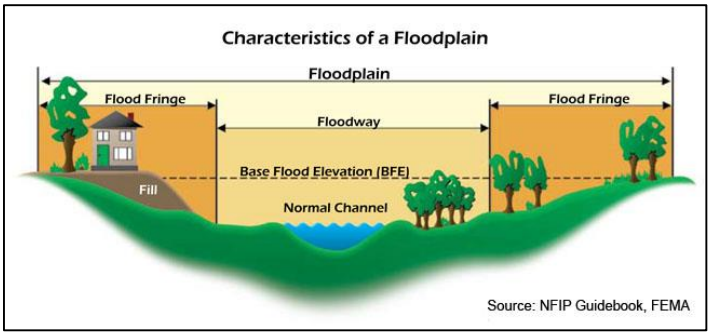


Figure 4.9 - Characteristics of a Floodplain

In its common usage, the floodplain most often refers to that area that is inundated by the 100-year flood, the flood that has a 1% chance in any given year of being equaled or exceeded. The 100-year flood is the national minimum standard to which communities regulate their floodplains through the National Flood Insurance Program (NFIP). The 500-year flood is the flood that has a 0.2 percent chance of being equaled or exceeded in any given year. The potential for flooding can change and increase through various land use changes and changes to land surface, which result in a change to the floodplain. A change in environment can create localized flooding problems inside and outside of natural floodplains by altering or confining natural drainage channels. These changes are most often created by human activity.

The 100-year flood, which is the minimum standard used by most federal and state agencies, is used by the NFIP as the standard for floodplain management and to determine the need for flood insurance. Participation in the NFIP requires adoption and enforcement of a local floodplain management ordinance which is intended to prevent unsafe development in the floodplain, thereby reducing future flood damages. Participation in the NFIP allows for the federal government to make flood insurance available within the community as a financial protection against flood losses. Since floods have an annual probability of occurrence, have a known magnitude, depth and velocity for each event, and in most cases, have a map indicating where they will occur, they are in many ways often the most predictable and manageable hazard.

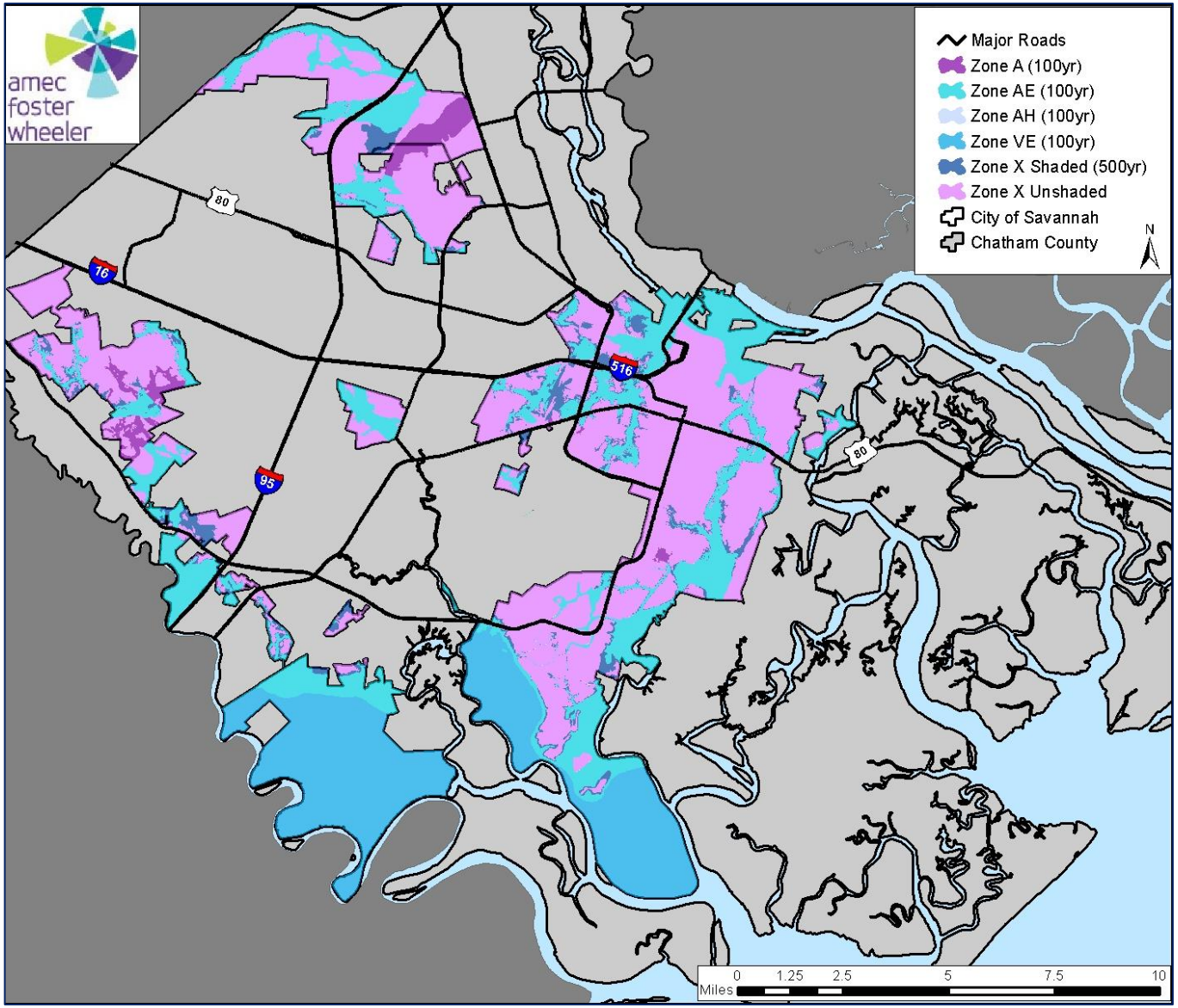
Regulated floodplains are illustrated on inundation maps called Digital Flood Insurance Rate Maps (DFIRMs). It is the official map for a community on which FEMA has delineated both the SFHAs and the risk premium zones applicable to the community. SFHAs represent the areas subject to inundation by the 100-year flood event. Structures located within the SFHA have a 26-percent chance of flooding during the life of a standard 30-year mortgage. Flood prone areas were identified within Savannah using the most current Flood Insurance Study (FIS) and associated DFIRMs developed by FEMA for Chatham County effective on July 7, 2014. Table 4.6 summarizes the flood insurance zones identified by the DFIRMs.

Table 4.6 – Mapped Flood Insurance Zones within Chatham County

Zone	Description
VE	Also known as the coastal high hazard areas. They are areas subject to high velocity water including waves; they are defined by the 1% annual chance (base) flood limits (also known as the 100-year flood) and wave effects 3 feet or greater. The hazard zone is mapped with base flood elevations (BFEs) that reflect the combined influence of stillwater flood elevations, primary frontal dunes, and wave effects 3 feet or greater.
AE	AE Zones, also within the 100-year flood limits, are defined with BFEs that reflect the combined influence of stillwater flood elevations and wave effects less than 3 feet. The AE Zone generally extends from the landward VE zone limit to the limits of the 100-year flood from coastal sources, or until it reaches the confluence with riverine flood sources. The AE Zones also depict the SFHA due to riverine flood sources, but instead of being subdivided into separate zones of differing BFEs with possible wave effects added, they represent the flood profile determined by

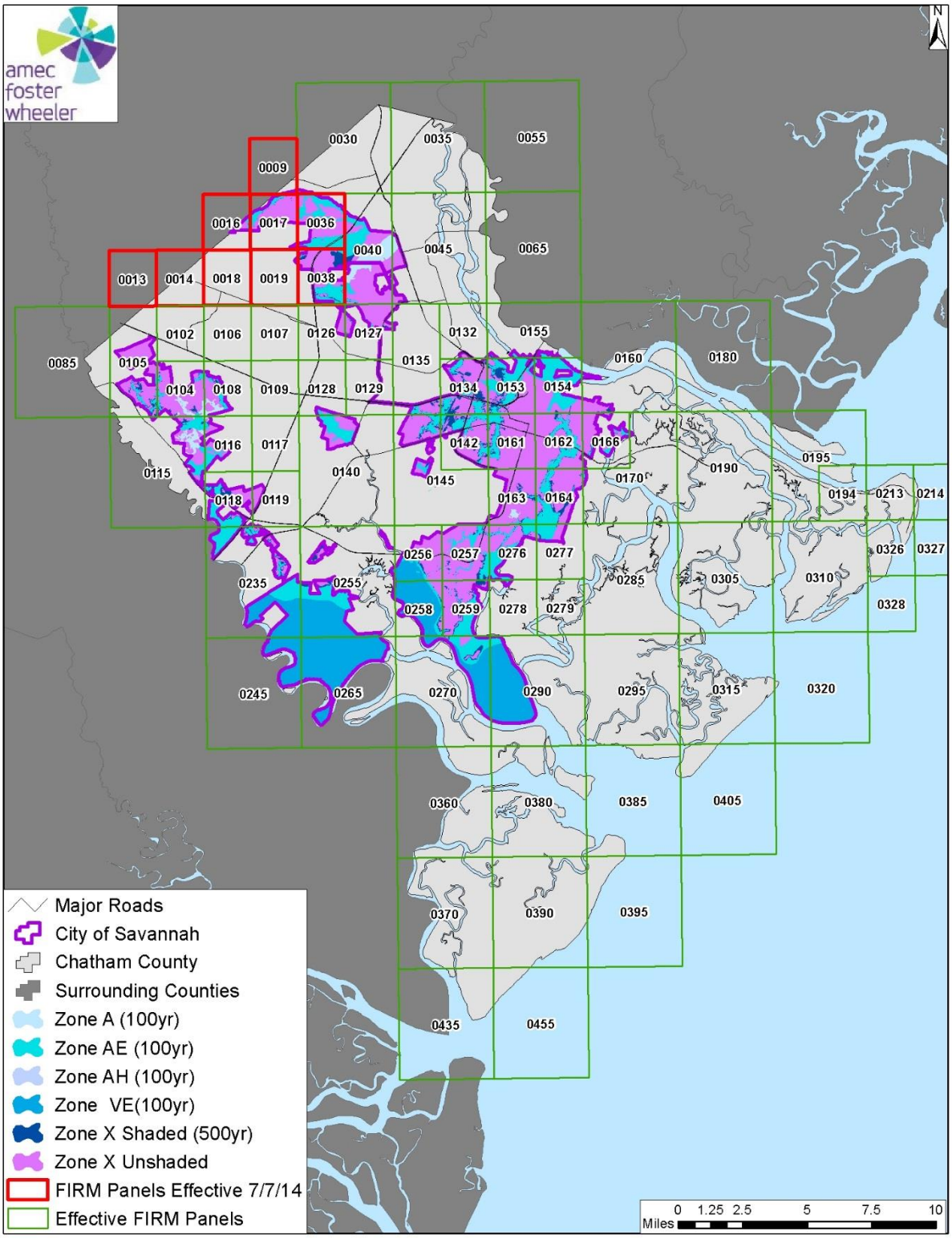
Zone	Description
	hydrologic and hydraulic investigations and have no wave effects.
AH	Areas subject to inundation by 1-percent-annual-chance shallow flooding (usually areas of ponding) where average depths are 1–3 feet. BFEs derived from detailed hydraulic analyses are shown in this zone.
A	Areas subject to inundation by the 1-percent-annual-chance flood event generally determined using approximate methodologies. Because detailed hydraulic analyses have not been performed, no Base Flood Elevations (BFEs) or flood depths are shown. Mandatory flood insurance purchase requirements and floodplain management standards apply.
0.2% Annual Chance (shaded Zone X)	Moderate risk areas within the 0.2-percent-annual-chance floodplain, areas of 1-percent-annual-chance flooding where average depths are less than 1 foot, areas of 1-percent-annual-chance flooding where the contributing drainage area is less than 1 square mile, and areas protected from the 1-percent-annual-chance flood by a levee. No BFEs or base flood depths are shown within these zones. (Zone X (shaded) is used on new and revised maps in place of Zone B.)
Zone X (unshaded)	Minimal risk areas outside the 1-percent and .2-percent-annual-chance floodplains. No BFEs or base flood depths are shown within these zones. (Zone X (unshaded) is used on new and revised maps in place of Zone C.)

Figure 4.10 reflects the mapped flood insurance zones for Chatham County. The southern portion of the City is comprised of Zone VE and Zone AE SFHAs with small areas of Zone X (500-yr). The central and northern portions of the City are comprised primarily of Zone AE and Zone X (unshaded) with small areas of Zone A and Zone X (500-yr). A summary of acreage by flood zone is as follows: Zone VE (10,795 Acres); Zone AE (13,223 Acres); Zone AH (1.8 Acres); Zone A (1,441 Acres); Zone X 500-yr (2,612 Acres); and Zone X unshaded (24,915 Acres). Figure 4.11 reflects the effective DFIRM panel scheme for Chatham County.



Source: FEMA DFIRM, 7/7/14

Figure 4.10 - Savannah DFIRM Flood Zones



Source: FEMA DFIRM, 7/7/14

Figure 4.11 - Chatham County Effective FIRM Panel Scheme

The NFIP utilizes the 100-year flood as a basis for floodplain management. The FIS defines the probability of flooding as flood events of a magnitude which are expected to be equaled or exceeded once on the average during any 100 year period (recurrence intervals). Or considered another way, properties within a 100-year flood zone have a one percent probability of being equaled or exceeded during any given year. Mortgage lenders require that owners of properties with federally-backed mortgages located within SFHAs purchase and maintain flood insurance policies on their properties. Consequently, newer and recently purchased properties in the community are insured against flooding. Due to the risk of flooding from hurricanes, all property owners in the City, even if the property is not located in a SFHA, should be encouraged to purchase and maintain flood insurance policies.

Past Occurrences

The climate in southeastern Georgia is warm and temperate to subtropical. The average high temperature in January is 60 degrees Fahrenheit (°F), and is 93°F in July, and the average annual precipitation is approximately 48 inches, with most precipitation occurring in August. While the Atlantic hurricane season lasts from June through November, most of the historic storms that have impacted Savannah occurred between the months of May and October. Past occurrences for tropical storms and hurricanes can be found in Section 4.2.6.

Table 4.7 shows flood events from causes other than hurricanes reported by the NCDC since 1950 for the City of Savannah. Table 4.8 shows flood events from causes other than hurricanes reported by SHELDUS from 1960 through present.

Table 4.7 - NCDC Flooding in Chatham County – January 1950 to June 2014

Location	Date	Event Type	Injuries/Deaths	Property Damage	Crop Damage
Savannah	7/5/1996	Flash Flood	0/2	1.00M	0.00K
Savannah	8/7/1996	Flash Flood	0/0	75.00K	0.00K
East Portion	1/23/1998	Flash Flood	0/0	0.00K	0.00K
East Portion	6/29/1999	Flash Flood	0/0	0.00K	0.00K
East Portion	6/29/1999	Flash Flood	0/0	0.00K	0.00K
East Portion	6/29/1999	Flash Flood	0/0	7.00M	0.00K
Savannah	10/11/2002	Flash Flood	0/0	0.00K	0.00K
Savannah	4/7/2003	Flash Flood	0/0	0.00K	0.00K
Savannah	4/8/2003	Flash Flood	0/0	0.00K	0.00K
Savannah	4/8/2003	Flash Flood	0/0	0.00K	0.00K
Savannah	7/24/2003	Flash Flood	0/0	0.00K	0.00K
Savannah	8/12/2004	Flash Flood	0/0	0.00K	0.00K
Savannah	10/5/2005	Flash Flood	0/0	0.00K	0.00K
Savannah	7/6/2006	Flash Flood	0/0	5.00K	0.00K
Savannah	7/6/2006	Flash Flood	0/0	5.00K	0.00K
Savannah	7/30/2007	Flash Flood	0/0	8.00K	0.00K
Wilmington Is	9/1/2007	Flash Flood	0/0	0.00K	0.00K
Savannah Intl A	9/1/2007	Flash Flood	0/0	0.00K	0.00K
Savannah	9/1/2007	Flash Flood	0/0	0.00K	0.00K
Central Jct	9/13/2007	Flash Flood	0/0	0.00K	0.00K
Central Jct	9/21/2007	Flash Flood	0/0	0.00K	0.00K
Central Jct	9/21/2007	Flash Flood	0/0	0.00K	0.00K
Central Jct	9/21/2007	Flash Flood	0/0	0.00K	0.00K
Garden City	12/21/2007	Flash Flood	0/0	0.00K	0.00K
Port Wentworth	12/21/2007	Flash Flood	0/0	0.00K	0.00K
Central Jct	12/21/2007	Flash Flood	0/0	0.00K	0.00K
Bona Bella	12/21/2007	Flash Flood	0/0	6.00K	0.00K

Location	Date	Event Type	Injuries/Deaths	Property Damage	Crop Damage
Savannah	12/21/2007	Flash Flood	0/0	5.00K	0.00K
Savannah Intl A	12/21/2007	Flash Flood	0/0	0.00K	0.00K
Savannah	12/21/2007	Flash Flood	0/0	0.00K	0.00K
Central Jct	7/27/2008	Flash Flood	0/0	0.00K	0.00K
Meinhard	10/24/2008	Flash Flood	0/0	0.00K	0.00K
Savannah	7/27/2009	Flash Flood	0/0	10.00K	0.00K
Central Jct	8/3/2009	Flash Flood	0/0	5.00K	0.00K
Sandfly	8/3/2009	Flash Flood	0/0	50.00K	0.00K
Garden City	8/3/2009	Flash Flood	0/0	100.00K	0.00K
Savannah	8/12/2009	Flash Flood	0/0	0.00K	0.00K
Savannah	6/27/2010	Flash Flood	0/0	0.00K	0.00K
Central Jct	6/27/2010	Flash Flood	0/0	0.00K	0.00K
Vernonburg	8/20/2010	Flash Flood	0/0	0.00K	0.00K
Chatham Co.	6/29/2011	Flash Flood	0/0	0.00K	0.00K
Chatham Co.	6/29/2011	Flash Flood	0/0	0.00K	0.00K
Chatham Co.	6/29/2011	Flash Flood	0/0	0.00K	0.00K
Chatham Co.	6/29/2011	Flash Flood	0/0	0.00K	0.00K
Chatham Co.	6/29/2011	Flash Flood	0/0	0.00K	0.00K
Chatham Co.	6/29/2011	Flash Flood	0/0	0.00K	0.00K
Chatham Co.	6/29/2011	Flash Flood	0/0	0.00K	0.00K
Chatham Co.	6/29/2011	Flash Flood	0/0	0.00K	0.00K
Chatham Co.	6/29/2011	Flash Flood	0/0	0.00K	0.00K
Thunderbolt	7/14/2011	Flash Flood	0/0	5.00K	0.00K
Savannah	7/14/2011	Flash Flood	0/0	5.00K	0.00K
Savannah	8/6/2011	Flash Flood	0/0	0.00K	0.00K
Savannah	7/12/2013	Flash Flood	0/0	10.00K	0.00K
Vernonburg	7/12/2013	Flash Flood	0/0	1.00K	0.00K
Oleary	7/13/2013	Flash Flood	0/0	30.00K	0.00K
Savannah	7/31/2013	Flash Flood	0/0	0.00K	0.00K
Fernwood	7/31/2013	Flash Flood	0/0	0.00K	0.00K
Savannah	7/31/2013	Flash Flood	0/0	30.00K	0.00K
Savannah	8/16/2013	Flash Flood	0/0	0.00K	0.00K
Central Jct	8/16/2013	Flash Flood	0/0	20.00K	0.00K
Savannah Beach	8/16/2013	Flash Flood	0/0	0.00K	0.00K
Bona Bella	6/23/2014	Flash Flood	0/0	0.00K	0.00K
Coastal Chatham	9/30/2007	Coastal Flood	0/0	0.00K	0.00K
Coastal Chatham	6/22/2009	Coastal Flood	0/0	0.00K	0.00K
Coastal Chatham	6/22/2009	Coastal Flood	0/0	0.00K	0.00K
Coastal Chatham	6/22/2009	Coastal Flood	0/0	0.00K	0.00K
Coastal Chatham	6/22/2009	Coastal Flood	0/0	0.00K	0.00K
Coastal Chatham	6/23/2009	Coastal Flood	0/0	0.00K	0.00K
Coastal Chatham	6/23/2009	Coastal Flood	0/0	0.00K	0.00K
Coastal Chatham	6/23/2009	Coastal Flood	0/0	0.00K	0.00K
Coastal Chatham	6/23/2009	Coastal Flood	0/0	25.00K	0.00K
Coastal Chatham	6/23/2009	Coastal Flood	0/0	0.00K	0.00K
Coastal Chatham	1/30/2010	Coastal Flood	0/0	15.00K	0.00K
Coastal Chatham	5/7/2012	Coastal Flood	0/0	0.00K	0.00K
Coastal Chatham	6/5/2012	Coastal Flood	0/0	0.00K	0.00K
Coastal Chatham	6/6/2012	Coastal Flood	0/0	0.00K	0.00K
Coastal Chatham	8/19/2013	Coastal Flood	0/0	0.00K	0.00K

Location	Date	Event Type	Injuries/Deaths	Property Damage	Crop Damage
Pooler	6/23/2014	Heavy Rain	0/0	0.00K	0.00K
Savannah Int A	6/23/2014	Heavy Rain	0/0	0.00K	0.00K
Savannah Beach	8/1/1996	Waterspout	0/0	0.00K	0.00K
Savannah Beach	5/31/1998	Waterspout	0/0	0.00K	0.00K
Thunderbolt	6/29/2001	Waterspout	0/0	0.00K	0.00K

Source: NCDC, September 2014

Table 4.8 - SHELDUS Flooding in Chatham County - 1960 to September 2014

Date		Hazard Type	Injuries/Fatalities	Crop Damage	Property Damage
Month	Year				
June	2005	Coastal	1/1	$0.00	$0.00
July	2009	Coastal	0/0	$0.00	$1,085.86
August	2010	Coastal	2/0	$0.00	$0.00
September	2010	Coastal	0/0	$0.00	$8,012.52
June	2012	Coastal	3/0	$0.00	$0.00
July	2013	Coastal	1/0	$0.00	$0.00
February	1979	Flooding	0/0	$195.67	$1,956.58
March	1980	Flooding	0/0	$0.00	$28,271.48
April	1991	Flooding	0/0	$0.00	$856,057.11
May	1991	Flooding	0/0	$0.00	$855.20
September	1992	Flooding	0/0	$0.00	$83.02
September	1994	Flooding	0/0	$0.00	$7,859.55
October	1994	Flooding	0/0	$785.95	$801,673.89
June	1995	Flooding	0/0	$0.00	$38,214.73
July	1996	Flooding	2/0	$0.00	$1,484,748.25
August	1996	Flooding	0/0	$0.00	$111,356.12
June	1999	Flooding	0/0	$0.00	$9,788,109.28
July	2006	Flooding	0/0	$0.00	$5,777.70
July	2007	Flooding	0/0	$0.00	$8,988.32
December	2007	Flooding	0/0	$0.00	$12,358.94
June	2009	Flooding	0/0	$0.00	$13,573.24
July	2009	Flooding	0/0	$0.00	$10,858.59
August	2009	Flooding	0/0	$0.00	$168,308.20
January	2010	Flooding	0/0	$0.00	$16,025.03
July	2011	Flooding	0/0	$0.00	$10,356.46
July	2013	Flooding	0/0	$0.00	$71,000.00
August	2013	Flooding	0/0	$0.00	$20,000.00
April	1960	Severe Storm/Thunder Storm	0/0	$53,176.84	$5,317.72
June	1963	Severe Storm/Thunder Storm	0/0	$0.00	$380,648.69
May	1964	Severe Storm/Thunder Storm	0/0	$23,631.23	$23,631.23
July	1964	Severe Storm/Thunder Storm	0/0	$0.00	$375,737.10
December	1964	Severe Storm/Thunder Storm	0/0	$507.77	$50,775.31
May	1966	Severe Storm/Thunder Storm	0/0	$10,573.59	$10,573.59
May	1969	Severe Storm/Thunder Storm	0/0	$0.00	$9,334.72
October	1969	Severe Storm/Thunder Storm	1/0	$0.00	$9,334.72
August	1970	Severe Storm/Thunder Storm	0/0	$0.00	$3,002,023.21
March	1971	Severe Storm/Thunder Storm	0/0	$180.90	$18,088.10
June	1971	Severe Storm/Thunder Storm	0/0	$0.00	$1,808.84
June	1972	Severe Storm/Thunder Storm	0/0	$0.00	$33,016.47
February	1973	Severe Storm/Thunder Storm	0/0	$0.00	$16,499.28

Date		Hazard Type	Injuries/Fatalities	Crop Damage	Property Damage
Month	Year				
April	1973	Severe Storm/Thunder Storm	0/0	$0.00	$3,199.28
June	1973	Severe Storm/Thunder Storm	0/0	$0.00	$262,338.97
June	1974	Severe Storm/Thunder Storm	0/0	$3,192.79	$3,192.79
July	1976	Severe Storm/Thunder Storm	0/0	$0.00	$20,470.74
June	1991	Severe Storm/Thunder Storm	0/0	$0.00	$17,959.24
July	1992	Severe Storm/Thunder Storm	0/0	$0.00	$1,660.42
August	1992	Severe Storm/Thunder Storm	0/0	$0.00	$1,660.42
July	1993	Severe Storm/Thunder Storm	0/0	$0.00	$80.61
June	1994	Severe Storm/Thunder Storm	0/0	$0.00	$80,953.33
August	1994	Severe Storm/Thunder Storm	0/0	$0.00	$78.60
June	1995	Severe Storm/Thunder Storm	0/0	$0.00	$53,500.62

Source: SHELDUS v13.1, September 2014

The following provides details on flood events detailed in the NCDC database and from members of the FMPC.

July 5, 1996 - Eight to ten (8-10) inches of rain fell in 3-4 hours in and around Savannah. As a result, 50 streets and 100 homes were flooded to various degrees. Numerous businesses had water several inches deep. There were 31,000 residents without power for several hours. This event also occurred close to high tide. Some streets had water up to headlights on cars while some homes had water almost knee deep. Several car dealerships had significant damage to some cars. Two elderly men barely escaped with their lives when their car stalled. By the time they were rescued, water was within six (6) inches of filling the inside of the car.

August 7, 1996 – Four to eight inches of rain fell in two to four hours causing flash flooding of streets and small streams in Savannah.

June 29, 1999 - Slow moving showers and thunderstorms developed repeatedly across Chatham County and Effingham County during the day. Twenty-four hour rainfall amounts ranged from about 7 inches to over 13 inches. As a result of the flooding, over 500 homes and businesses were damaged to varying degrees and almost 600 automobiles were damaged. Water was as much as 6 ft deep in some places. Numerous roads were washed out and/or closed during the flooding. Estimated dollar damage for public property was 4.5 million dollars and at least another 2.5 million dollars for private property.

July 30, 2007 - Numerous road closures were reported in Downtown Savannah. High water was reported entering some apartments. Cars floating down the roadway at 65th and Abercorn Street.

August 16, 2013 - Reports that portions of Victory Drive, Price Street, and 37th Street in Savannah are covered by one to two feet of water due to flash flooding. Water was up to the porches of a few homes in this area.

June 23, 2014 - The Savannah Airport ASOS measured 6.65 inches of rainfall for the day. This is the wettest June day on record at the airport since records began in 1871. This surpassed the previous record of 6.60 inches set in June 29, 1999.

Frequency/Likelihood of Future Occurrence

Occasional - By definition of the 100-year flood event, the City has a 1 percent chance of being equaled or exceeded in any given year. The annual precipitation for the City of Savannah averages 50.0 inches. A similar amount of precipitation should be anticipated in the future, and occasional flooding is likely to occur.

Climate Change and Flood: 100-/500-year

With its populous coastal community and low topography, the City of Savannah is particularly vulnerable to the effects of climate change and sea level rise. While average annual rainfall may increase or decrease slightly, the intensity of individual rainfall events is likely to increase, which may overwhelm stormwater drainage systems.

4.2.5 Flood: Stormwater/Localized Flooding

Hazard/Problem Description

Localized stormwater flooding can also occur throughout the City of Savannah. Localized stormwater flooding occurs when heavy rainfall and an accumulation of runoff overburden the stormwater drainage system. Savannah is situated on a low coastal plain with much of its surrounding area consisting of tidal marshes. The cause of flooding in Savannah can be attributed to a number of factors, including its low elevation, relatively flat terrain, close proximity to the coast, 6 to 9 foot tides, abundance of water features, and the large amount of developed and impervious land, which limits ground absorption and increases surface water runoff. Early in its history, the City constructed a series of canals to convey stormwater. Without these canals, development in many parts of the City would not have been possible, and over the years, these canals have been supplemented by additional drainage improvements of varying capacities to help alleviate potential flooding. The Savannah canal system is shown in Figure 4.12.

Past Occurrences

Figure 4.13 depicts the areas of localized flooding identified by the FMPC. The areas of localized flooding include:

Neighborhood	Location(s)
Abercorn Heights/Lamara Heights/Ridgewood /Poplar:	- 65th & Paulsen, 65th & Abercorn to Bull - 61st & Habersham, Habersham, North of Derenne - Brandywine St. & Battery St. - E 63rd, 64th & 65th St & Reynolds St.
Ardmore/Gould Estates/Olin Heights	- 55th Lane between Habersham & Abercorn - 57th & 58th between Reynolds & Atlantic
Ardsley Park/Chatham Crescent	- Washington and Paulsen - E 45th & Harmon St, E 45th & Reynolds St, E 45th & Paulsen St - E 49th & Waters - E Victory St & Paulsen St
Avondale	- 2428 Tennessee Ave, New Jersey & Tennessee Ave, Delaware Ave & Tennessee Ave
Bacon Park Area/Sandfly	- Skidaway, Just South of Bacon Park Golf Course
Bay Street Viaduct Area	- Bay St @ Viaduct inside Great Dane, Read of Great Dane Through Gate
Beach High School Area	- E 48th to 52nd @ Springfield Canal
Benjamin Van Clark Park	- Ash St & Duffy, Ash St & E Anderson St, Ash St & E Henry St - Cedar St & E Henry St, 1201 E Henry St
Blackshear	- Kayton Pump Station
Brookview/Skidaway Terrace/Parkview	- Brookview & CountrySide - Jan St & Bona Bella
Carver Heights	- Dell St - 535 Magazine Ave - Cornwall St & Hastings
Chatham Parkway	- Lynes Ave - Tremont St @ the railroad tracks
Coffee Bluff/ Rose Dhu	- East end of Back St, then left on Grant to Tidegate - Behind #12 Sutton

Neighborhood	Location(s)
	- Behind 63 & 65 Ramsgate - Rear of 3 Bridgeport, Rear of 3 Bridgeport through woods to Back St - 13907 Coffee Bluff Rd
Cuyler/Brownville	- W 41st & E 42nd St @ Ogeechee Rd - W 42nd, rear of 1231 - E 42nd & Hopkins, E 42nd @ Ogeechee Rd
Dale Terrace/Olympus/Victory Square	- Ditch behind Food Lion off Victory Dr
East Savannah	- 2417 E Gwinnett St
East Victorian District	- Abercorn St & E Henry St, Abercorn St & E Park Ave - E Henry St & Drayton St, E Henry St & Lincoln St - Park Ave & Drayton St
Eastside	- E Gwinnett St Underpass - Henry St underpass, Henry St railroad underpass - E Henry St & Harmon St, E Henry St & Paulsen St
Edgemere	- 1500 Blk E 54th St - E 55th St & Waters Ave
Fairway Oaks	- Derenne Pump Station
Gordonston	- Virginia Lane @ Skidaway Rd, Lane behind Savannah Oaks Bldg. 23 - Edgewood & Kentucky - Goebel & Pierpont
Groveland/Kensington Park	- 318 Kensington Dr, Left of home; 75' down the ditch, Kensington Dr & Althea- Community Park, SE Corner Behind pool - Habersham, between Johnston St & Groveland Circle- Hampstead Canal
Highland Park	- 712 Mall Blvd West of Triple A Auto - Sallie Mood @ County Yard - Goebel & Greenville, Goebel & Elgin
Hitch Village/ Fred Wessels Homes	- Marriott Hotel East Side of Tidegate @ Savannah River - Bilbo Box- Tidegate @ Savannah River, Bilbo Box @ Perry Lane - Savannah River Tidegate - Tidegate @ Marriott, Tidegate Bilbo Box N or President, S of East Coast, Tidegate W Side under Marriott, Tidegate E of Marriott @ Savannah River Landing, New Tidegate @ Savannah River Landings
Hudson Hill/Bayview	- Rogers St W of Carolan @ Park - Fell St Pump Station, Fell St Box @ Carolan behind Airco - West Bay & Graham @ Ditch behind Barrett Oil Co.
Hunter Army Airfield	- White Bluff @ Savannah tech entrance, White Bluff along Hunger AAF wall - Mohawk St & Kingslan Ct
Jackson Park	- 52nd & Montgomery St
Largo Woods	- 11011 Largo Dr rear, S @ Ditch - Rear of Quail Forrest Court, #10 - 209 San Fernando between 207 & 211
LaRoche Park/Springhill/Daffin Heights/Wilemere/S*	- Dead end of Costa Rica @ Truman Parkway - E 56th & Honduras @ Parkway - E 57th & Costa Rica Ave
Laurel Grove/Railroad Area	- Louisville & 1-16 - Ogeechee Rd & W 42nd St
Leeds Gate/Colonial Village/Hunters Chase	- Middleground Rd, rear of Woodhouse Apts, North of Apts - 328 Tibet Ave, E of Southside Assembly of God - Tibet Ave W of Elementary School @ Ditch, Tibet Ave @ Wilshire Canal - W Montgomery Rd, W of Indigo @ Canal

Neighborhood	Location(s)
	- Clinch St Bar Screen Springfield Canal, Stark St @ Springfield Canal
Live Oak	- Victory Dr, Waters to Bee Rd - 1300 Block E 34th St, 1311 E 34th St
Lundhurst/Rivers End	- 8515 Hurst Ave- Tidegate; left hand side, 613 Rivers End- Tidegate - 16 Delta Circle- Left between 16 Delta Circle & 18 Delta Circle
Magnolia Park/Blueberry Hill	- Woodland Dr & Spaulding Dr- Casey Canal
Mayfair	- Montgomery Rd & Whitefield Ave, Casey Canal
Medical Arts	- Paulsen St & 61st St, Paulsen St & E 63rd St
Midtown	- E Anderson St & Harmon St, E Anderson St & Ott St
Oakdale	- Memorial Day School, 300 Hampton St off of Habersham - Wheeler & Waters
Oakhurst	- Abercorn to Edgewater- Harmon canal
Paradise Park	- Rear of 107 Paradise Dr @ Arden Apt, 109 Paradise Dr, 125 Paradise Drive, 19 Paradise Dr - 9 Joyce Ct
Parkside	- E 50th St & Waters Ave
Pine Gardens	- President St Median inlets to city limits
Sackville	- Hospital access Rd between Delesseps & 59th @ Parkway - Delesseps Ave & Waters Ave
Savannah Gardens	- Elgin & Pennsylvania, Elgin- Mid block between Pennsylvania & Crescent
Savannah State/Glynwood/Placentia Plantation/Bren*	- Derenne Ave & Bonnie Dr @ Savannah Christian - 50' west of Savannah Christian entrance - Loroche Ave @ Placentia Canal
Skyland Terrace/Greenway Park/Grove Park/Oglethor*	- 11 Sherwood- Pipe entrance behind house
South Historic District	- Alice & Jefferson, Alice & Tattnall, 403 Tattnall St - W Gwinnett St & Whitaker St - Bull St & E Henry St
Sylvan Terrace	- Herty Dr, Thackery Place to Berkley Place
The Village/ Rio/ Armstrong	- 1 Rio Rd
Tremont Park	- Tremont Ave & MusGrove Canal - 3488 Ogeechee Rd
Twickenham	- 50 Goebel Ave , Goebel Ave & President St, Goebel Ave & New Mexico - Greenville & Lawton - 1825 E Gwinnett St - Beech St & Presidents St
Victory Heights	- Skidaway Ave & 39th St, Skidaway Ave & E 38th St, Skidaway Ave & Victory Dr - 2441 E 40th St - Grate Inlet @ Rear of Precision Tune - Victory Dr & Wallin St
Victory Manor/East Hill/Donwood	- E 39th St, E 39th St & Elm Circle - E 38th- End of Rd, E 38th @ Dead End
West Savannah	- Comer St @ Abbott - Baker St @ Bay St, Graham St & Bay St - McIntyre @ Chester - Newcastle St - Patch St - Fell St

Neighborhood	Location(s)
	- Jenks St - Louisville & W Lathrop - Margery & Kenilworth
White Bluff Neighborhoods	- Robin Rd Tidegates, #6 Robin Rd- back to marsh - Screen E Side of White Bluff Rd @ Greenbriar - Wilshire Canal E of White Bluff Rd @ Outfall Point, Holland Canal E of White Bluff Rd @ Outfall Point - 13322 Coffee Bluff Rd
White Bluff/ Holland Drive	- 245 Holland Dr @ Royal Dutch Apts, pipe entrance
Wilshire Estates/Savannah Mall/Tranquilla Woods/Q*	- 403 Montclair, between 403 & 405, rear - San Anton Dr @ Wilshire Canal bridge, San Anton Dr @ Largo Dr, 2 San Anton Dr - Quail Hollow Rd @ Dutchtown Rd - Abercorn & Wilshire @ Canal, South of Southside Veterinarian Clinic, Tibet Ave @ Wilshire Canal - 117 Wilshire, Wilshire @ Montclair Blvd @ Canal - Middleground Rd & Shawnee, NW Corner - 245 Forest Ridge Dr - 3 Ventura Blvd - 16 Quail Hollow Ct
Windsor Forest	- Beside 602 Plantation - Between 420 & 422 Windsor Rd, Windsor Rd @ Pump Station, 509 Windsor Rd - Between 512 & 514 Arlington Rd, West of Arlington Rd - Beside 13104 Stillwood, beside 1510 Stillwood - 419 Briarcliff - Rear 610 Northbrook Rd - 121 Juniper Circle, rear - 12421 Largo, 12517 Largo- ditch in median, Largo & Woodley Rd, 13101 Largo Dr - rear of house - 119 Hoover Creek Dr - 12403 Woodley Rd, 306 Woodley Rd, Northwood Rd & Woodley Rd, Red Oak Dr & Woodley Rd - Northwood Rd & Red Oak Dr - 426 Sharondale Rd - 1503 Cedar Grove Plantation Dr
Woodville/Bartow	- 32 Darling St - 39 King @ Fence
Yamacraw Village	- Travelodge Inn Tidegate - Springfield Pump Station

Localized flooding may be caused by the following maintenance related issues:

Clogged Inlets – debris covering the asphalt apron and the top of grate at catch basin inlets may contribute to an inadequate flow of stormwater into the system which may cause flooding near the structure. Debris within the basin itself may also reduce the efficiency of the system by reducing the carrying capacity.

Blocked Drainage Outfalls – debris blockage or structural damage at drainage outfalls may prevent the system from discharging runoff, which may lead to a back-up of stormwater within the system.

Improper Grade – poorly graded asphalt around catch basin inlets may prevent stormwater from entering the catch basin as designed. Areas of settled asphalt may create low spots within the roadway that allow for areas of ponded water.

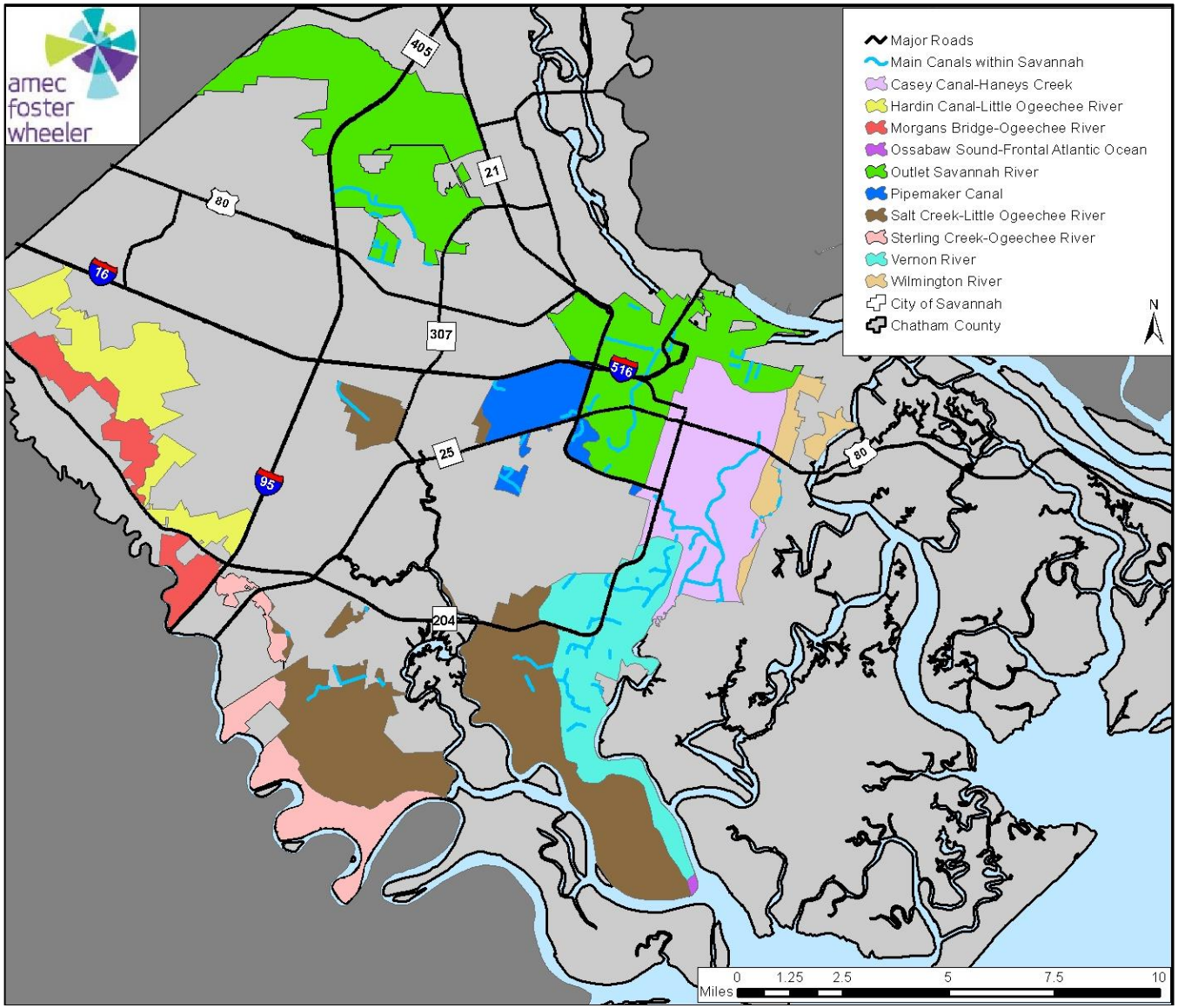
Photos of Flood Events in Savannah

Street flooding is a frequent occurrence in the Ardsley Park area. *(Photo courtesy of the City of Savannah)*

Flooding in Savannah often times requires the City to evacuate residents of flood prone areas. *(Photo courtesy of the City of Savannah)*

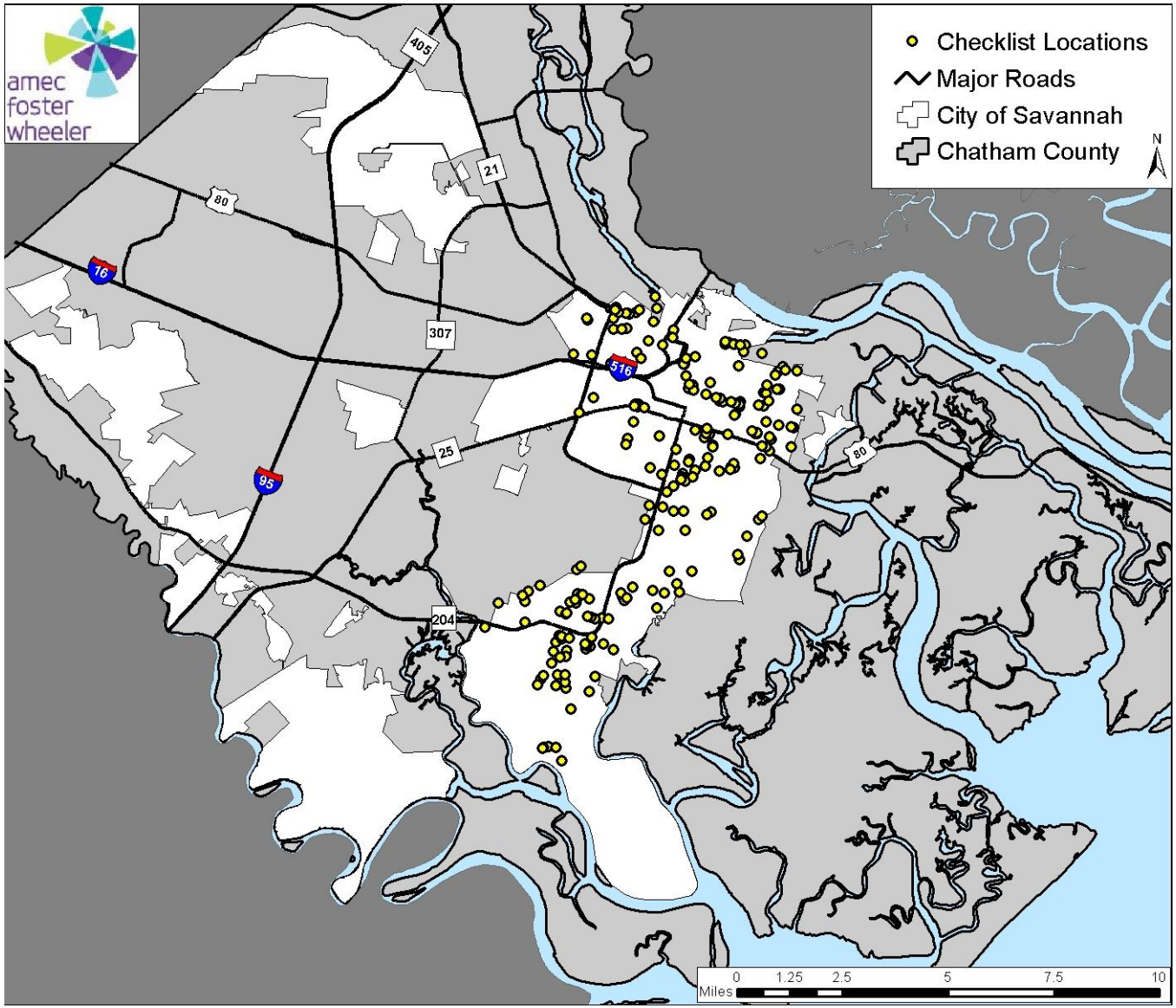
The flooding of vehicles parked in low lying areas is a significant problem in many areas throughout Savannah. This photo was taken standing on Washington Avenue looking east to Paulsen Street. *(Photo courtesy of the City of Savannah)*

The City's top priority for drainage improvement projects is the elimination of flooding to homes and businesses, particularly those that have flooded repetitively over the years. *(Photo courtesy of the City of Savannah)*



Data Source: SAGIS, 2014

Figure 4.12 - Savannah Canal System



Source: City of Savannah, 2014

Figure 4.13 - Localized Flooding Locations

Frequency/Likelihood of Future Occurrence

Highly Likely - Due to the low elevations, a flat terrain, a consistent level of annual precipitation and the tidal influence on canal drainage resulting from heavy rainstorms, tropical storms, and hurricanes, it is highly likely that unmitigated properties will continue to experience localized flooding.

Climate Change and Flood: Stormwater/Localized Flooding

Climate change and sea level rise have the potential to affect localized flooding in Savannah. The intensity of individual rainfall events is likely to increase, which may overwhelm stormwater drainage systems.

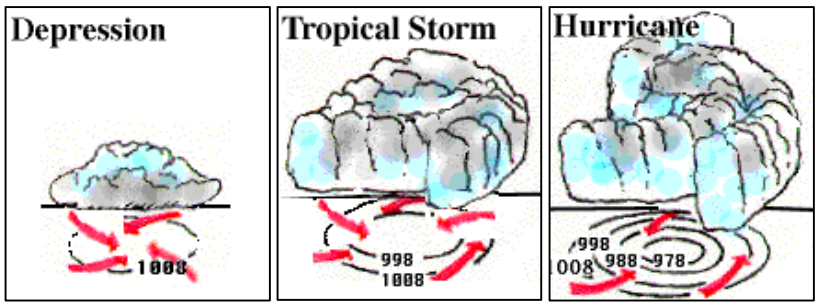
4.2.6 Hurricane and Tropical Storm (including Storm Surge)

Hazard/Problem Description

A hurricane is a type of tropical cyclone or severe tropical storm that forms in the southern Atlantic Ocean, Caribbean Sea, Gulf of Mexico, and in the eastern Pacific Ocean. A typical cyclone is accompanied by thunderstorms, and in the Northern Hemisphere, a counterclockwise circulation of winds near the earth's surface. All Atlantic and Gulf of Mexico coastal areas are subject to hurricanes. The Atlantic hurricane season lasts from June to November, with the peak season from mid-August to late October.

Hurricanes evolve through a life cycle of stages from birth to death. While hurricanes pose the greatest threat to life and property, tropical storms and depressions also can be devastating. Floods from heavy rains and severe weather, such as tornadoes, can cause extensive damage and loss of life. A tropical disturbance can grow to a more intense stage through an increase in sustained wind speeds. The progression of a tropical disturbance is described below and can be seen in Figure 4.14.

- **Tropical Depression:** A tropical cyclone with maximum sustained winds of 38 mph (33 knots) or less.
- **Tropical Storm:** A tropical cyclone with maximum sustained winds of 39 to 73 mph (34 to 63 knots).
- **Hurricane:** A tropical cyclone with maximum sustained winds of 74 mph (64 knots) or higher. In the western North Pacific, hurricanes are called typhoons; similar storms in the Indian Ocean and South Pacific Ocean are called cyclones.
- **Major Hurricane:** A tropical cyclone with maximum sustained winds of 111 mph (96 knots) or higher, corresponding to a Category 3, 4 or 5 on the Saffir-Simpson Hurricane Wind Scale.



Source: Department of Atmospheric Sciences at the University of Illinois at Urbana-Champaign

Figure 4.14 - Life Cycle of a Hurricane

Tropical Storm

Tropical depressions and tropical storms are both categorized by the National Weather Service as a tropical cyclone. The differentiation between these two is wind speed and organization:

Tropical Depression - a tropical cyclone in which the maximum 1-minute sustained surface wind is 33 knots (38 mph) or less. When viewed from a satellite, tropical depressions appear to have little organization. However, the slightest amount of rotation can usually be perceived when looking at a series of satellite images. Instead of a round appearance similar to hurricanes, tropical depressions look like individual thunderstorms that are grouped together.

Tropical Storm - a tropical cyclone in which the maximum 1-minute sustained surface wind ranges from 34 to 63 knots (39 to 73 mph) inclusive. As the storm transitions from tropical depression to tropical storm, the storm itself becomes more organized and begins to become more circular in shape - resembling a hurricane.

Hurricane

A hurricane is a tropical cyclone in which the maximum sustained surface wind is 74 mph or more. Hurricanes are classified by intensity into one of five categories on the Saffir-Simpson Hurricane Wind Scale as shown in Table 4.9. This scale estimates potential property damage. Hurricanes reaching Category 3 and higher are considered major hurricanes because of their potential for significant loss of life and damage. Category 1 and 2 storms are still dangerous, however, and require preventative measures.

Table 4.9 – Saffir-Simpson Hurricane Wind Scale, 2012

Category	Wind Speed (mph)	Potential Damage
1	74-95	**Very dangerous winds will produce some damage**: Well-constructed frame homes could have damage to roof, shingles, vinyl siding and gutters. Large branches of trees will snap and shallowly rooted trees may be toppled. Extensive damage to power lines and poles likely will result in power outages that could last a few to several days.
2	96-110	**Extremely dangerous winds will cause extensive damage:** Well-constructed frame homes could sustain major roof and siding damage. Many shallowly rooted trees will be snapped or uprooted and block numerous roads. Near-total power loss is expected with outages that could last from several days to weeks.
3	111-129	**Devastating damage will occur:** Well-built framed homes may incur major damage or removal of roof decking and gable ends. Many trees will be snapped or uprooted, blocking numerous roads. Electricity and water will be unavailable for several days to weeks after the storm passes.
4	130-156	**Catastrophic damage will occur:** Well-built framed homes can sustain severe damage with loss of most of the roof structure and/or some exterior walls. Most trees will be snapped or uprooted and power poles downed. Fallen trees and power poles will isolate residential areas. Power outages will last weeks to possibly months. Most of the area will be uninhabitable for weeks or months.
5	$\geq$ 157	**Catastrophic damage will occur:** A high percentage of framed homes will be destroyed, with total roof failure and

Category	Wind Speed (mph)	Potential Damage
		wall collapse. Fallen trees and power poles will isolate residential areas. Power outages will last for weeks to possibly months. Most of the area will be uninhabitable for weeks or months.

Source: National Hurricane Center/NOAA

Wind speed is the determining factor in the scale, as storm surge values are highly dependent on the slope of the continental shelf and the shape of the coastline in the landfall region. The following describes the characteristics of each category storm from the Saffir-Simpson Hurricane Wind Scale Extended Table:

Category 1 Hurricane - Winds 74 – 95 mph. Very dangerous winds will produce some damage. People, livestock, and pets struck by flying or falling debris could be injured or killed. Older (mainly pre-1994 construction) mobile homes could be destroyed, especially if they are not anchored properly as they tend to shift or roll off their foundations. Newer mobile homes that are anchored properly can sustain damage involving the removal of shingle or metal roof coverings, and loss of vinyl siding, as well as damage to carports, sunrooms, or lanais. Some poorly constructed frame homes can experience major damage, involving loss of the roof covering and damage to gable ends as well as the removal of porch coverings and awnings. Unprotected windows may break if struck by flying debris. Masonry chimneys can be toppled. Well-constructed frame homes could have damage to roof shingles, vinyl siding, soffit panels, and gutters. Failure of aluminum, screened-in, swimming pool enclosures can occur. Some apartment building and shopping center roof coverings could be partially removed. Industrial buildings can lose roofing and siding especially from windward corners, rakes, and eaves. Failures to overhead doors and unprotected windows will be common. Windows in high-rise buildings can be broken by flying debris. Falling and broken glass will pose a significant danger even after the storm. There will be occasional damage to commercial signage, fences, and canopies. Large branches of trees will snap and shallow rooted trees can be toppled. Extensive damage to power lines and poles will likely result in power outages that could last a few to several days.

Category 2 Hurricane - Winds 96-110 mph. Extremely dangerous winds will cause extensive damage. There is a substantial risk of injury or death to people, livestock, and pets due to flying and falling debris. Older (mainly pre-1994 construction) mobile homes have a very high chance of being destroyed and the flying debris generated can shred nearby mobile homes. Newer mobile homes can also be destroyed. Poorly constructed frame homes have a high chance of having their roof structures removed especially if they are not anchored properly. Unprotected windows will have a high probability of being broken by flying debris. Well-constructed frame homes could sustain major roof and siding damage. Failure of aluminum, screened-in, swimming pool enclosures will be common. There will be a substantial percentage of roof and siding damage to apartment buildings and industrial buildings. Unreinforced masonry walls can collapse. Windows in high-rise buildings can be broken by flying debris. Falling and broken glass will pose a significant danger even after the storm. Commercial signage, fences, and canopies will be damaged and often destroyed. Many shallowly rooted trees will be snapped or uprooted and block numerous roads. Near-total power loss is expected with outages that could last from several days to weeks. Potable water could become scarce as filtration systems begin to fail.

Category 3 Hurricane - Winds 111-129 mph. Devastating damage will occur. There is a high risk of injury or death to people, livestock, and pets due to flying and falling debris. Nearly all older (pre-1994) mobile homes will be destroyed. Most post-1994 mobile homes will sustain severe damage with potential for complete roof failure and wall collapse. Poorly constructed frame homes can be destroyed by the removal of the roof and exterior walls. Unprotected windows will be broken by flying debris. Well-built frame homes can experience major damage involving the removal of roof decking and gable ends. There

will be a high percentage of roof covering and siding damage to apartment buildings and industrial buildings. Isolated structural damage to wood or steel framing can occur. Complete failure of older metal buildings is possible, and older unreinforced masonry buildings can collapse. Numerous windows will be blown out of high-rise buildings resulting in falling glass, which will pose a threat for days to weeks after the storm. Most commercial signage, fences, and canopies will be destroyed. Many trees will be snapped or uprooted, blocking numerous roads. Electricity and water will be unavailable for several days to a few weeks after the storm passes.

Category 4 Hurricane - Winds 130 to 156 mph. Catastrophic damage will occur. There is a very high risk of injury or death to people, livestock, and pets due to flying and falling debris. Nearly all older (pre-1994) mobile homes will be destroyed. A high percentage of newer mobile homes also will be destroyed. Poorly constructed homes can sustain complete collapse of all walls as well as the loss of the roof structure. Well-built homes also can sustain severe damage with loss of most of the roof structure and/or some exterior walls. Extensive damage to roof coverings, windows, and doors will occur. Large amounts of windborne debris will be lofted into the air. Windborne debris damage will break most unprotected windows and penetrate some protected windows. There will be a high percentage of structural damage to the top floors of apartment buildings. Steel frames in older industrial buildings can collapse. There will be a high percentage of collapse to older unreinforced masonry buildings. Most windows will be blown out of high-rise buildings resulting in falling glass, which will pose a threat for days to weeks after the storm. Nearly all commercial signage, fences, and canopies will be destroyed. Most trees will be snapped or uprooted and power poles downed. Fallen trees and power poles will isolate residential areas. Power outages will last for weeks to possibly months. Long-term water shortages will increase human suffering. Most of the area will be uninhabitable for weeks or months.

Category 5 Hurricane - Winds 157 mph or higher. Catastrophic damage will occur. People, livestock, and pets are at very high risk of injury or death from flying or falling debris, even if indoors in mobile homes or framed homes. Almost complete destruction of all mobile homes will occur, regardless of age or construction. A high percentage of frame homes will be destroyed, with total roof failure and wall collapse. Extensive damage to roof covers, windows, and doors will occur. Large amounts of windborne debris will be lofted into the air. Windborne debris damage will occur to nearly all unprotected windows and many protected windows. Significant damage to wood roof commercial buildings will occur due to loss of roof sheathing. Complete collapse of many older metal buildings can occur. Most unreinforced masonry walls will fail which can lead to the collapse of the buildings. A high percentage of industrial buildings and low-rise apartment buildings will be destroyed. Nearly all windows will be blown out of high-rise buildings resulting in falling glass, which will pose a threat for days to weeks after the storm. Nearly all commercial signage, fences, and canopies will be destroyed. Nearly all trees will be snapped or uprooted and power poles downed. Fallen trees and power poles will isolate residential areas. Power outages will last for weeks to possibly months. Long-term water shortages will increase human suffering. Most of the area will be uninhabitable for weeks or months.

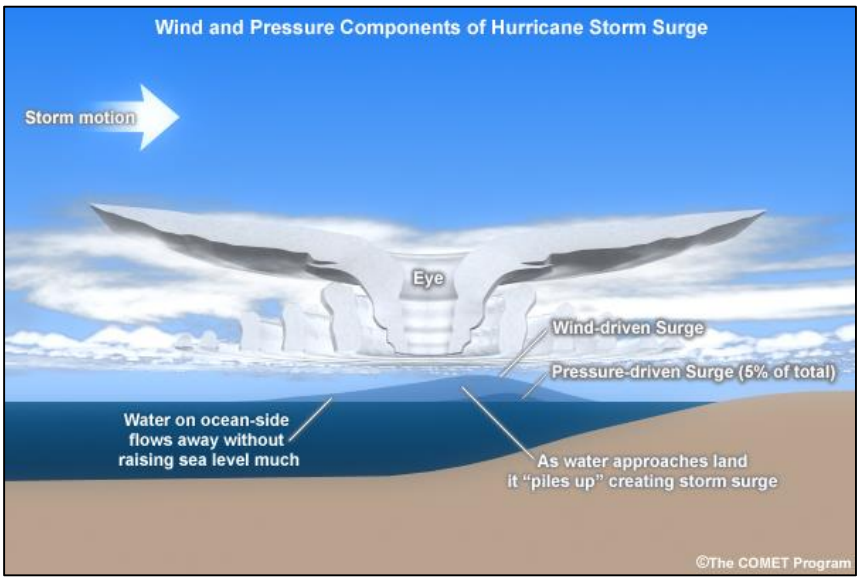
Hurricanes can cause catastrophic damage to coastlines and several hundred miles inland. Hurricanes can produce winds exceeding 157 miles per hour as well as tornadoes and mircrobursts. Additionally, hurricanes can create storm surges along the coast and cause extensive damage from heavy rainfall. Floods and flying debris from the excessive winds are often the deadly and destructive results of these weather events. Flash flooding can also occur due to intense rainfall.

Storm Surge

The greatest potential for loss of life related to a hurricane is from the storm surge. Storm surge is simply water that is pushed toward the shore by the force of the winds swirling around the storm as shown in Figure 4.15. This advancing surge combines with the normal tides to create the hurricane storm tide,

which can increase the mean water level to heights impacting roads, homes and other critical infrastructure. In addition, wind driven waves are superimposed on the storm tide. This rise in water level can cause severe flooding in coastal areas, particularly when the storm tide coincides with the normal high tides.

The maximum potential storm surge for a particular location depends on a number of different factors. Storm surge is a very complex phenomenon because it is sensitive to the slightest changes in storm intensity, forward speed, size (radius of maximum winds-RMW), angle of approach to the coast, central pressure (minimal contribution in comparison to the wind), and the shape and characteristics of coastal features such as bays and estuaries. Other factors which can impact storm surge are the width and slope of the continental shelf. A shallow slope will potentially produce a greater storm surge than a steep shelf.



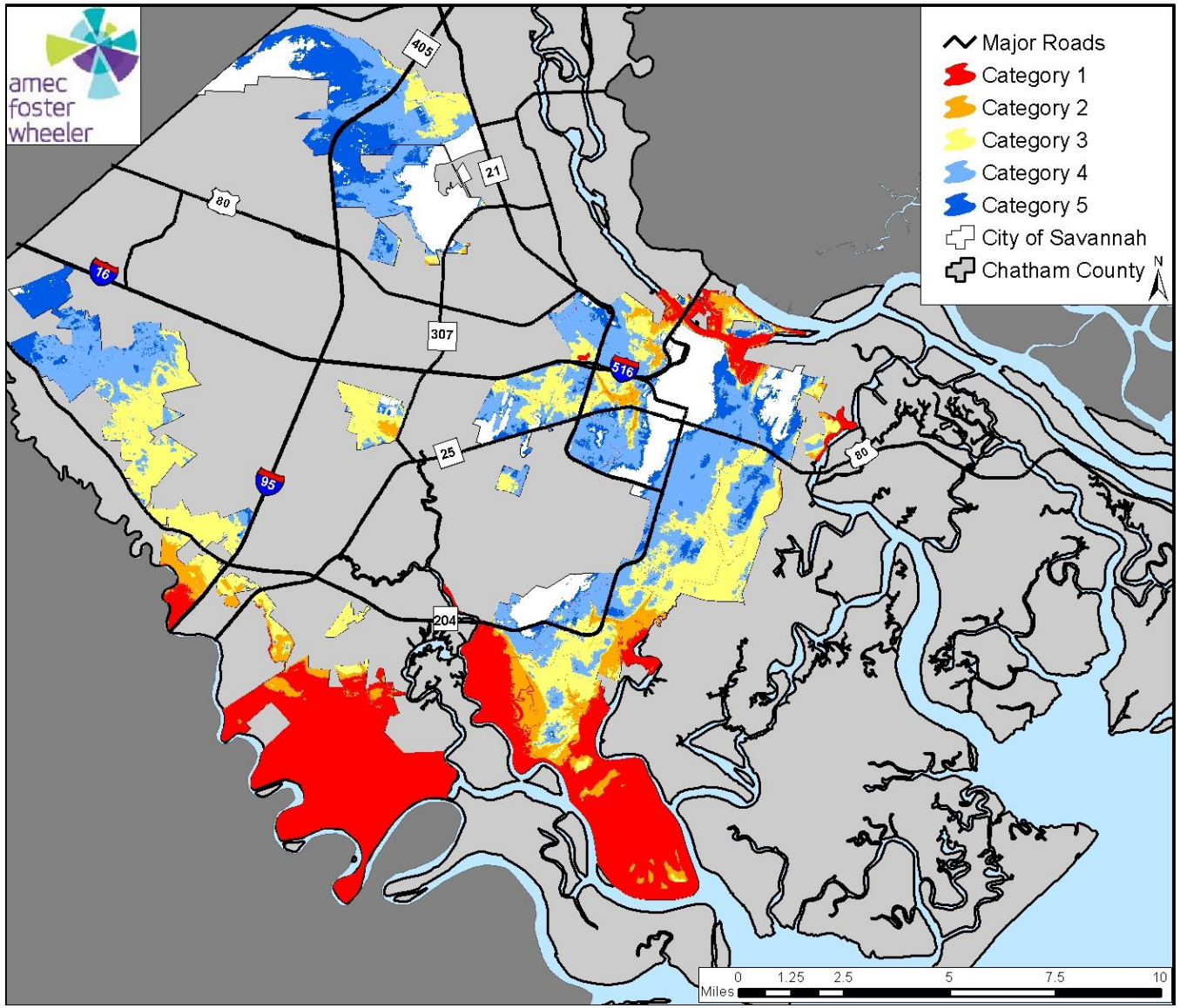
Source: NOAA/The COMET Program

Figure 4.15 - Components of Hurricane Storm Surge

Storm Surge Mapping

The Sea, Lake and Overland Surges from Hurricanes (SLOSH) model is a computerized numerical model developed by the National Weather Service (NWS) to estimate storm surge heights resulting from historical, hypothetical, or predicted hurricanes by taking into account the atmospheric pressure, size, forward speed, and track data. These parameters are used to create a model of the wind field which drives the storm surge. The SLOSH model consists of a set of physics equations which are applied to a specific locale's shoreline, incorporating the unique bay and river configurations, water depths, bridges, roads, levees and other physical features.

Anticipated SLOSH model surge elevations for Category 1-5 hurricanes are shown for the City of Savannah in Figure 4.16. The feature set depicting surge zones in this figure was created using data derived from National Hurricane Center SLOSH model runs on all the NOAA SLOSH basins throughout Georgia. The runs create outputs for all different storm simulations from all points of the compass. Each direction has a MEOW (maximum envelope of water) for each category of storm (1-5), and all directions combined result in a MOMs (maximum of maximums) set of data. The MOMs are used in this surge model.



Data Source: NOAA

Figure 4.16 - Storm Surge Zones for Savannah

Past Occurrences

Table 4.10 shows hurricane and tropical storm data reported by NCDC since 1950 for Chatham County. Major disaster declarations for hurricanes and tropical storms in Chatham County can be found in Table 4.2. Figures 4.17 and 4.18 reflect past hurricane strike data for land falling major hurricanes in Savannah, GA as provided by the National Hurricane Center and the Georgia Coastal Hazards Portal, respectively. The following is a description of select past occurrences of hurricanes and tropical storms for Savannah and Chatham County.

September 9 - September 25, 1989 (Hurricane Hugo)
Hurricane Hugo was a destructive Category 5 hurricane that killed 82 people, left 56,000 homeless and caused $16.3 billion in damages, making it the most destructive hurricane ever recorded up to that time. Hugo was originally forecast to move toward Savannah, but instead turned north toward Charleston, South Carolina. Savannah was evacuated in anticipation of Hugo but saw no effects other than isolated showers.

July 11 – July 12, 1996 (Hurricane Bertha)
Hurricane Watch for Bertha and later a Warning for the Georgia Coast caused about 20,000 people to evacuate, primarily Chatham County. Bertha was far enough offshore so that it did not cause any significant damage. Estimated loss revenue and down time for local plants and factories was $2,000,000.

September 15, 1999 (Hurricane Floyd)
Hurricane Floyd approached from the south, but turned more northeast on the afternoon of the 15th and just brushed southeast Georgia. Well over 200,000 citizens in the affected counties evacuated the area. Because Floyd turned to the northeast, damage was minimal and confined mostly to the coastal counties. Scattered trees and a few power lines were down. Highest winds over land were 40 mph with a gust to 53 mph at the Savannah Airport. Maximum tide at Savannah was 12.39 ASL (8.69 MLLW) with a maximum departure of 3.3 feet.

June 14, 2006 (Tropical Storm Alberto)
Tropical Storm Alberto formed off the western tip of Cuba and moved north into the northeast Gulf of Mexico June 12th. Alberto made landfall in the Florida Big Bend on the 13th and the moved north into Southern Georgia. Tropical storm force winds affected the Georgia coast the afternoon and evening on the 13th into the morning of the 14th. Winds were as strong as 40 mph in many locations mainly near the coast. Rainfall totaled 3 to 5 inches across portions of southeast Georgia mainly along the Interstate 95 corridor with isolated rain totals near 7 inches. Rain bands produced 2 tornadoes including a F1 tornado in Savannah. Storm effects to the coast were minimal.

May 27, 2012 (Tropical Storm Beryl)
Beryl developed as a Subtropical Storm over the Atlantic Ocean well east of the North Coastal Georgia area. The cyclone eventually became a Tropical Storm and slowly moved to the southwest and finally made landfall along the northeast Florida coast. The system then weakened to a Tropical Depression and meandered about before slowly moving back to the northeast across coastal portions of Georgia and South Carolina. The system produced tropical storm force winds, rip currents, and areas of heavy rainfall across the region.

Table 4.10 - NCDC Hurricane/Tropical Storm Data for Chatham County, 1950-2014

Location	Date	Event Type	Deaths/ Injuries	Property Damage	Crop Damage
Coastal Chatham	7/11/1996	Hurricane (typhoon)	0/0	$0.00	$0.00
Inland Chatham	7/11/1996	Hurricane (typhoon)	0/0	$0.00	$0.00
Inland Chatham	9/15/1999	Hurricane (typhoon)	0/0	$0.00	$0.00
Coastal Chatham	9/15/1999	Hurricane (typhoon)	0/0	$0.00	$0.00
Coastal Chatham	9/27/2004	Tropical Storm	0/0	$0.00	$0.00
Inland Chatham	9/27/2004	Tropical Storm	0/0	$0.00	$0.00
Inland Chatham	10/5/2005	Tropical Storm	0/0	$0.00	$0.00
Coastal Chatham	10/5/2005	Tropical Storm	0/0	$0.00	$0.00
Inland Chatham	6/12/2006	Tropical Storm	0/0	$0.00	$0.00
Coastal Chatham	6/12/2006	Tropical Storm	0/0	$0.00	$0.00
Inland Chatham	8/30/2006	Tropical Storm	0/0	$0.00	$0.00
Coastal Chatham	8/30/2006	Tropical Storm	0/0	$0.00	$0.00
Coastal Chatham	8/21/2008	Tropical Storm	0/0	$500.00	$0.00
Coastal Chatham	8/21/2008	Tropical Storm	0/0	$0.00	$0.00
Coastal Chatham	8/21/2008	Tropical Storm	0/0	$1,500.00	$0.00
Coastal Chatham	8/21/2008	Tropical Storm	0/0	$500.00	$0.00
Coastal Chatham	8/21/2008	Tropical Storm	0/0	$0.00	$0.00
Coastal Chatham	8/21/2008	Tropical Storm	0/0	$500.00	$0.00
Coastal Chatham	8/22/2008	Tropical Storm	0/0	$0.00	$0.00
Coastal Chatham	8/22/2008	Tropical Storm	0/0	$0.00	$0.00
Coastal Chatham	8/22/2008	Tropical Storm	0/0	$1,000.00	$0.00
Coastal Chatham	8/22/2008	Tropical Storm	0/0	$500.00	$0.00
Coastal Chatham	8/22/2008	Tropical Storm	0/0	$0.00	$0.00
Coastal Chatham	5/27/2012	Tropical Storm	0/0	$500.00	$0.00
Coastal Chatham	5/27/2012	Tropical Storm	0/0	$1,000.00	$0.00
Coastal Chatham	5/27/2012	Tropical Storm	0/0	$0.00	$0.00
Inland Chatham	5/27/2012	Tropical Storm	0/0	$500.00	$0.00
Coastal Chatham	5/27/2012	Tropical Storm	0/0	$500.00	$0.00
Coastal Chatham	5/27/2012	Tropical Storm	0/0	$0.00	$0.00
Coastal Chatham	5/27/2012	Tropical Storm	0/0	$0.00	$0.00
Coastal Chatham	5/27/2012	Tropical Storm	0/0	$0.00	$0.00
Inland Chatham	5/27/2012	Tropical Storm	0/0	$0.00	$0.00
Inland Chatham	5/27/2012	Tropical Storm	0/0	$0.00	$0.00
Inland Chatham	6/6/2013	Tropical Storm	0/0	$1,000.00	$0.00
Coastal Chatham	6/6/2013	Tropical Storm	0/0	$0.00	$0.00
Inland Chatham	6/6/2013	Tropical Storm	0/0	$1,000.00	$0.00
Inland Chatham	6/6/2013	Tropical Storm	0/0	$4,500.00	$0.00
Coastal Chatham	6/7/2013	Tropical Storm	0/0	$0.00	$0.00
Coastal Chatham	6/7/2013	Tropical Storm	0/0	$0.00	$0.00
Inland Chatham	6/7/2013	Tropical Storm	0/0	$1,000.00	$0.00
			Total:	**$14,500.00**	**$0.00**

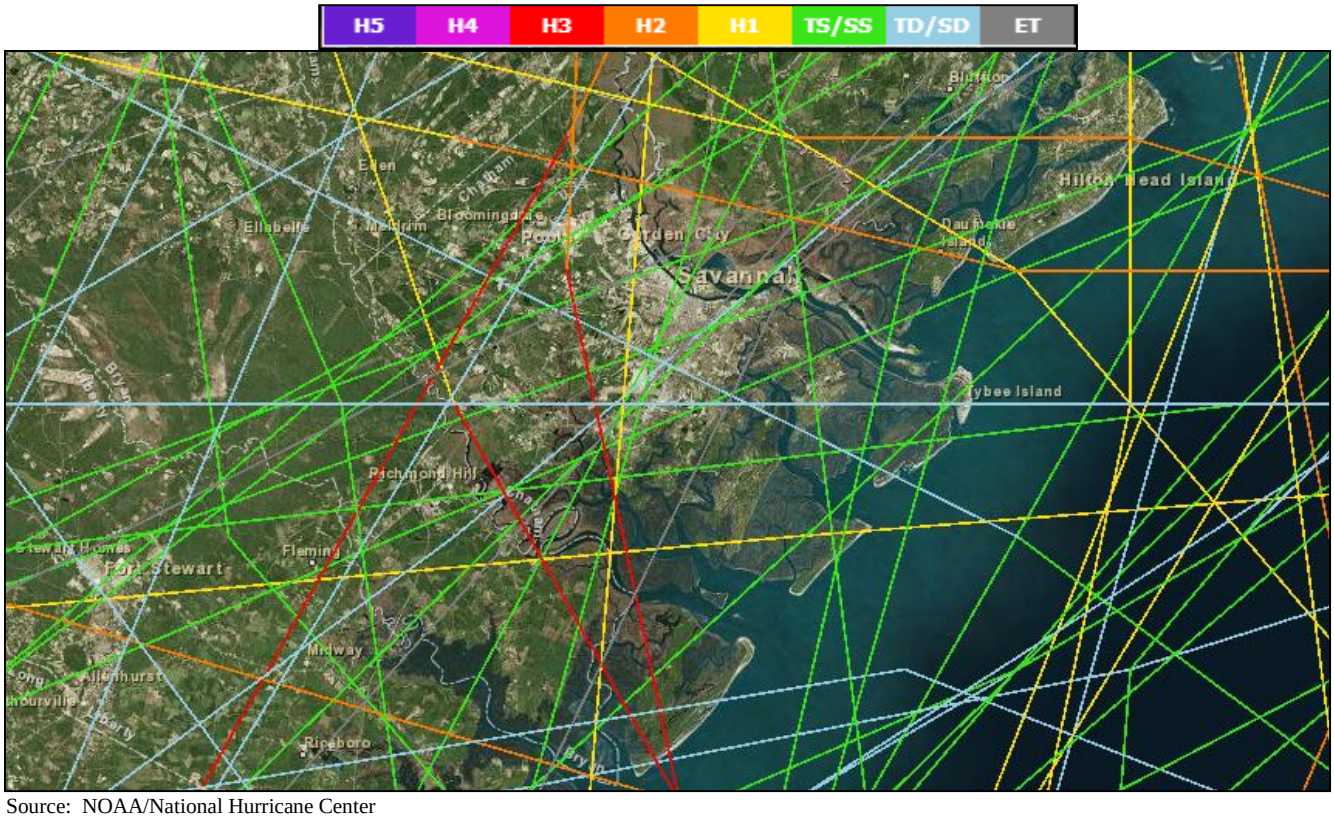
Source: NCDC, October 2014

Table 4.11 shows SHELDUS events related to hurricanes and tropical storms from 1960 through present.

Table 4.11- SHELDUS Hurricane/Tropical Storm Data for Chatham County - 1960 to October 2014

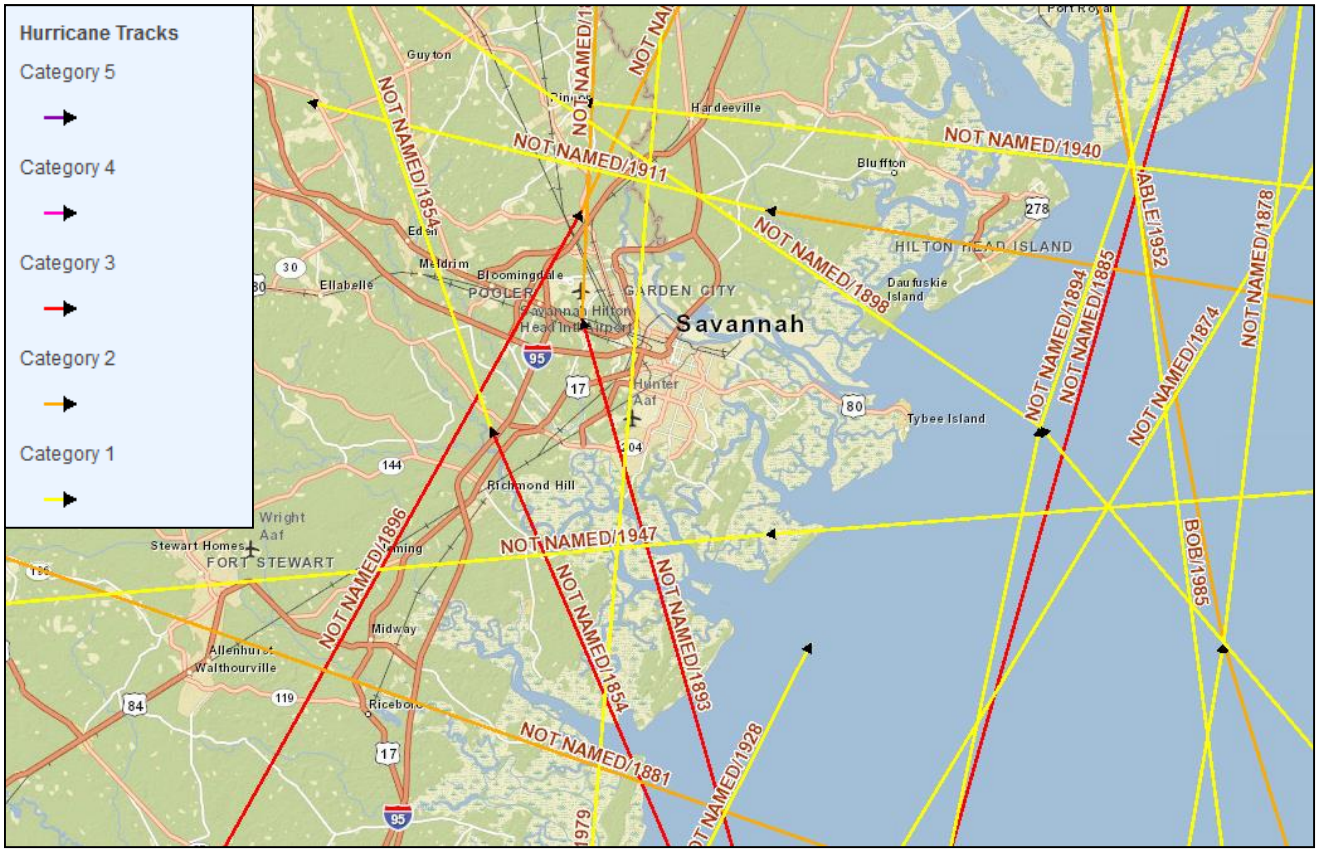
Date		Hazard Type	Injuries/ Fatalities	Crop Damage	Property Damage
Month	Year				
September	1960	Hurricane/Tropical Storm	0/0	$0.00	$3,027.02
October	1963	Hurricane/Tropical Storm	0/0	$0.00	$38,064.87
August	1964	Hurricane/Tropical Storm	0/0	$853.98	$8,539.45
September	1964	Hurricane/Tropical Storm	0/0	$11,051.10	$1,105,109.09
June	1966	Hurricane/Tropical Storm	0/0	$10,573.59	$10,573.59
June	1968	Hurricane/Tropical Storm	0/0	$0.00	$984.44
May	1972	Hurricane/Tropical Storm	0/0	$0.00	$46,442.76
June	1972	Hurricane/Tropical Storm	0/0	$1,752.53	$0.00
September	1979	Hurricane/Tropical Storm	0/0	$0.00	$2,673,978.41
August	2008	Hurricane/Tropical Storm	0/0	$0.00	$1,622.99
May	2012	Hurricane/Tropical Storm	0/0	$0.00	$3,001.65
June	2013	Hurricane/Tropical Storm	0/0	$0.00	$4,999.98
			Total:	**$24,231.20**	**$3,896,344.25**

Source: SHELDUS v13.1, October 2014



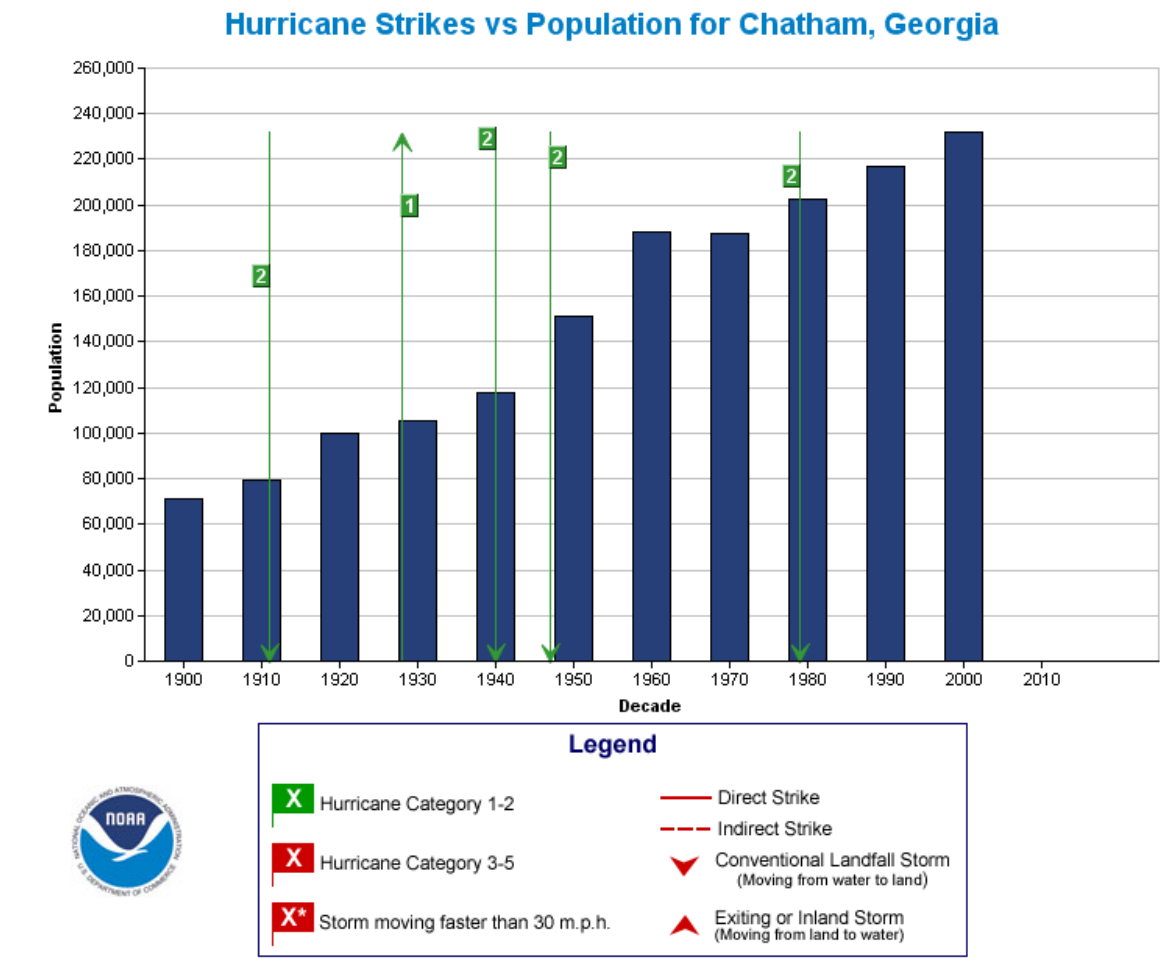
Source: NOAA/National Hurricane Center

Figure 4.17 – NOAA Historical Hurricane Tracks, City of Savannah



Source: Georgia Coastal Hazards Portal

Figure 4.18 - Hurricane Tracks, City of Savannah



Hurricane Strike Data: National Hurricane Center
Population Data: U.S. Census Bureau
NOTE:Population values may be missing in some counties, particularly for earlier periods. This is most often attributable to the fact that the county had not yet been established.
NOTE:There may be discrepancies between the strike data shown in this chart and the HURDAT strike data used in the Historical Hurricanes Tracks Tool. The National Hurricane Center is currently updating the strike data used for these charts. For more information visit http://www.aoml.noaa.gov/hrd/data_sub/re_anal.html
NOTE:Population data is current as of 2000 U.S. Census. X-axis on graphs depict years through 2010 to illustrate storms that have occurred from 2000-2006.

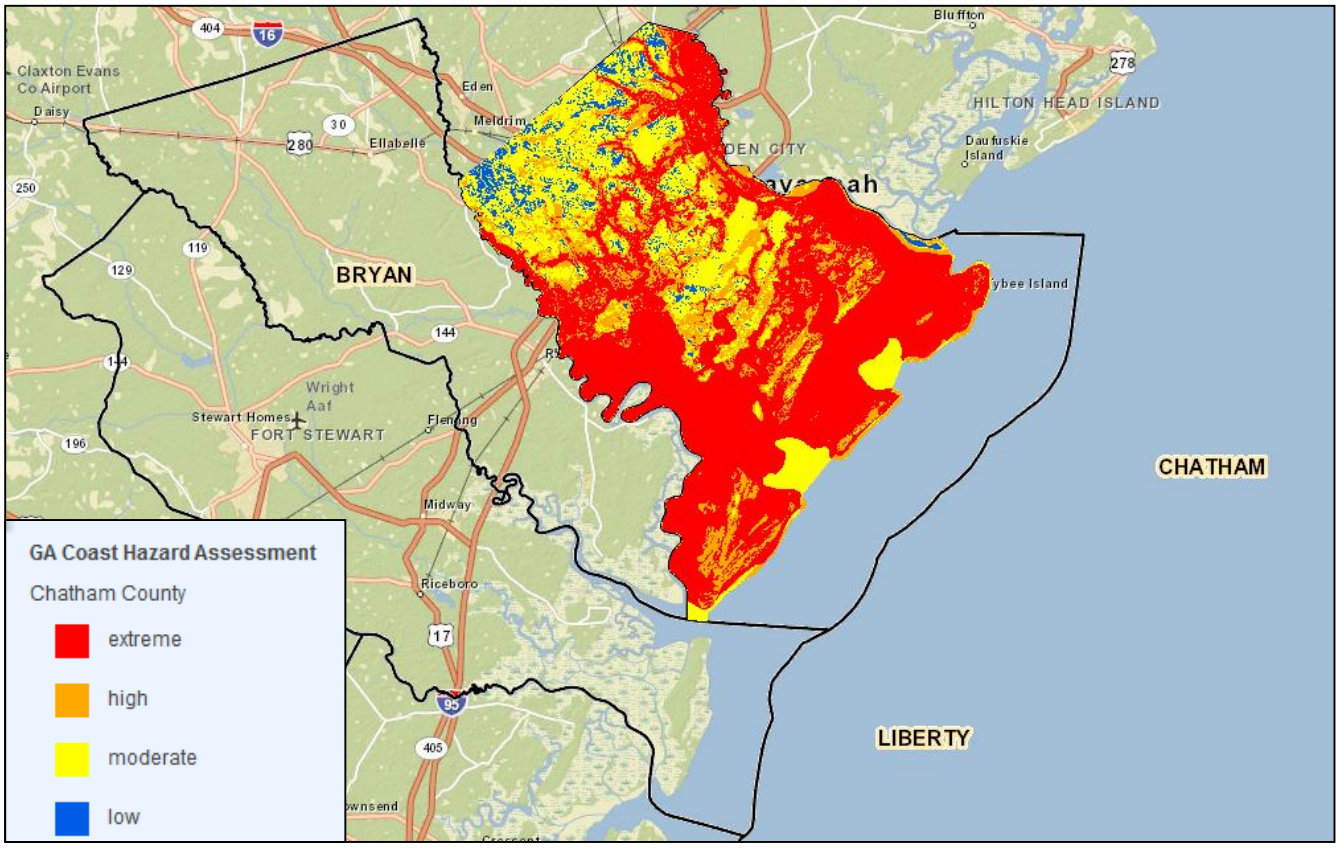
Figure 4.19- Hurricane Strikes vs. Population for Chatham County

Frequency/Likelihood of Future Occurrence

Hurricane and Tropical Storm

Occasional – Given the 40 hurricane and tropical storm occurrences recorded by the NCDC over a period of 17 years (1996 - 2013), 2.4 hurricanes or tropical storm events affect Chatham County on average each year.

GIS was used in Figure 4.20 to produce zones of relative risk of coastal storm damage for the Georgia coast. This coastal risk mapping dataset considers geography, geological processes and storm characteristics. As shown in the figure below, the Savannah planning areas includes extreme, high and moderate risk areas.



Source: Georgia Coastal Hazards Portal

Figure 4.20 – Georgia Coast Hazard Assessment, Chatham County

Coastal Storm Surge

Occasional – There are currently zero records of storm surge in the NCDC database for Chatham County. However, the City is located in an area that is vulnerable to tidal flooding and storm surge inundation from the Savannah River.

Climate Change and Hurricane and Tropical Storms

One of the primary factors contributing to the origin and growth of tropical storm and hurricanes systems is water temperature. Sea surface temperature may increase significantly in the main hurricane development region of the North Atlantic during the next century as well as in the Gulf of Mexico.

Sea level change will be particularly important in influencing storm surge flooding in the Chatham County area, since the area is already subject to flooding from rainfall events from hurricanes and less powerful tropical storms. Anticipated sea level rise along the Georgia coast will increase the risk of damage and losses due to future coastal flooding and storm surge events. Rising sea level over time will shorten the return period (increasing the frequency) of significant flood events. For example, sea level rise of 1 foot over a typical project analysis period (50 years) may cause a flood event currently of annual probability 2 percent (50-year flood) to become an event of 10 percent annual probability (10-year flood).

4.2.7 Assessment of Areas Likely to Flood

The following targeted areas are identified by the FMPC as areas likely to flood in the future. Some of these areas are already experiencing flooding but others are not. For example, changes in floodplain development, the watershed, population in combination with climate change and sea level rise will make these targeted areas more likely to flood in the future.

Identified Area #1: 100-year SFHAs

According to the July 7, 2014 Flood Insurance Study prepared by FEMA, approximately half of the parcel acreage within the City is located within a Special Flood Hazard Area (SFHA). Changes in floodplain development and development within the watershed in general due to future population growth is likely to increase the size of the SFHAs due to an increase in impervious area.

Identified Area #2: Areas of Localized Stormwater Flooding

Due to the level topography, poorly drained soils, a consistent level of annual precipitation and the tidal influence on canal drainage resulting from heavy rainstorms, tropical storms, and hurricanes, it is highly likely that unmitigated properties will continue to experience localized flooding. An increase in imperious area due to future development will only exacerbate the localizing flooding issues unless measures are taken to reduce the volume of runoff. Furthermore, the intensity of individual rainfall events is likely to increase in the future due to climate change which may further overwhelm stormwater drainage systems.

Identified Area #3: Repetitive Loss Areas

Properties categorized as repetitive loss properties have a greater need for flood protection. Repetitive loss can be attributed to development within the 100-year floodplain as well as localized stormwater flooding. As mentioned above, both types of flooding are likely to increase in the future due to development in the floodplain/watershed as well as due to the effects of climate change and sea level rise. Therefore, is it very likely that unmitigated repetitive loss properties will continue to flood in the future.

Identified Area #4: Zone X (Unshaded)

There are 55,201 improved parcels within Savannah that are located in Zone X (Unshaded) with a total value of $170,625,939,134. As shown in the repetitive loss figure in Section 4.3.4, flooding is not limited to the 100-year flood zones. As mentioned above, changes in floodplain development and development within the watershed in general are likely to increase the size of the SFHAs due to an increase in impervious area. Therefore, the Zone X area is likely subject to future flood risk.

4.2.8 Flood Hazards Profile Summary

Table 4.12 summarizes the results of the hazard profile for the City of Savannah based on hazard identification data and input from the FMPC. For each hazard profiled within Section 4.2, this table includes the likelihood of future occurrence and whether or not the hazard is considered a priority for the City.

Table 4.12 Summary of Flood Hazard Profile Results

Hazard	Likelihood of Future Occurrence	Priority Hazard
Climate Change and Sea Level Rise	Likely	Yes
Coastal/Canal Bank Erosion	Highly Likely	Yes
Dam/Levee Failure	Unlikely	No
Flood: 100-/500-year	Occasional	Yes
Flood: Stormwater/Localized Flooding	Highly Likely	Yes
Hurricane and Tropical Storms (including Storm Surge)	Occasional	Yes

4.3 Vulnerability Assessment

Requirement §201.6(c)(2)(ii): [The risk assessment shall include a] description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the community. Plans approved after October 1, 2008 must also address NFIP insured structures that have been repetitively damaged by floods. The plan should describe vulnerability in terms of:

A) The types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard areas;

(B): An estimate of the potential dollar losses to vulnerable structures identified in paragraph (c)(2)(ii)(A) of this section and a description of the methodology used to prepare the estimate; and

(C): Providing a general description of land uses and development trends within the community so that mitigation options can be considered in future land use decisions.

The FMPC conducted a vulnerability assessment of the hazards identified as a priority in order to assess the impact that each hazard would have on the City. The vulnerability assessment quantifies, to the extent feasible using best available data, assets at risk to natural hazards and estimates potential losses. Vulnerability assessments followed the methodology described in the FEMA publication *Understanding Your Risks—Identifying Hazards and Estimating Losses*. The vulnerability assessment first describes the total vulnerability and values at risk and then discusses vulnerability by hazard.

Savannah's GIS-based flood risk assessment was completed using the best data made available at the time of the analysis. Digital data was collected from local, regional and national sources that included the Savannah Area Geographic Information System (SAGIS), Chatham County Emergency Management Agency (CEMA), Chatham County GIS, Federal Emergency Management Agency (FEMA) and National Oceanic and Atmospheric Administration (NOAA). This analysis took advantage of the new Chatham County Digital Flood Insurance Rate Map (DFIRM) as revised by FEMA in 2014.

Properties at Risk

Savannah's 2014 parcel and building footprint layers were used as the basis for the inventory of developed parcels. Table 4.13 shows the building count, improved value, content value and total value for all buildings located within a SFHA.

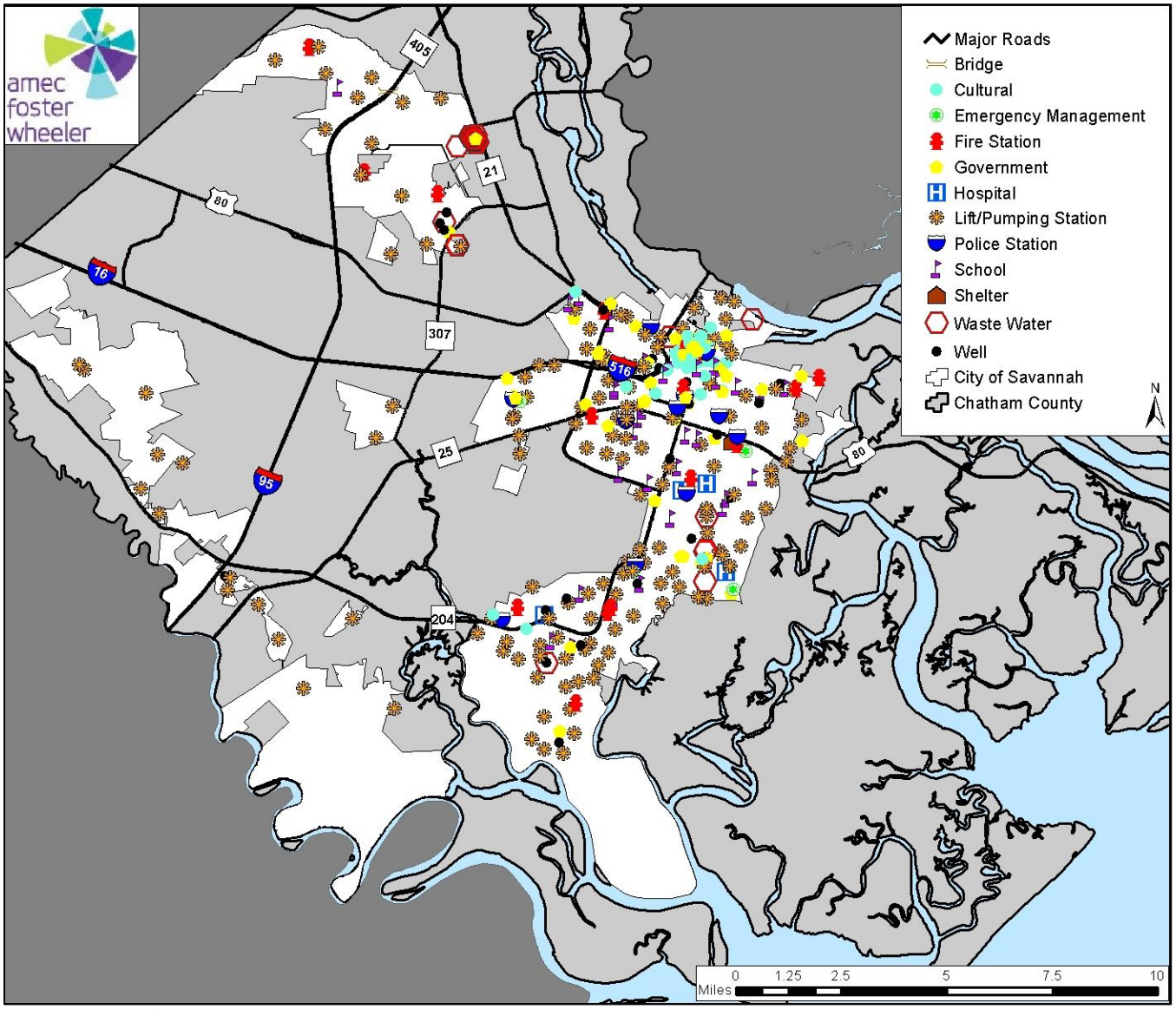
Table 4.13 – City of Savannah Properties at Risk by Occupancy Type

Occupancy Type	Total Number of Buildings	Total Building Value	Estimated Content Value	Total Value
Zone VE				
Commercial	4	$12,366,200	$12,366,200	$24,732,400
Education	0	$0	$0	$0
Government	0	$0	$0	$0
Industrial	0	$0	$0	$0
Religious	0	$0	$0	$0
Residential	125	$15,513,580	$7,756,790	$23,270,370
Total	**129**	**$27,879,780**	**$20,122,990**	**$48,002,770**
Zone AE				
Commercial	303	$865,957,819	$867,010,869	$1,732,968,688
Education	8	$13,075,540	$13,075,540	$26,151,080
Government	154	$1,030,676,330	$1,030,790,335	$2,061,466,665

Occupancy Type	Total Number of Buildings	Total Building Value	Estimated Content Value	Total Value
Industrial	140	$92,729,200	$139,093,800	$231,823,000
Religious	30	$8,342,760	$8,342,760	$16,685,520
Residential	6,363	$12,779,068,354	$6,389,534,177	$19,168,602,531
Total	**6,998**	**$14,789,850,003**	**$8,447,847,481**	**$23,237,697,484**
Zone AH				
Commercial	0	$0	$0	$0
Education	0	$0	$0	$0
Government	0	$0	$0	$0
Industrial	0	$0	$0	$0
Religious	0	$0	$0	$0
Residential	1	$120,000	$60,000	$180,000
Total	**1**	**$120,000**	**$60,000**	**$180,000**
Zone A				
Commercial	50	$20,983,539	$22,016,239	$42,999,778
Education	0	$0	$0	$0
Government	1	$449,290,500	$449,290,500	$898,581,000
Industrial	10	$93,674,300	$140,511,450	$234,185,750
Religious	0	$0	$0	$0
Residential	92	$10,284,930	$5,142,465	$15,427,395
Total	**153**	**$574,233,269**	**$616,960,654**	**$1,191,193,923**
Zone X (500-yr)				
Commercial	190	$427,540,673	$427,810,673	$855,351,346
Education	5	$6,691,990	$6,691,990	$13,383,980
Government	3	$3,077,040	$3,077,040	$6,154,080
Industrial	60	$138,365,834	$207,548,751	$345,914,585
Religious	21	$9,466,900	$9,466,900	$18,933,800
Residential	3,760	$7,182,364,499	$3,591,182,249	$10,773,546,748
Total	**4,039**	**$7,767,506,936**	**$4,245,777,603**	**$12,013,284,539**
Zone X (unshaded)				
Commercial	4,806	$16,907,886,888	$17,098,953,458	$34,006,840,346
Education	496	$4,980,940,123	$4,980,940,123	$9,961,880,246
Government	183	$12,987,173,700	$12,987,842,525	$25,975,016,225
Industrial	369	$578,405,599	$857,218,798	$1,435,624,397
Religious	449	$262,887,124	$262,887,124	$525,774,248
Residential	48,898	$65,813,869,114	$32,906,934,557	$98,720,803,671
Total	**55,201**	**$101,531,162,548**	**$69,094,776,585**	**$170,625,939,133**

Critical Facility Inventory

Of significant concern with respect to any disaster event is the location of critical facilities in the planning area. Critical facilities are often defined as those essential services and facilities in a major emergency which, if damaged, would result in severe consequences to public health and safety or a facility which, if unusable or unreachable because of a major emergency, would seriously and adversely affect the health, safety, and welfare of the public. Critical facilities within the City are shown in Figure 4.21.



Data Source: City of Savannah, 2014

Figure 4.21 - Critical Facilities in Savannah

4.3.1 Vulnerability of the City of Savannah to Specific Hazards

The Disaster Mitigation Act regulations require that the FMPC evaluate the risks associated with each of the hazards identified in the planning process. This section summarizes the possible impacts and quantifies the City's vulnerability to each of the hazards identified as a priority hazard in Table 4.12 in Section 4.2.8 Flood Hazards Profile Summary. The hazards evaluated as part of this vulnerability assessment include:

- Climate Change and Sea Level Rise
- Coastal/Canal Bank Erosion
- Flood: 100-/500-year
- Flood: Stormwater/Localized Flooding
- Hurricane and Tropical Storms (including storm surge)

Vulnerability is measured in general, qualitative terms and is a summary of the potential impact based on past occurrences, spatial extent, and damage and casualty potential. It is categorized into the following classifications:

- **Extremely Low -** The occurrence and potential cost of damage to life and property is very minimal to nonexistent.
- **Low -** Minimal potential impact. The occurrence and potential cost of damage to life and property is minimal.
- **Medium -** Moderate potential impact. This ranking carries a moderate threat level to the general population and/or built environment. Here the potential damage is more isolated and less costly than a more widespread disaster.
- **High -** Widespread potential impact. This ranking carries a high threat to the general population and/or built environment. The potential for damage is widespread. Hazards in this category may have occurred in the past.
- **Extremely High -** Very widespread with catastrophic impact.

Vulnerability can be quantified in those instances where there is a known, identified hazard area, such as a mapped floodplain. In these instances, the numbers and types of buildings subject to the identified hazard can be counted and their values tabulated. Other information can be collected in regard to the hazard area, such as the location of critical community facilities (e.g., a fire station), historic structures, and valued natural resources (e.g., an identified wetland or endangered species habitat). Together, this information conveys the impact, or vulnerability, of that area to that hazard.

4.3.2 Climate Change and Sea Level Rise Vulnerability Assessment

Likelihood of Future Occurrence—Likely
Vulnerability—Medium

The City of Savannah, due to its close proximity to the Atlantic Coast and the tidally influenced Savannah River, is vulnerable to the potential impacts of climate change and sea level rise. The climate change hazard profile in Section 4.2.1 discusses how climate-driven hazards such as hurricanes and flooding are likely to increase in frequency, and possibly intensity, in the future. Thus the 50-year flood of today may become the 10-year event in the future. The reader should refer to the vulnerability assessment discussions on Flood (Section 4.3.4), Erosion (Section 4.3.3), and Hurricane (Section 4.3.6) for the current exposure and risk to these hazards with the perspective that climate change has the potential to

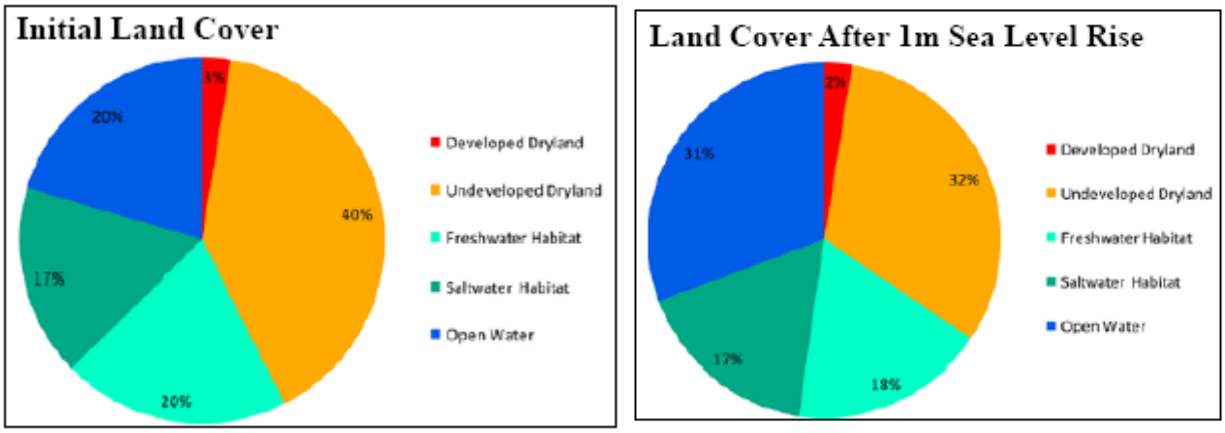
exacerbate the existing risk and vulnerabilities. This section will focus on an assessment of direct impacts from sea level rise, using best available data. The potential impacts of climate change and sea level rise include increased flooding frequency, potential damage to critical infrastructure, and increasing public costs associated with flood insurance claims, infrastructure repair and maintenance, environmental impacts and increased costs associated with emergency management efforts.

Sea Level Rise

Sea level rise may have the following impacts on property and infrastructure in the City of Savannah:

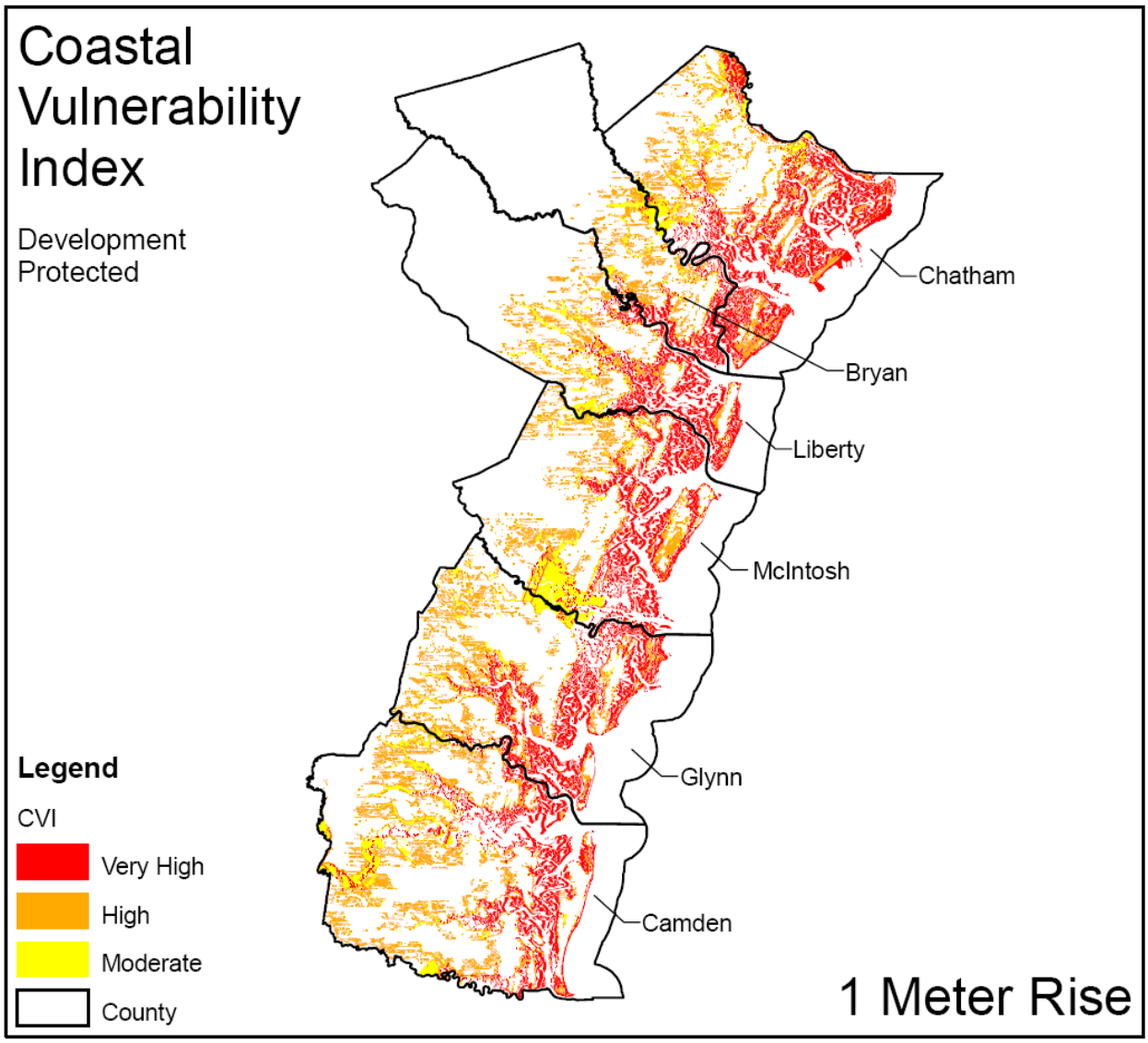
- Roads and bridges
- Utility infrastructure
- Erosion hazard zones
- Built environment including residential development
- Natural resources
- Recreational facilities and amenities such as parks
- Salt water intrusion into water supply
- Loss of property and property tax revenue due to inundation

As discussed in Section 4.2.1, scientists expect coastal Georgia to experience at least six inches of sea level rise within the next 50 years and one meter (3.3 feet) of sea level rise is projected by 2110. In 2008, the River Basin Center at the University of Georgia was awarded a three-year grant from NOAA to research the impacts of sea level rise on the Georgia coast. A computer model was created to forecast the results of a 1 meter rise in sea levels by 2100. The River Basin Center utilized the Sea Level Affecting Marshes Model (SLAMM), which simulates long-term sea level rise and summarizes its expected impacts in map and data formats. The study focused on the Georgia coast as a whole, defined by the six counties of Chatham, Bryan, Liberty, McIntosh, Glynn and Camden. Figure 4.22 shows relative vulnerability of coastal areas to one meter of sea level rise. The coastal vulnerability index (CVI) measures change in broad-level land cover as a result of predicted sea level rise.



Source: University of Georgia, River Basin Center

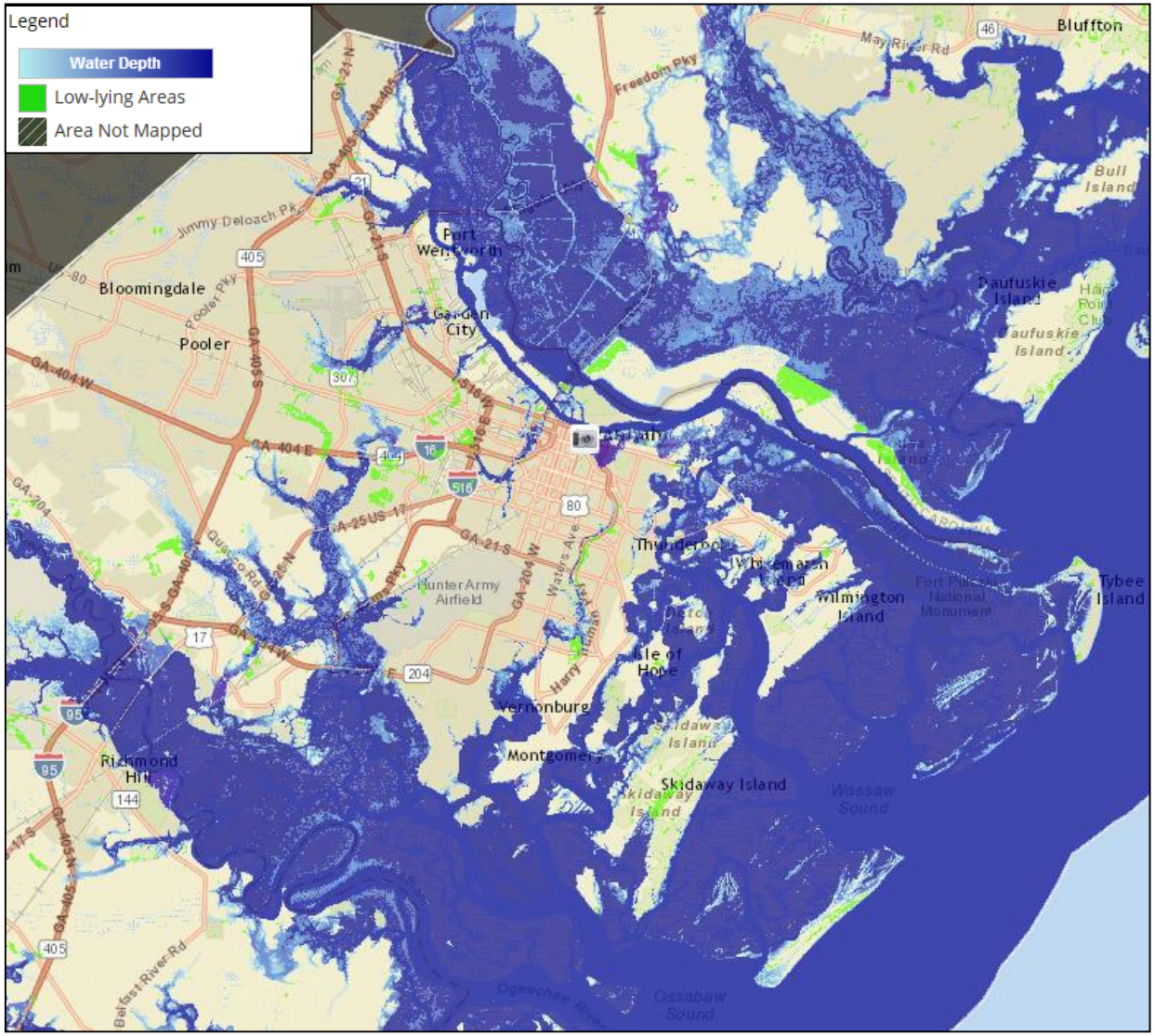
According to the River Basin Center, the amount of undeveloped dry land is predicted to decrease by 8% — a loss of 290 square miles of coastline. In contrast, the amount of open water stands to increase by approximately 11%, or 381 square miles. The amount of developed dry land is expected to decrease, affecting developments directly on the coastline as well as critical facilities that could include hospitals, schools, roads and causeways throughout coastal Georgia.



Source: University of Georgia, River Basin Center (http://www.rivercenter.uga.edu)

Figure 4.22 - Coastal Vulnerability Index

NOAA Coastal Services Center provides a sea level rise and coastal flooding impacts viewer in order to assess how sea level rise will impact coastal communities. Figure 4.23 reflects the impact of three feet of sea level rise on the City of Savannah using the coastal flooding impacts viewer provided by NOAA. The sea levels represent inundation at high tide, and areas that are hydrologically connected are shown in shades of blue (darker blue = greater depth). The low-lying areas, displayed in green, are hydrologically "unconnected" areas that may flood. The shaded area is unmapped. Table 4.14 provides an exposure analysis based on the elevation of land that structures are located on relative to local high tide. The results do not factor in structure elevation.



Source: http://www.csc.noaa.gov/digitalcoast/tools/slrviewer

Figure 4.23 – Impact of Three Feet of Sea Level Rise – Savannah, GA

Table 4.14 - Sea Level Rise and Coastal Flood Exposure in Savannah, GA

Elevation relative to local high tide line (Mean Higher High Water)

	Unit	< 1ft	< 2ft	< 3ft	< 4ft	< 5ft	< 6ft	< 7ft	< 8ft	< 9ft	< 10ft
BY TOTALS											
High social vulnerability population	Count	467	653	830	1112	1521	1997	2522	3262	4407	5950
Medium social vulnerability population	Count	321	552	940	1508	2291	3420	5004	6903	8996	11335
Low social vulnerability population	Count	406	625	912	1289	1738	2346	3052	3929	4946	6225
Property value	$Million	310	536	777	1046	1369	1714	2118	2579	3105	3653
Population	Count	1194	1830	2681	3910	5550	7764	10577	14094	18349	23509
Caucasian population	Count	654	987	1355	1787	2288	2896	3631	4474	5541	6991
Population of color	Count	567	883	1385	2207	3373	5013	7137	9864	13107	16881
African-American population	Count	481	760	1205	1958	3048	4589	6582	9154	12230	15808
Asian population	Count	47	69	94	126	162	210	270	337	421	532
Hispanic population	Count	94	129	184	248	319	412	536	679	826	998
Native American population	Count	13	19	29	42	56	74	99	134	173	213
Homes	Count	437	682	1022	1527	2199	3145	4355	5894	7779	10085
Hospitals	Count	0	0	0	1	1	1	1	1	1	1
Schools	Count	0	1	1	1	1	1	4	5	7	10
Libraries	Count	1	1	1	3	3	3	3	4	4	4
Museums	Count	1	1	1	1	1	1	1	1	1	1
Houses of worship	Count	0	1	3	3	4	7	9	17	20	32
Government buildings	Count	0	1	2	4	5	5	5	5	6	6
Roads	Miles	7	12	21	31	45	60	78	102	132	171
Federal roads	Miles	0	1	1	1	2	2	3	3	4	5
Local roads	Miles	7	12	20	30	43	57	74	97	126	164
Primary roads	Miles	0	0	0	0	0	0	0	0	0	1
Secondary roads	Miles	0	0	1	1	2	3	4	5	5	6
State roads	Miles	0	0	0	0	1	1	1	2	2	2
Railroads	Miles	1	1	2	3	4	4	5	5	6	7
Mainline rail	Miles	1	1	1	1	1	2	2	3	3	4
Non-mainline rail	Miles	0	0	1	2	2	2	2	3	3	3
Passenger stations	Count	3	3	3	3	3	3	4	4	4	4
Amtrak stations	Count	0	0	0	0	0	0	1	1	1	1
Ferry stations	Count	3	3	3	3	3	3	3	3	3	3

Rail stations	Count	0	0	0	0	0	0	1	1	1	1
Commuter or intercity rail stations	Count	0	0	0	0	0	0	1	1	1	1
Transit passenger stations	Count	3	3	3	3	3	3	3	3	3	3
EPA listed sites	Count	0	5	6	7	9	18	22	28	35	49
Biennial Reporters	Count	0	0	0	0	0	0	0	0	1	1
NPDES sites	Count	0	0	0	1	1	1	1	1	1	1
OIL sites	Count	0	0	0	0	0	0	1	1	1	1
RADINFO sites	Count	0	1	2	2	4	12	15	20	26	39
RMP sites	Count	0	0	0	0	0	0	0	1	1	1
TRI sites	Count	0	0	0	0	0	1	1	1	1	2
Hazardous materials facilities	Count	0	0	0	0	0	1	2	3	3	4
Extreme hazmat facilities	Count	0	0	0	0	0	0	0	1	1	1
Oil facilities	Count	0	0	0	0	0	0	1	1	1	1
Hazardous waste sites	Count	0	1	2	2	4	12	15	20	26	39
Major hazwaste source sites	Count	0	0	0	0	0	1	1	1	1	2
Minor hazwaste source sites	Count	0	0	0	0	0	3	4	5	6	9
Unspecified hazardous waste sites	Count	0	1	2	2	4	8	10	14	18	27
Landfills	Count	0	4	4	4	4	4	4	4	4	4
Wastewater sites	Count	0	0	0	1	1	1	1	1	1	1
Non-major wastewater sites	Count	0	0	0	1	1	1	1	1	1	1
Land	Acres	4580	5548	6588	7701	8899	10377	12291	14408	17093	19829
Protected land	Acres	420	514	617	725	818	920	1023	1182	1411	1600
Federal protected land	Acres	367	425	491	552	613	685	756	851	945	1053

Source: Climate Central 2014, Findings from Surging Seas (SurgingSeas.org)

4.3.3 Coastal/Canal Bank Erosion Vulnerability Assessment

Likelihood of Future Occurrence—Highly Likely
Vulnerability—Medium

Coastal Erosion
The severity of coastal erosion is typically measured through a quantitative assessment of annual shoreline change for a given beach cross-section profile (feet or meters per year) over a long period of time. Erosion rates vary as a function of shoreline type and are influenced primarily by episodic events, but can be used in land use and hazard management to define areas of critical concern. Coastal erosion is currently occurring in Chatham County as discussed in Section 4.2.2 and should be expected to continue to occur in the future. The planning area for the City of Savannah does not lie within the critical areas of coastal erosion concern.

Canal Bank Erosion
Savannah has experienced canal bank erosion in the past. Canal bank erosion is a natural process, but acceleration of this natural process leads to a disproportionate sediment supply, stream channel instability, land loss, habitat loss and other adverse effects. Canal bank erosion can be expected to occur in the future as a matter of course in all canal bank areas.

4.3.4 Flood: 100-/500-year Vulnerability Assessment

Likelihood of Future Occurrence—Occasional
Vulnerability—High

Flood damage is directly related to the depth of flooding by the application of a depth damage curve. In applying the curve, a specific depth of water translates to a specific percent damage to the structure, which translates to the same percentage of the structure's replacement value. SFHAs for the City of Savannah are shown in Figure 4.10.

Methodology

Building counts by FEMA flood zone were determined using a spatial intersection of the building footprints provided by the Savannah Area Geographic Information System and the effective FEMA flood zones provided in the Chatham County DFIRM Database effective 7/7/2014. In order to determine the correct occupancy class for each parcel, the land use codes provided in the Savannah parcel data were translated into FEMA Hazus specific occupancy classes (i.e. RES1, COM4, EDU2, etc.). These were translated to ensure the correct depth damage factor was applied to the parcel based on its occupancy class to ensure a more accurate damage assessment of the parcel.

Figure 4.24 depicts the depth of flooding that can be expected within the City during the 100-year flood event.

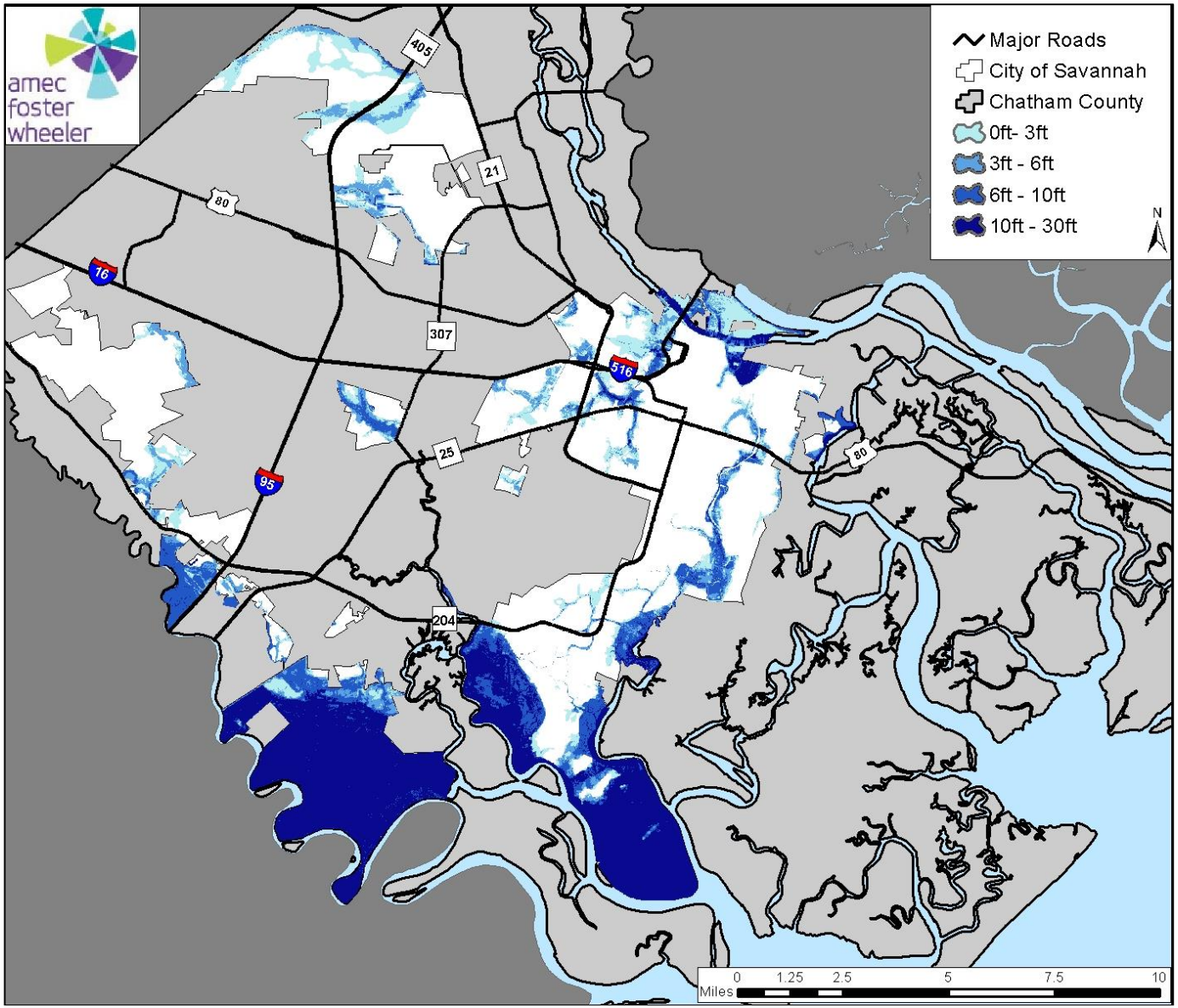


Figure 4.24 - 100-yr Flood Depths for Savannah

Table 4.15 provides the depth damage factors that were used in calculating flood losses for the City. These depth damage factors were developed based on the default depth damage curve used in Hazus. All depths assume the structure has no basement.

Table 4.15 - Savannah Flood Loss Damage Factors

	Percent Damaged (%)						
Depth (ft)	**Agricultural**	**Commercial**	**Education**	**Government**	**Industrial**	**Religious**	**Residential**
0	0	1	0	0	1	0	18
1	6	9	5	5	10	10	22
2	11	14	7	8	12	11	25
3	15	16	9	13	15	11	28
4	19	18	9	14	19	12	30
5	25	20	10	14	22	12	31
6	30	23	11	15	26	13	40
7	35	26	13	17	30	14	43
8	41	30	15	19	35	14	43
9	46	34	17	22	29	15	45
10	51	38	20	26	42	17	46
11	57	42	24	31	48	19	47
12	63	47	28	37	50	24	47
13	70	51	33	44	51	30	49
14	75	55	39	51	53	38	50
15	79	58	45	59	54	45	50
16	82	61	52	65	55	52	50
17	84	64	59	70	55	58	51
18	87	67	64	74	56	64	51
19	89	69	69	79	56	69	52
20	90	71	74	83	57	74	52
21	92	74	79	87	57	78	53
22	93	76	84	91	57	82	53
23	95	78	89	95	58	85	54
24	96	80	94	98	58	88	54

Source: Hazus 2.1

Content value estimations are based on FEMA Hazus methodologies of estimating value as a percent of improved structure values by property type. Table 4.16 shows the breakdown of the different property types in Savannah and their estimated content replacement value percentages.

Table 4.16 - Content Replacement Factors

Property Type	Content Replacement Values
Residential	50%
Commercial	100%
Education	100%
Government	100%
Religious	100%
Industrial	150%

Source: Hazus 2.1

Values at Risk

The loss estimate for flood is based on the total of improved building value and contents value. Land value is not included in any of the loss estimates as generally the land is not subject to loss from floods. It is important to note that information on those properties mitigated (e.g., floodproofed or elevated) in the SFHA was not available for analysis, thus the resulting flood damage loss estimates could be lower than actual figures. Once the potential value of affected parcels was calculated, damage factors were applied to obtain loss estimates by flood zone.

Table 4.17 shows the building count, total value, estimated damages and loss ratio for buildings that fall within the 100-year floodplain by flood zone and land use type. The loss ratio is the loss estimate divided by the total potential exposure (i.e., total of improved and contents value for all buildings located within the 100-year floodplain) and displayed as a percentage of loss. FEMA considers loss ratios greater than 10% to be significant and an indicator a community may have more difficulties recovering from a flood.

Table 4.17 – Estimated Building Damage and Content Loss

Occupancy Type	Total Number of Buildings	Total Value (Building & Contents)	Estimated Building Damage	Estimated Content Loss	Estimated Total Damage	Loss Ratio
Zone VE						
Commercial	4	$24,732,400	$2,534,452	$8,658,017	$11,192,468	45%
Education	0	$0	$0	$0	$0	0%
Government	0	$0	$0	$0	$0	0%
Industrial	0	$0	$0	$0	$0	0%
Religious	0	$0	$0	$0	$0	0%
Residential	125	$23,270,370	$5,561,427	$3,355,242	$8,916,668	38%
Total	**129**	**$48,002,770**	**$8,095,878**	**$12,013,258**	**$20,109,137**	**42%**
Zone AE						
Commercial	303	$1,732,968,688	$37,610,986	$108,243,997	$145,854,984	8%
Education	8	$26,151,080	$645,860	$3,653,874	$4,299,734	16%
Government	154	$2,061,466,665	$26,178,878	$162,709,707	$188,888,586	9%
Industrial	140	$231,823,000	$3,102,364	$7,635,008	$10,737,372	5%
Religious	30	$16,685,520	$87,782	$964,998	$1,052,780	6%
Residential	6,363	$19,168,602,531	$1,485,607,556	$927,096,902	$2,412,704,458	13%
Total	**6,998**	**$23,237,697,484**	**$1,553,233,428**	**$1,210,304,486**	**$2,763,537,914**	**12%**
Zone AH						
Commercial	0	$0	$0	$0	$0	0%
Education	0	$0	$0	$0	$0	0%
Government	0	$0	$0	$0	$0	0%
Industrial	0	$0	$0	$0	$0	0%
Religious	0	$0	$0	$0	$0	0%
Residential	1	$180,000	$24,326	$11,630	$35,956	20%
Total	**1**	**$180,000**	**$24,326**	**$11,630**	**$35,956**	**20%**
Zone A						
Commercial	50	$42,999,778	$0	$0	$0	0%
Education	0	$0	$0	$0	$0	0%
Government	1	$898,581,000	$0	$0	$0	0%
Industrial	10	$234,185,750	$0	$0	$0	0%
Religious	0	$0	$0	$0	$0	0%

Occupancy Type	Total Number of Buildings	Total Value (Building & Contents)	Estimated Building Damage	Estimated Content Loss	Estimated Total Damage	Loss Ratio
Residential	92	$15,427,395	$0	$0	$0	0%
Total	**153**	**$1,191,193,923**	**$0**	**$0**	**$0**	**0%**
Zone X (500-yr)						
Commercial	190	$855,351,346	$354,413	$738,743	$1,093,156	0%
Education	5	$13,383,980	$0	$0	$0	0%
Government	3	$6,154,080	$0	$0	$0	0%
Industrial	60	$345,914,585	$434,258	$627,366	$1,061,624	0%
Religious	21	$18,933,800	$0	$0	$0	0%
Residential	3,760	$10,773,546,749	$20,503,691	$11,786,634	$32,290,325	0%
Total	**4,039**	**$12,013,284,540**	**$21,292,362**	**$13,176,352**	**$34,468,714**	**0%**
Zone X (unshaded)						
Commercial	4,806	$34,006,840,346	$68,379	$183,508	$251,887	0%
Education	496	$9,961,880,246	$0	$0	$0	0%
Government	183	$25,975,016,225	$0	$0	$0	0%
Industrial	369	$1,435,624,398	$67	$252	$319	0%
Religious	449	$525,774,248	$116,611	$713,264	$829,875	0%
Residential	48,898	$98,720,803,671	$64,663,751	$36,893,163	$101,556,914	0%
Total	**55,201**	**$170,625,939,134**	**$64,848,807**	**$37,790,187**	**$102,638,995**	**0%**

Source: Savannah 2014 Tax Assessor's Data, FEMA 2014 DFIRM

Flooded acres

Also of interest is the land area affected by the various flood zones. The following is an analysis of flooded acres in the City in comparison to total area within the City limits.

Methodology

GIS was used to calculate acres flooded by FEMA flood zones. The City parcel layer and effective DFIRM were intersected and the flooded parcel area was calculated in acres. The flood zone was assigned to any given parcel based on the intersection of the parcel with a flood zone. Parcels can be located in multiple flood zones, and only the flooded acreage within the parcel was counted for each flood zone.

Limitations

One limitation to be made from this analysis is that the parcel layer does not include right-of-way areas. Due to this, there are voids of land that are not accounted for; therefore, this analysis only represents total parcel acres. Table 4.18 represents a detailed and summary analysis of total improved flooded acres by FEMA DFIRM flood zone for the City.

Table 4.18 - Total Parcel Acres to Improved Flooded Acres by Flood Zone

Flood Zone	Total Parcel Acres	Improved Flooded Acres
Zone AE	13,223.1	4,754.1
Zone VE	10,795.0	166.1
Zone AH	1.8	0.5
Zone A	1,441.3	854.0
6Zone X (500-yr)	2,612.1	927.4

Flood Zone	Total Parcel Acres	Improved Flooded Acres
Zone X (unshaded)	24,915.3	17,440.7
Total	**52,988.6**	**24,142.8**

Source: Savannah 2014 Tax Assessor's Data, FEMA 2014 DFIRM

Population at Risk

A separate analysis was performed to determine the population at risk to the individual FEMA flood zones. Using GIS, the DFIRM flood zones were intersected with the building footprint layer. Those residential buildings that intersected the flood zones were counted and multiplied by the 2010 Census Bureau household factor for the City of Savannah (2.53) as shown in Table 4.19.

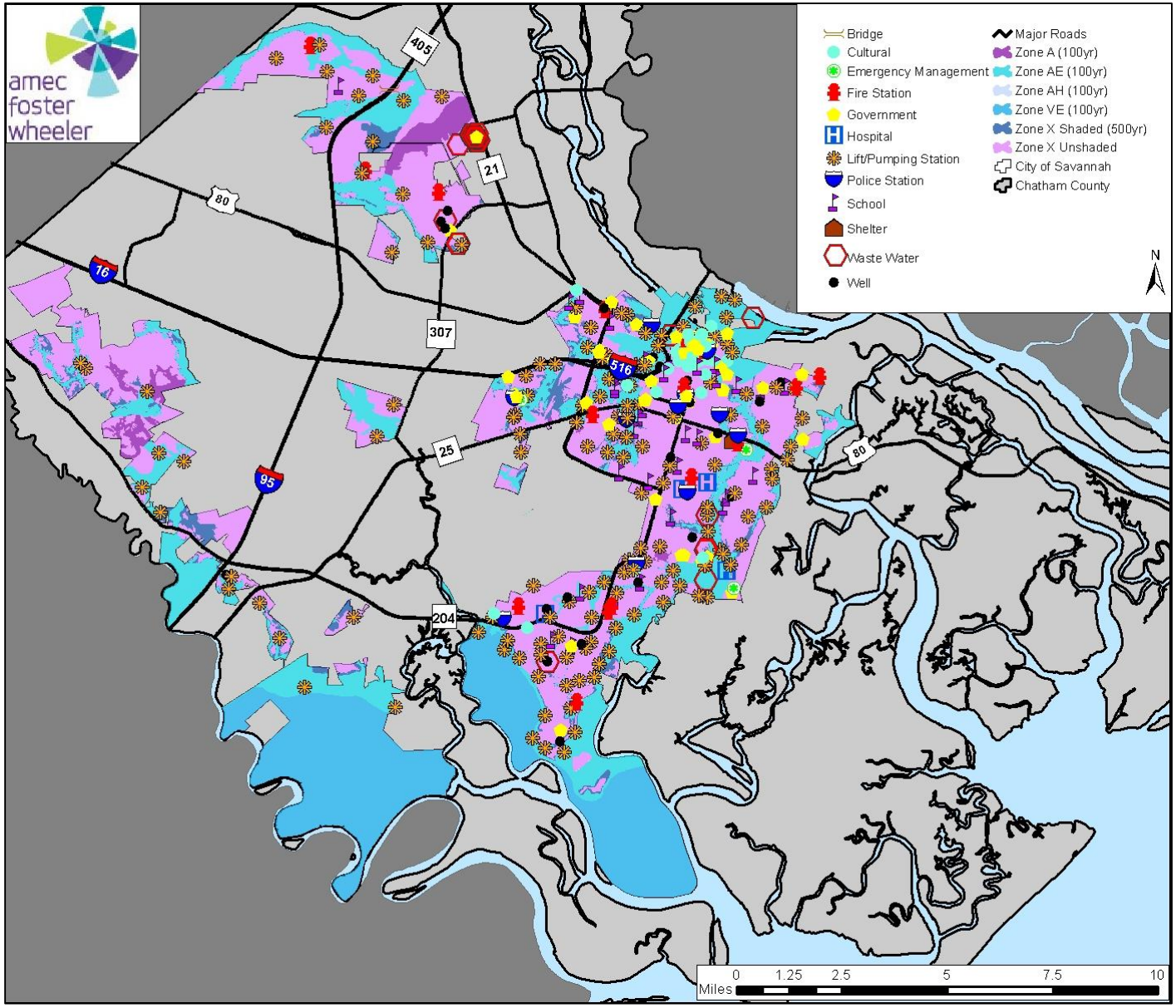
Table 4.19 - Savannah Population at Risk to Flood

Flood Zone	Residential Property Count	Population at Risk
Zone VE	125	316
Zone AE	6,363	16,098
Zone AH	1	3
Zone A	92	233
Zone X (500-yr)	3,760	9,513
Zone X (unshaded)	48,898	123,712
Total	**59,239**	**149,875**

Source: Savannah 2014 Tax Assessor's Data, FEMA 2014 DFIRM, U.S. Census Bureau (2010)

Critical Facilities at Risk

A separate analysis was performed to determine critical facilities located in the 100- and 500-year floodplains. Using GIS, the DFIRM flood zones were overlayed on the critical facility location data. Figure 4.25 shows critical facilities and DFIRM flood zones. Table 4.20 details critical facilities by facility type, flood zone, replacement value, and base flood elevation.



Source: City of Savannah, FEMA DFIRM 7/7/14

Figure 4.25 - Critical Facilities and FEMA Flood Zones

Table 4.20 - Critical Facilities by Flood Zone

Facility	Facility Type	Address/Coordinates	Estimated 100-yr Flood Depth (ft)
Zone VE			
Sav Lift Stations #099	WATER	Rio Road / 24 Rio Rd.	6.52
Zone AE			
Forest City Branch Library	CULTURAL	1501 Stiles Ave.	1.01
Hitch Branch Library	CULTURAL	840 Hitch Dr.	5.39
Old Water Plant	CULTURAL	City Lot	2.08
Savannah Exposition	CULTURAL	Visitors Center - MLK, Jr. and Louisville Road	-0.64
Administrative Offices	GOVERNMENT	City Lot / Gwinnett St. & Stiles Ave.	1.57
County Public Health	GOVERNMENT	1395 Eisenhower Dr.	-1.26
Maintenance Bldg	GOVERNMENT	Cemetery	5.66
Recreation Center - Tremont Park Neighborhood	GOVERNMENT	2010 Paige Ave. 31401	4.37
Traffic Engineering	GOVERNMENT	City Lot	1.56
USACE Facility & Dock	GOVERNMENT	Savannah Harbor Pkwy	3.89
Radio Tower	OTHER	1801 Kerry Street	0.22
Police Precinct #2 (Leased)	SAFETY	102 E Lathrop Ave	4.43
Southside Fire Dept Sta # 14	SAFETY	2526 East President Street	-5.08
Largo-Tibet Elementary	SCHOOL	430 Tibet Avenue	0.00
Woodville Tompkins HS (extension)	SCHOOL	402 Market St	1.88
Georgia Regional Hospital	VULNERABLE	1915 Eisenhower Dr.	3.38
County Lift Station	WATER	Ambuc Park	5.13
County Lift Station	WATER	Lake Meyer	1.24
Generator Bldg	WATER	Abercorn Street	5.43
Sav Lift Stations #002	WATER	Herbed /next to 2441 E. 40th St.	4.01
Sav Lift Stations #008	WATER	Magnolia Park / Derenne Ave. & Woodland Dr.	13.14
Sav Lift Stations #014	WATER	Paradise #2 /3 Sheridan Cr.	1.81
Sav Lift Stations #015	WATER	Wilshire #1 / 183 Wilshire Blvd.	4.29
Sav Lift Stations #016	WATER	Wilshire #2 / 11013 Largo Dr.	2.30
Sav Lift Stations #021	WATER	River Street / River St. & Lincoln St.	0.43
Sav Lift Stations #022	WATER	Hopkins Street / 1025 W. 41st St. & Hopkins St.	0.00
Sav Lift Stations #023	WATER	SCAD / Louisville Rd. & 121 W. Boundary St.	-7.92
Sav Lift Stations #026	WATER	Cloverdale #1 / Stiles Ave. @ 1806 Eleanor	4.01
Sav Lift Stations #028	WATER	Woodville / Division St. @ Canal St.	3.52
Sav Lift Stations #034	WATER	McAlpin / Wallin St. & 42nd St.	7.11
Sav Lift Stations #036	WATER	Colonial Oaks / Stillwood Dr. & 600 Plantation Dr.	0.76
Sav Lift Stations #042	WATER	Wheeler Street / 410 Wheeler St. & Waters Ave.	8.19
Sav Lift Stations #045	WATER	Tibet Avenue / Leeds Gate Rd. & 326 Tibet Ave.	2.44
Sav Lift Stations #046	WATER	Dan Vaden / Lewis Dr. & 9393 Abercorn	0.80
Sav Lift Stations #052	WATER	Tatumville Park / Park @ W. 64th St off Coleman St.	-1.39
Sav Lift Stations #054	WATER	Vassar / 1417 Vassar St.	1.45
Sav Lift Stations #060	WATER	Gulf Line / 6911 Skidaway Rd.	6.34

Facility	Facility Type	Address/Coordinates	Estimated 100-yr Flood Depth (ft)
Sav Lift Stations #062	WATER	35 & Cedar / 1227 E. 35th St. & Cedar St.	3.85
Sav Lift Stations #073	WATER	Damon Street / Damon St. & Carolan St.	3.57
Sav Lift Stations #074	WATER	Baker Street / Baker St. & 101 Fell St	1.92
Sav Lift Stations #075	WATER	Industry / Industry Dr. & E. 230 Lathrop	1.32
Sav Lift Stations #080	WATER	Bacon Park / Bacon Park Dr. & 1915 Eisenhower	4.14
Sav Lift Stations #082	WATER	Bacon Park CH / Shorty Cooper Rd. @ Club House	7.52
Sav Lift Stations #090	WATER	Marsh Cove / 11400 White Bluff Rd.	-1.11
Sav Lift Stations #091	WATER	Rose Dhu / 13814 Coffee Bluff Rd.	0.67
Sav Lift Stations #092	WATER	Holland Park / 31 Austin Dr. West of White Bluff	4.66
Sav Lift Stations #093	WATER	Downing Ave	1.99
Sav Lift Stations #096	WATER	Cypress Landing / 8000 Waters Ave.	4.23
Sav Lift Stations #097	WATER	Coffee Bluff Plantation#1 / 22 Sutton Rd.	-3.22
Sav Lift Stations #098	WATER	Coffee Bluff Plantation #2 / Cardiff Rd. @ Ramsgate Rd.	-3.94
Sav Lift Stations #100	WATER	Savannah Mall / 12001 Rio Rd. @ Savannah Mall	-0.68
Sav Lift Stations #101	WATER	Rose Dhu Woods / Coffee Woods Dr. @ Levee Rd.	1.86
Sav Lift Stations #113	WATER	Bells Landing / 12502 Apache Ave.	6.48
Sav Lift Stations #115	WATER	Chatham Parkway #2 / Chatham Pkwy. Behind Southern Oaks	4.45
Sav Lift Stations #123	WATER	Lynes / 1021 Lynes Ave. & Gwinnett Ave.	3.37
Sav Lift Stations #125	WATER	Savannah Festival / 11 Gateway Blvd. & Hwy. 204	3.71
Sav Lift Stations #128	WATER	Clinch Street / 4216 Clinch St.	3.80
Sav Lift Stations #137	WATER	Pritchard Street / 31 Pritchard St.	2.58
Sav Lift Stations #140	WATER	Ross Road / 79 Ross Rd.	0.14
Sav Lift Stations #141	WATER	Apache Avenue / 12300 Apache Ave.	3.74
Sav Lift Stations #143	WATER	Marriott / East Bay St. @ 100 General McIntosh Ave.	5.50
Sav Lift Stations #148	WATER	Airport #1 / 400 Airways Ave. I-95/Sav. Airport Dr.	0.47
Sav Lift Stations #152	WATER	Robin Road / Rendant Ave. @ 106 Robin Rd.	0.15
Sav Lift Stations #156	WATER	Rose Dhu on the Marsh / 46 Rose Hill Dr.	-0.30
Sav Lift Stations #158	WATER	Cross Roads Bus Ctr #2 / East of I-95 on SE Corner of Jimmy DeLoach & Crossroads	-0.16
Sav Lift Stations #163	WATER	Hutchinson Island #1 / 540-L Grand Prize of America Ave. @ 2 Resort	-0.72
Sav Lift Stations #164	WATER	Bradley Point / 128 Grayson Ave. @ Dunnoman Dr.	1.08
Sav Lift Stations #168	WATER	Vallambrosa Phase 1 / 931 Chevis Rd	0.69
Sav Lift Stations #169	WATER	Hutchinson Island #2 / The Reserve 118 Tidegate	0.79
Sav Lift Stations #170	WATER	Hutchinson Island #3 / The Reserve 818 Reserve Circle	1.16

Facility	Facility Type	Address/Coordinates	Estimated 100-yr Flood Depth (ft)
Sav Lift Stations #175	WATER	Village of Vallambrosa /	2.98
Sav Lift Stations #176	WATER	Grainger Tract	-0.61
Sav Lift Stations #187	WATER	Savannah River Landings	10.14
Sav Lift Stations #190	WATER	SEDA / 141 Hutchinson Island Rd	2.11
Sav Lift Stations #191	WATER	Fort Argyle Villages	0.35
Sav Lift Stations #193	WATER	S.W. Quadrant PH 2 Master	1.13
Sav Lift Stations #196	WATER	Habersham Plantation	-0.07
Sav Well #03	WATER	In City Yard Lot - Stiles Ave. @ Gwinnett St.	5.48
Sav Well #36	WATER	Gateway Blvd. & Hwy 204	2.25
Storm Water Pump Station	WATER	Vehicle Maintenance	1.96
Storm Water Pump Station	WATER	DeRenne Ave	9.01
Storm Water Pump Station	WATER	Montgomery Cross Rd	9.05
Storm Water Treatment	WATER	Canal Street	1.40
Water Booster Station	WATER	Abercorn Street	-6.56
Zone X (500-yr)			
Chatham County Botanical Garden	CULTURAL	1388 Eisenhower Dr.	0.00
Administrative Offices	GOVERNMENT	Cemetery - Bonaventure Road	0.00
Recreation Center - Richards Street	GOVERNMENT	1311 Richards St. 31401	0.00
Recreation Center - Hudson Hill Community	GOVERNMENT	Hudson Ave. &W. Lathrop Ave. 31401	0.00
Vehicle Maintenance Garage	GOVERNMENT	Eisenhower Drive & Sallie Mood Drive	0.00
Fire Station #07	SAFETY	6902 Sallie Mood Dr	0.00
Heard Elementary	SCHOOL	414 Lee Blvd.	0.00
Oglethorpe Acad. Middle	SCHOOL	707 Stiles Avenue	0.00
Sav Lift Stations #086	WATER	Packard / 1925 Packard Ave. @ Corvair Ave.	0.00
Sav Well #04	WATER	Gwinnett St. @West Boundary & I-16	0.00
Sav Well #31	WATER	400 Chatham Pkwy beside Sav. Gas Office	0.00
Sav Lift Stations #027	WATER	Cloverdale #2 / 1543 Cloverdale Dr.	0.00
Sav Lift Stations #114	WATER	Chatham Parkway #1 / 1668 Chatham Pkwy. @ Hwy. 17	0.00
Sav Lift Stations #147	WATER	Marshedge / 130 Marshedge Ln.	0.00
Sav Well #42	WATER	Agonic Rd./Eisenhower	0.00
Sav Lift Stations #155	WATER	Crossroads Business I / 100 Crossroads Pkwy. near 1 Knowlton	0.00
Sav Lift Stations #184	WATER	New City Lot #1 / Interchange Ct	0.00
Sav Lift Stations #185	WATER	New City Lot #2 / Interchange Ct.	0.00
Sav Lift Stations #173	WATER	Savannah Airport Perimeter Rd. /	0.00
Sav Lift Stations #057	WATER	White Bluff ./ Wellwood Dr. & 12802 White Bluff Rd.	0.00
Sav Lift Stations #178	WATER	Remington Park / 4307 Ogeechee Rd	0.00
Sav Lift Stations #182	WATER	Springs at Chatham Pkwy.	0.00
Sav Lift Stations #174	WATER	Teal Lake / 12 Teal Lke Rd	0.00
Sav Lift Stations #200	WATER	The Palms	0.00
Sav Lift Stations #010	WATER	Brookview / 6001 Betty Dr. & Asbury St.	0.00
Sav Lift Stations #065	WATER	Bacon Park / Agonic Rd. & Eisenhower Dr.	0.00

Source: Savannah 2014 Tax Assessor's Data, FEMA 2014 DFIRM

Historic Properties at Risk

There are ten National Register Historic Districts located in the City of Savannah, listed below in alphabetical order and illustrated graphically in Figure 4.26. Historic properties are defined, for the purposes of this study, as any historic district, site, building, structure or object included in, or eligible for inclusion in, the National Register of Historic Places maintained by the Secretary of the Interior.

Historic properties and cultural resources are of high community value in Savannah, in terms of (at least in part): national recognition (heritage); tourism and convention traffic (business, entertainment); restoration and habitation of residential properties (real estate); appropriate and beneficial business use (local economy); and other such factors.

- **Ardsley Park-Chatham Crescent National Register Historic District**
  This district is bounded by Victory Drive on the north to 55th Street on the south, and by Waters Avenue on the east to Bull Street on the west.

- **Central of Georgia Railroad: Savannah Shops and Terminal Facilities**
  This is an antebellum industrial district, established in the 1850s, and is the nation's oldest surviving and best remaining example of an integrated, comprehensive railroad facility of its period. This district is located at West Broad Street and Railroad Avenue.

- **Cuyler-Brownsville National Register Historic District**
  This district is roughly bounded by Anderson Lane, West 31st Street, Montgomery Street, Victory Drive, Ogeechee Road, and Hopkins Street.

- **Eastside National Register Historic District**
  This district has north and south boundaries of Gwinnett Street and Anderson Street and east and west boundaries of East Broad Street and Cedar Street.

- **Gordonston National Register Historic District**
  This district consists of various sizes and types of residential structures, ranging from brick mansions to small craftsmen style cottages. It is roughly bounded by Skidaway Road, Goebel Avenue, Gwinnett Street, and Pennsylvania Avenue.

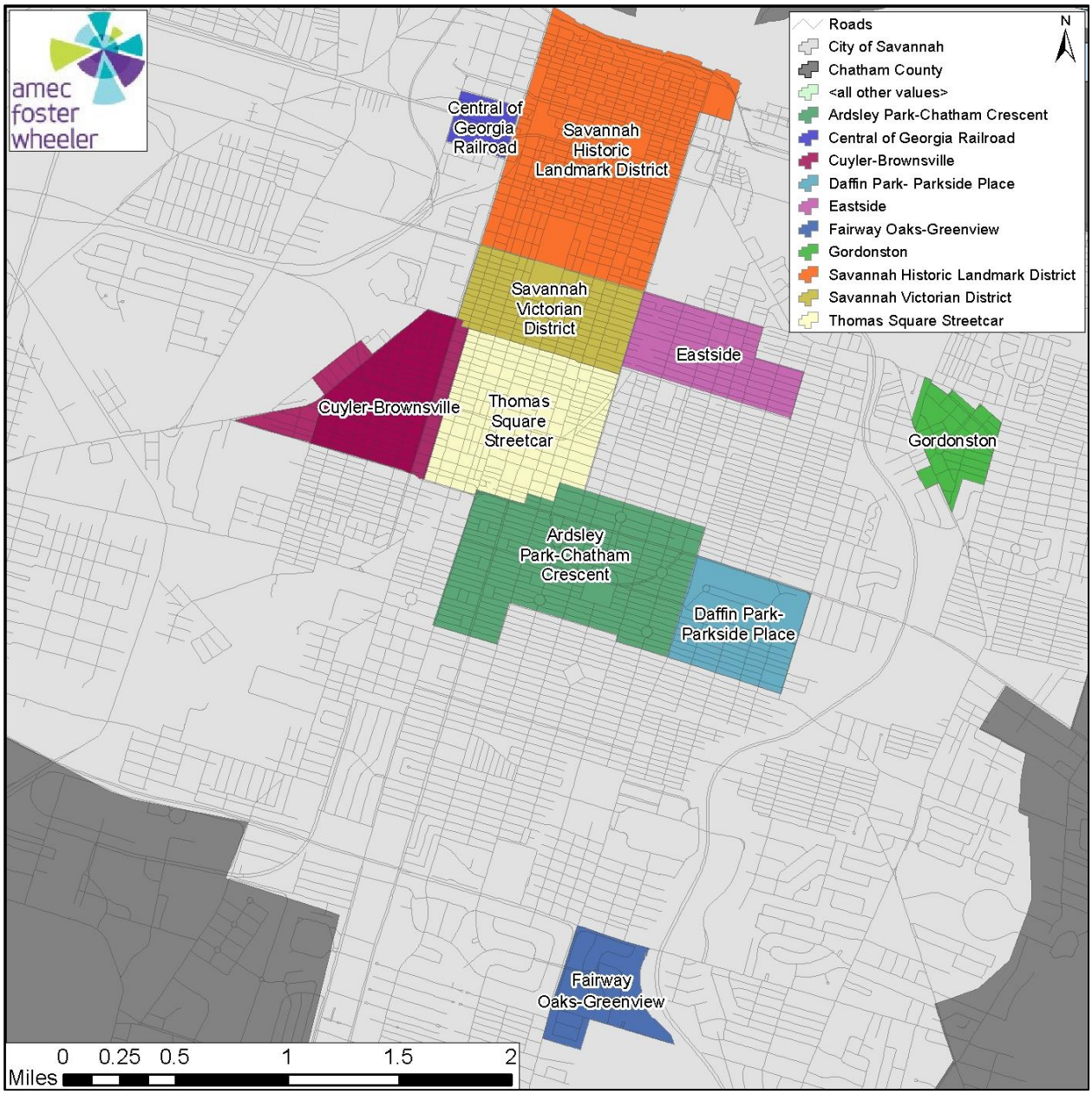
- **Daffin Park-Parkside Place National Register Historic District**
  This district is bounded by Victory Drive, Waters Avenue, Bee Street and 51st Street Lane.

- **Savannah Historic Landmark District**
  This district contains park-like squares surrounded by residential, commercial and institutional properties, many of them dating from the City's early years (c1733). It is bounded by East Broad Street on the east, Gwinnett Street on the south, West Broad Street on the west, and the Savannah River on the north.

- **Savannah Victorian District**
  This district consists of wood frame houses dating from the 1870s and 1880s that are a mixture of several Victorian styles of architecture. The boundaries of the Savannah Victorian Historic District are Gwinnett Street on the north, Anderson Lane on the south, Martin Luther King, Jr. Boulevard on the west, and East Broad Street.

- **Thomas Square Streetcar National Register Historic District**
  This district contains primarily historic residential, commercial and community buildings and is one of the largest historic districts in Savannah. It is bounded by Anderson Lane on the north, Broad Street on the east, Victory Drive on the south and Montgomery Street on the west.

- **Fairway Oaks-Greenview District**
  This district consists of two contiguous suburban and residential subdivision developed between 1950 and the early 1960s on the outskirts of the City.



Source: SAGIS, 2014

Figure 4.26 - National Register Historic Districts in the City of Savannah

Methodology

The Savannah historic district layer was used to identify historic buildings at risk to the 100-yr and 500-yr FEMA flood zones. This analysis of the historic districts provides a baseline understanding of the level of risk and vulnerability associated with historic properties in the City of Savannah.

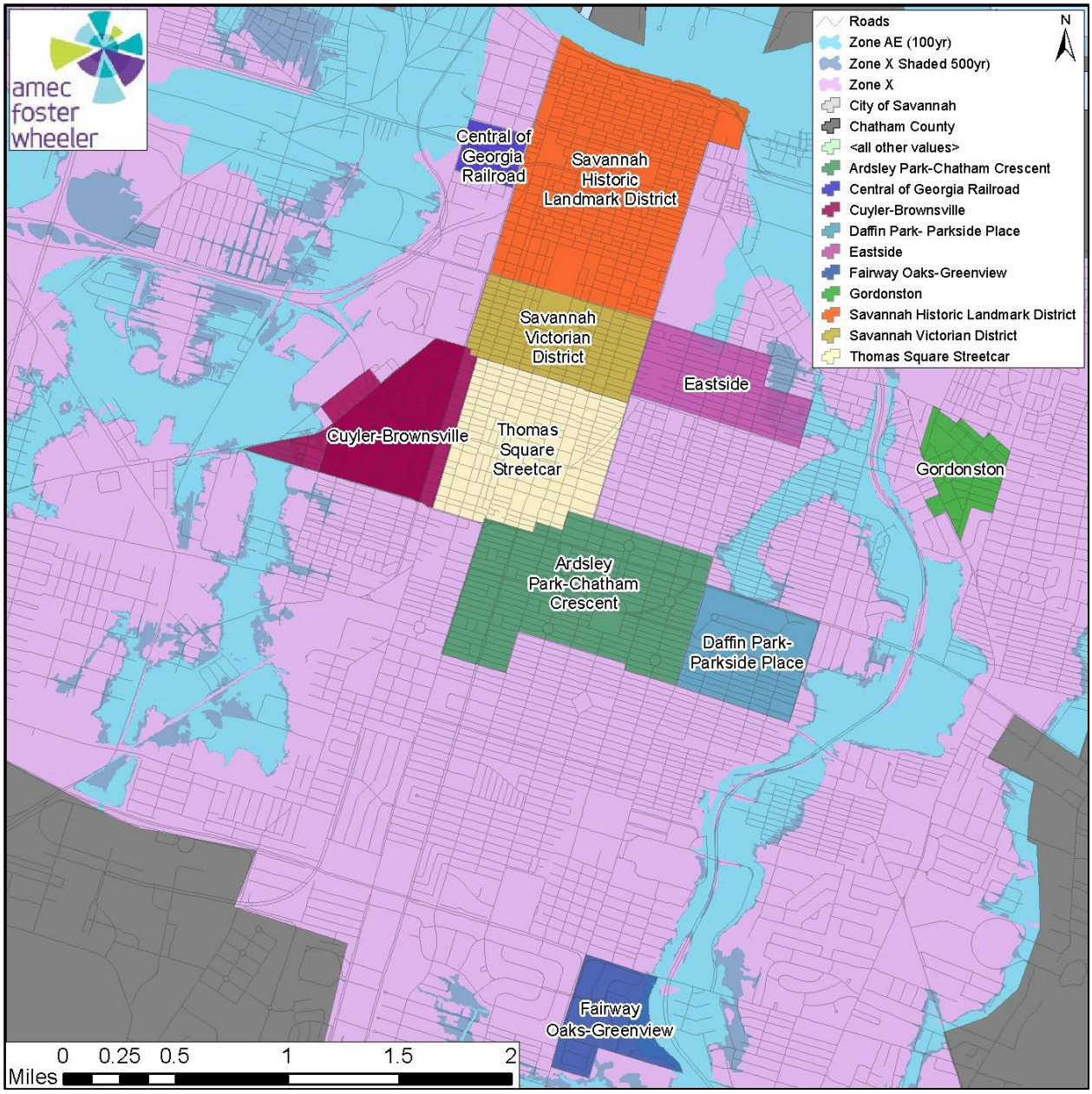
Table 4.21 indicates the exposure of the nine National Register Historic Districts to the riverine flood, flash flood and coastal flood hazards by determining whether any portion of the historic district intersects with a known flood hazard area or is known to have had past problems with one or more of these hazards.

Table 4.21 - Historic District Exposure to Flood Hazards

National Register Historic District	Exposure to Flood Hazards		
	Riverine Flooding	Flash Flooding[1]	Coastal Flooding
Ardsley Park-Chatham Crescent		■	
Central of Georgia Railroad	■		
Cuyler-Brownsville	■	■	
Daffin Park-Parkside Place	■	■	
Eastside	■	■	
Gordonston		■	
Savannah Landmark	■	■	
Savannah Victorian		■	
Thomas Square Streetcar		■	
Fairway Oaks-Greenview District	■		

[1]Based on history of local flooding identified by the FMPC.

Figure 4.27 illustrates the exposure of the ten historic districts to mapped FEMA flood zones.



Source: SAGIS 2014, FEMA DFIRM 7/7/14

Figure 4.27 - Historic District Exposure to FEMA Flood Zones

Based on a GIS analysis, there are six historic districts of possible concern with regard to the riverine flood hazard: Central of Georgia Railroad, Cuyler-Brownsville, Daffin Park-Parkside Place, Eastside, Savannah Landmark and Fairway Oaks-Greenview.

Table 4.22 provides a more detailed analysis of the number of buildings within each historic district that intersect with riverine flood hazard areas. Two of the districts – Central of Georgia Railroad and Daffin Park-Parkside Place intersect with flood hazard areas but do not contain any actual buildings that intersect with those areas.

Table 4.22- Number and Value of Historic Properties at Risk

National Register Historic District (With Exposed Properties)	Approx. No. of Historic Properties In Hazard Areas		Approx. Dollar Value of Historic Properties In Hazard Area
	1 Percent Annual Chance	0.2 Percent Annual Chance	
Central of Georgia Railroad	0	0	$0
Cuyler-Brownsville	35	42	$3,449,772
Daffin Park-Parkside Place	0	0	$0
Eastside	78	71	$14,902,603
Savannah Landmark	11	0	$267,043,804
Fairway Oaks-Greenview	1	11	$3,584,100
TOTAL	**125**	**124**	**$288,980,279**

Figures 4.28 through 4.31 show buildings (based on digital building footprint data) associated with the four historic districts that contain buildings that intersect with mapped flood hazard areas. The flood hazard areas relevant to each district are defined in the legend on each map. Buildings that intersect with the 1-percent-annual-chance (100-year) flood hazard area appear in red. Buildings that intersect with the 0.2-percent-annual-chance (500-year) flood hazard area appear in green.

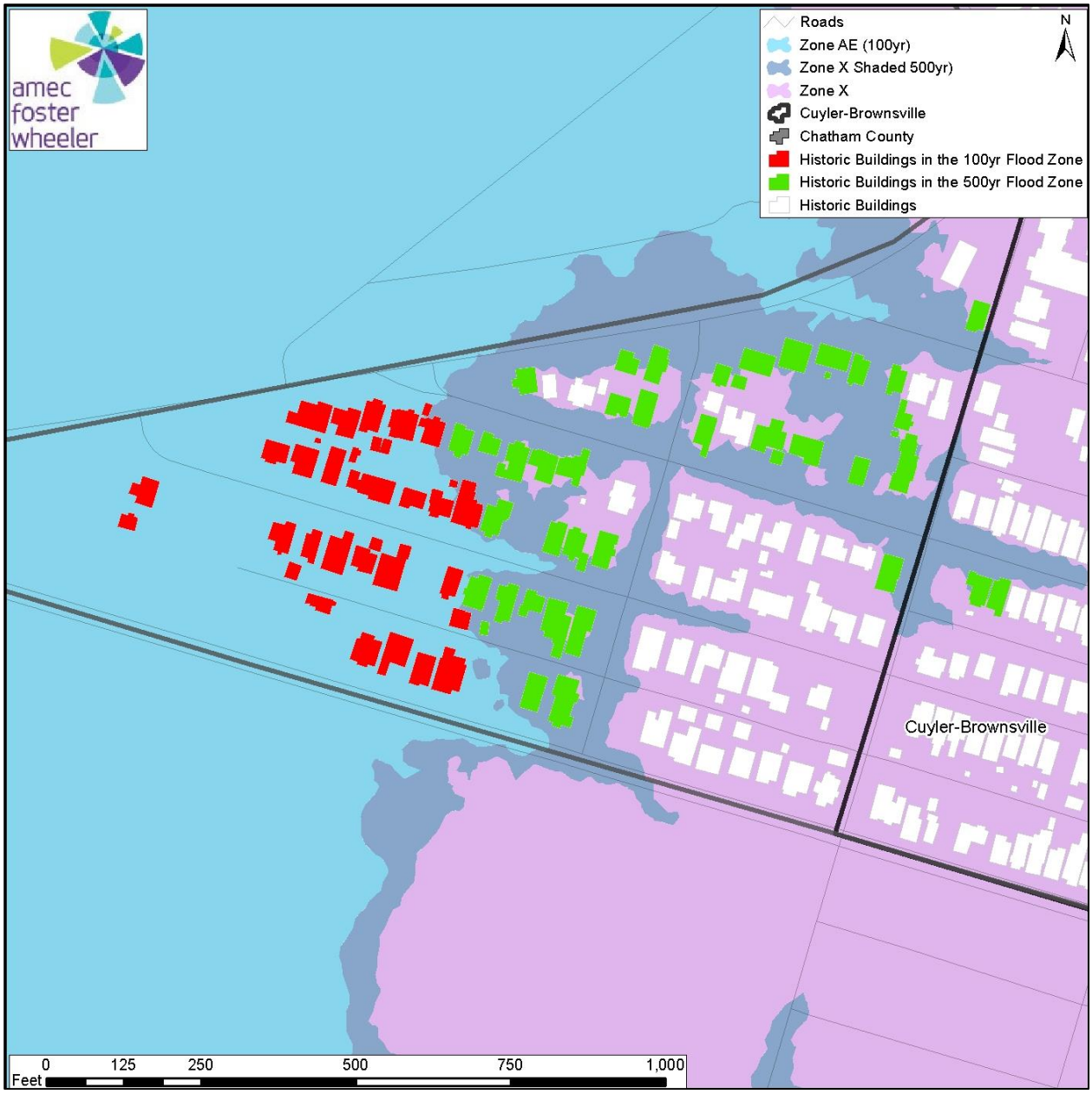


Figure 4.28 - Cuyler-Brownsville Historic District Properties at Risk

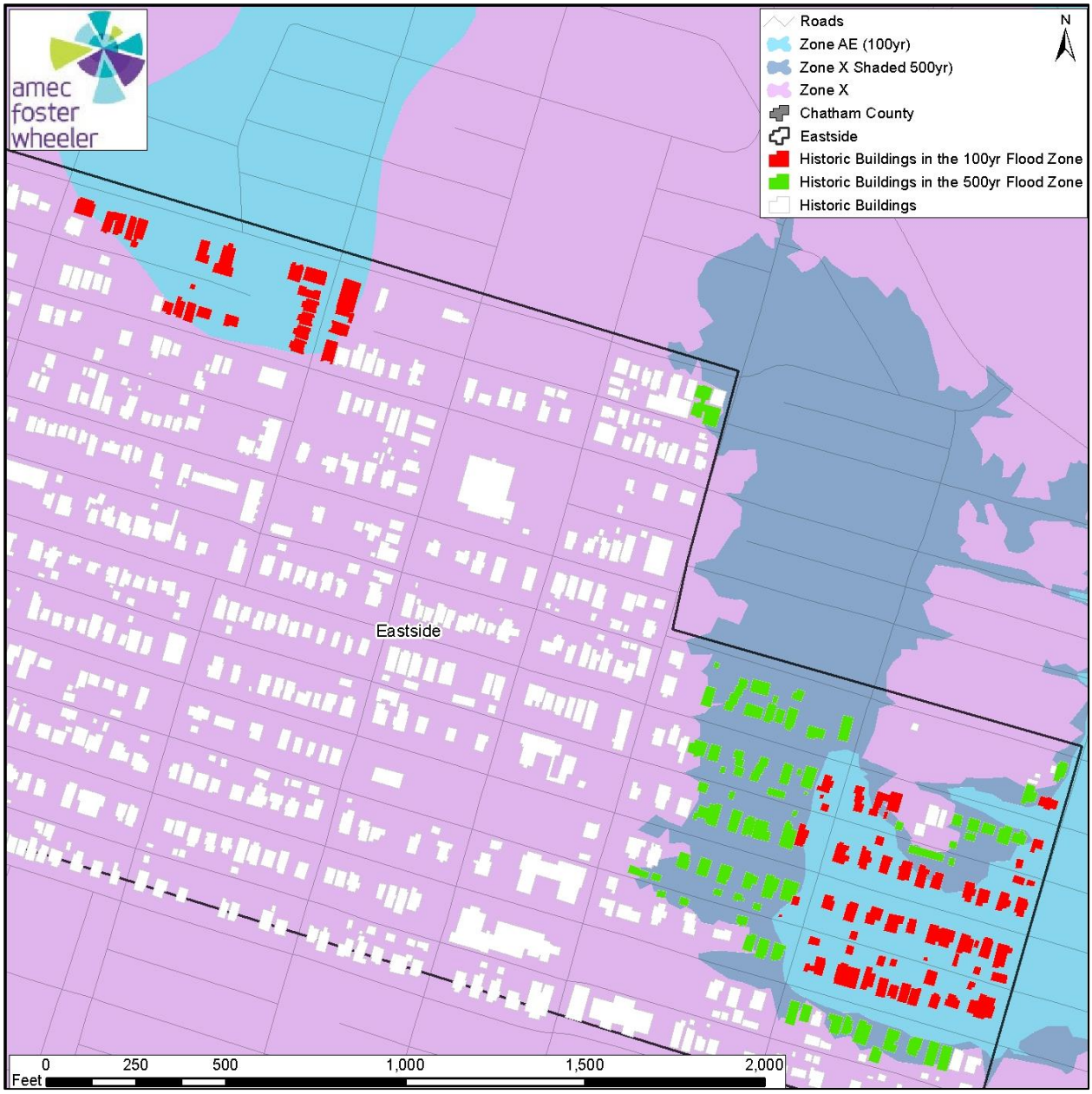


Figure 4.29 - Eastside Historic District Properties at Risk

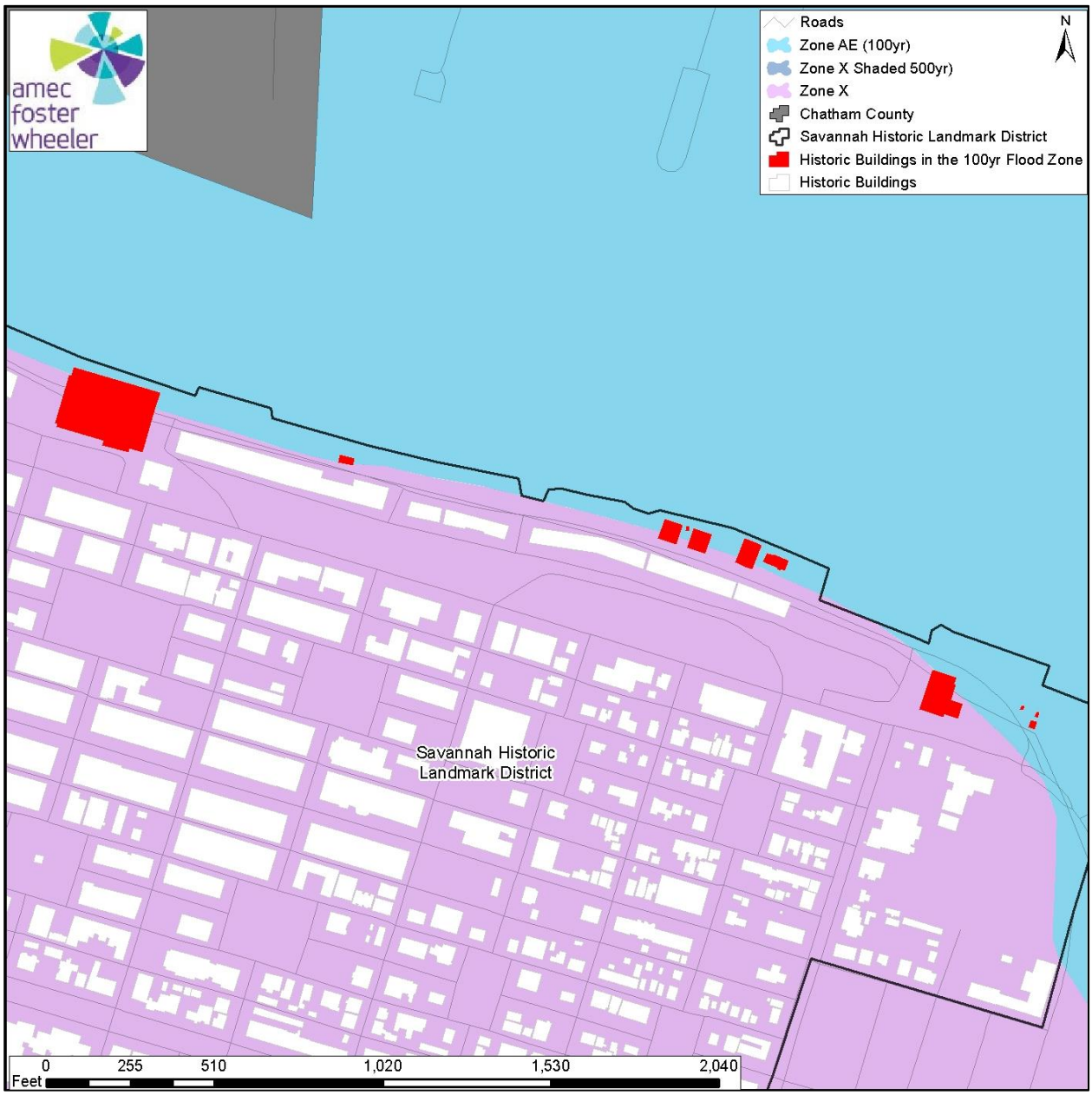


Figure 4.30 - Savannah Historic Landmark District Properties at Risk

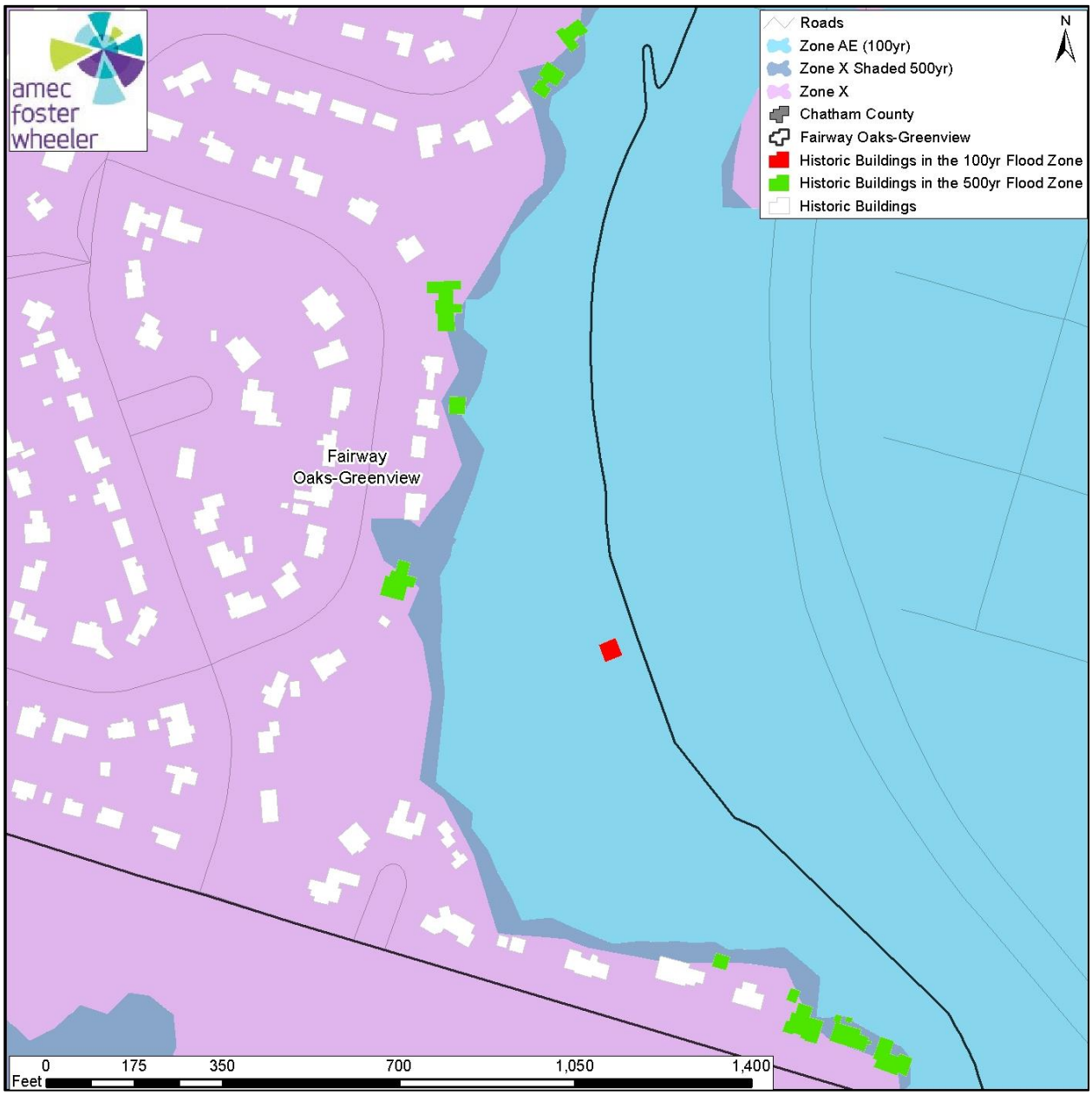


Figure 4.31 - Fairway Oaks-Greenview Historic District Properties at Risk

Future Development

A GIS analysis was performed to quantify parcels within potential future development areas that are located within a special flood hazard area.

Methodology

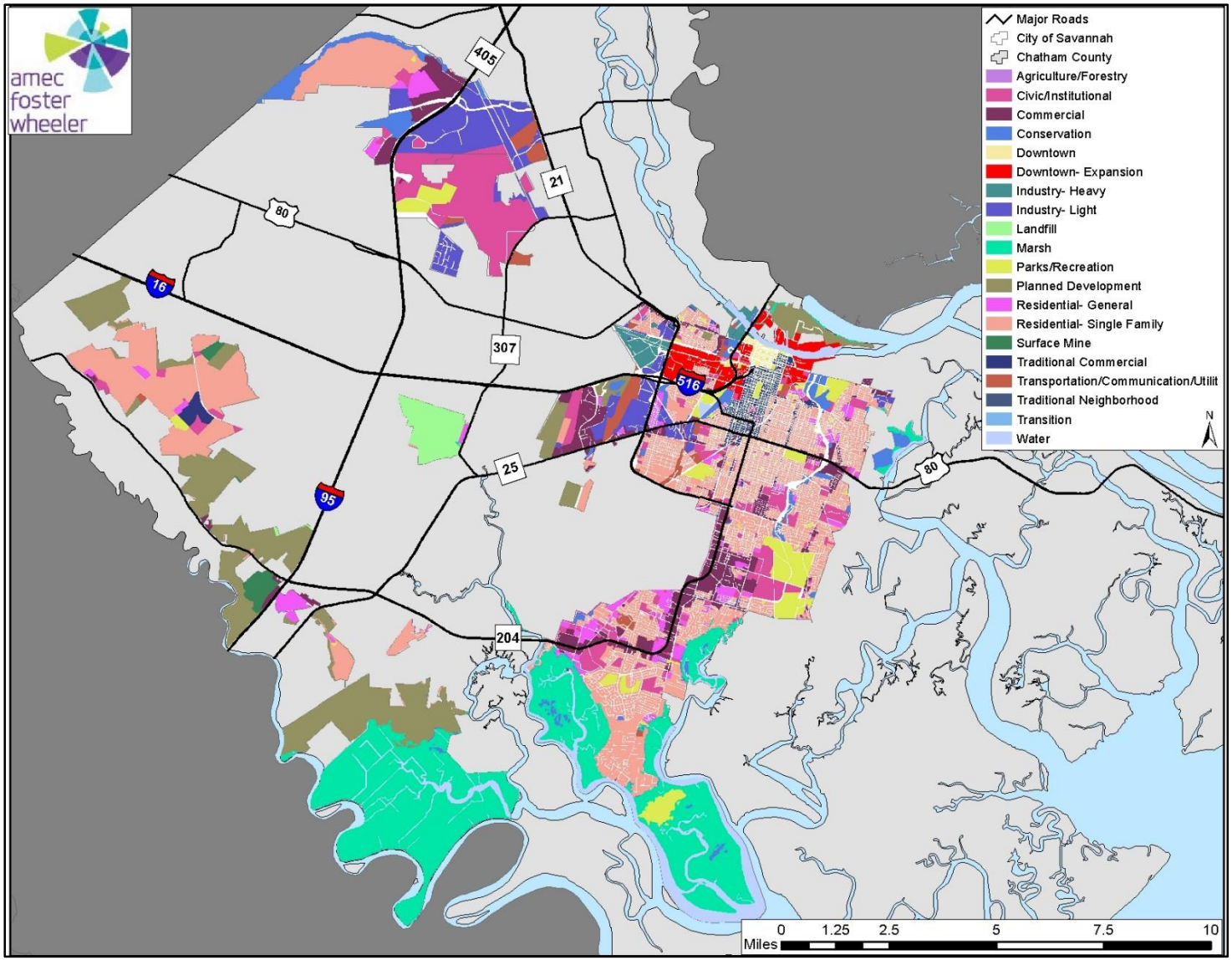
The 2014 Savannah parcel layer was used to identify potential areas of future development located within FEMA flood zones. Parcel counts by FEMA flood zone were determined using a spatial intersection of the tax parcels and the effective flood hazard area provided in the Chatham County FEMA DFIRM Database, effective 7/7/2014. In the event that a parcel was affected by multiple zones, the flood zone covering the majority of the parcel was assigned to the parcel. Table 4.23 delineates the future development areas by flood zone and land use. Figure 4.32 reflects the City's future land use designations.

Table 4.23 - Future Land Use and FEMA Flood Zones

Future Land Use	Unimproved Parcel Count	Unimproved Acreage
Zone AE		
Civic/Institutional	19	218.2
Commercial	68	407.7
Commercial- Neighborhood	0	0.0
Commercial- Suburban	5	0.8
Conservation	104	583.9
Downtown	1	0.5
Downtown- Expansion	134	475.0
Industry- Heavy	9	149.5
Industry- Light	26	445.3
Landfill	0	0.0
Marsh	42	609.6
Parks/Recreation	67	125.6
Planned Development	39	1,345.2
Residential- General	140	193.3
Residential- Single Family	564	918.3
Surface Mine	3	319.2
Traditional Commercial	4	2.5
Traditional Neighborhood	2	0.1
Transportation/Communication/Utilities	15	143.5
Water	3	43.2
Total	**1,245**	**5,981.4**
Zone A		
Civic/Institutional	3	116.1
Commercial	11	10.0
Industry- Light	4	75.6
Planned Development	1	151.9
Residential- Single Family	4	0.4
Transportation/Communication/Utilities	2	134.1
Total	**25**	**488.2**
Zone AH		
Residential- Single Family	1	1.5
Total	**1**	**1.5**
Zone VE		
Conservation	1	13.5

Future Land Use	Unimproved Parcel Count	Unimproved Acreage
Marsh	35	8,799.3
Planned Development	5	813.9
Residential- General	6	2.2
Residential- Single Family	2	0.6
Water	2	403.4
Total	**51**	**10,033.0**
Zone X (500-yr)		
Agriculture/Forestry	0	0.0
Civic/Institutional	9	29.2
Commercial	34	73.7
Commercial- Suburban	2	0.3
Conservation	7	4.9
Downtown- Expansion	6	40.3
Industry- Heavy	28	60.5
Industry- Light	16	166.0
Parks/Recreation	7	14.0
Planned Development	15	233.6
Residential- General	74	46.8
Residential- Single Family	253	171.8
Traditional Commercial	8	50.1
Traditional Neighborhood	0	0.0
Transportation/Communication/Utilities	2	8.8
Total	**461**	**899.9**
Zone X (unshaded)		
Agriculture/Forestry	0	0.0
Civic/Institutional	82	394.5
Commercial	492	511.5
Commercial- Neighborhood	3	0.4
Commercial- Regional	1	0.0
Commercial- Suburban	0	0.0
Conservation	34	298.4
Downtown	282	11.2
Downtown- Expansion	109	63.2
Industry- Heavy	29	43.6
Industry- Light	54	458.1
Marsh	5	72.5
Parks/Recreation	83	205.3
Planned Development	41	2,015.7
Residential- General	386	271.4
Residential- Single Family	2,153	2,038.8
Surface Mine	1	137.5
Traditional Commercial	471	49.8
Traditional Neighborhood	592	27.0
Transition	2	1.3
Transportation/Communication/Utilities	30	140.1
Total	**4,850**	**6,740.2**

Source: Savannah 2014 Tax Assessor's Data, FEMA 2014 DFIRM



Source: SAGIS, 2014

Figure 4.32 - City of Savannah Future Land Use

Flood Insurance Analysis

One valuable source of information on flood hazards is current flood insurance data for active policies and past claims. Flood insurance is required as a condition of federal aid or a mortgage or loan that is federally insured for a building located in a FEMA flood zone.

The City of Savannah has been a participant in the NFIP since May 1971. Savannah has achieved a Class 6 flood insurance rating through participation in the NFIP's Community Rating System which rewards all policyholders in the City with a 20 percent reduction in their flood insurance premiums. Tables 4.24 through 4.27 reflect NFIP policy and claims data for the City categorized by structure type, flood zone, Pre-FIRM and Post-FIRM.

Table 4.24 - NFIP Policy and Claims Data by Structure Type – City of Savannah

Structure Type	Number of Policies in Force	Total Premium	Total Coverage	Number of Closed Paid Losses	Total of Closed Paid Losses
Single Family	5,871	$3,035,815	$1,473,288,500	1,427	$20,348,735
2-4 Family	406	$233,449	$82,285,800	52	$1,168,613
All Other Residential	672	$347,947	$120,711,300	51	$2,033,811
Non-Residential	548	$1,074,627	$273,388,800	78	$2,848,670
Total	**7,497**	**$4,691,838**	**$1,949,674,400**	**1,608**	**$26,399,829**

Source: FEMA Community Information System, October 2014

Table 4.25 - NFIP Policy and Claims Data by Flood Zone – City of Savannah

Flood Zone	Number of Policies in Force	Total Premium	Total Coverage	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	2,502	$2,061,215	$550,439,300	634	10,460,414
A Zones	14	$19,659	$2,891,400	20	300,311
AO Zones	0	$0	$0	0	0
AH Zones	4	$3,558	$949,700	0	0
AR Zones	0	$0	$0	0	0
A99 Zones	0	$0	$0	0	0
V01-30 & VE Zones	31	$99,269	$7,326,000	2	2,904
V Zones	0	$0	$0	0	0
D Zones	4	$3,512	$412,200	64	541,613
B, C & X Zone					
Standard	636	$647,972	$146,947,800	380	8,448,845
Preferred	4,306	$1,856,653	$1,240,708,000	507	6,643,628
Total	**7,497**	**$4,691,838**	**$1,949,674,400**	**1,607**	**26,397,711**

Source: FEMA Community Information System, October 2014

Table 4.26 - NFIP Policy and Claims Data Pre-FIRM – City of Savannah

Flood Zone	Number of Policies in Force	Total Premium	Total Coverage	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	1,152	$1,255,222	$210,532,500	510	$8,675,629
A Zones	6	$7,170	$1,026,000	20	$300,311
AO Zones	0	$0	$0	0	$0

Flood Zone	Number of Policies in Force	Total Premium	Total Coverage	Number of Closed Paid Losses	Total of Closed Paid Losses
AH Zones	0	$0	$0	0	$0
AR Zones	0	$0	$0	0	$0
A99 Zones	0	$0	$0	0	$0
V01-30 & VE Zones	13	$34,548	$2,586,300	2	$2,904
V Zones	0	$0	$0	0	$0
D Zones	4	$3,512	$412,200	63	$498,347
B, C & X Zone	2,648	$1,232,637	$738,229,100	638	$9,166,675
Standard	171	$224,297	$41,754,100	288	$4,883,240
Preferred	2,477	$1,008,340	$696,475,000	350	$4,283,434
Total	**3,823**	**$2,533,089**	**$952,786,100**	**1,233**	**$18,643,861**

Source: FEMA Community Information System, October 2014

Table 4.27 - NFIP Policy and Claims Data Post-FIRM – City of Savannah

Flood Zone	Number of Policies in Force	Total Premium	Total Coverage	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	1,350	$805,993	$339,906,800	124	$1,784,785
A Zones	8	$12,489	$1,865,400	0	$0
AO Zones	0	$0	$0	0	$0
AH Zones	4	$3,558	$949,700	0	$0
AR Zones	0	$0	$0	0	$0
A99 Zones	0	$0	$0	0	$0
V01-30 & VE Zones	18	$64,721	$4,739,700	0	$0
V Zones	0	$0	$0	0	$0
D Zones	0	$0	$0	1	$43,267
B, C & X Zone	2,294	$1,271,988	$649,426,700	248	$5,914,794
Standard	465	$423,675	$105,193,700	91	$3,554,601
Preferred	1,829	$848,313	$544,233,000	157	$2,360,194
Total	**3,674**	**$2,158,749**	**$996,888,300**	**373**	**$7,742,845**

Source: FEMA Community Information System, October 2014

Repetitive Loss Analysis

A repetitive loss property is a property for which two or more flood insurance claims of more than $1,000 have been paid by the NFIP within any 10-year period since 1978. An analysis of repetitive loss was completed by the City to examine repetitive loss properties against FEMA flood zones.

Methodology

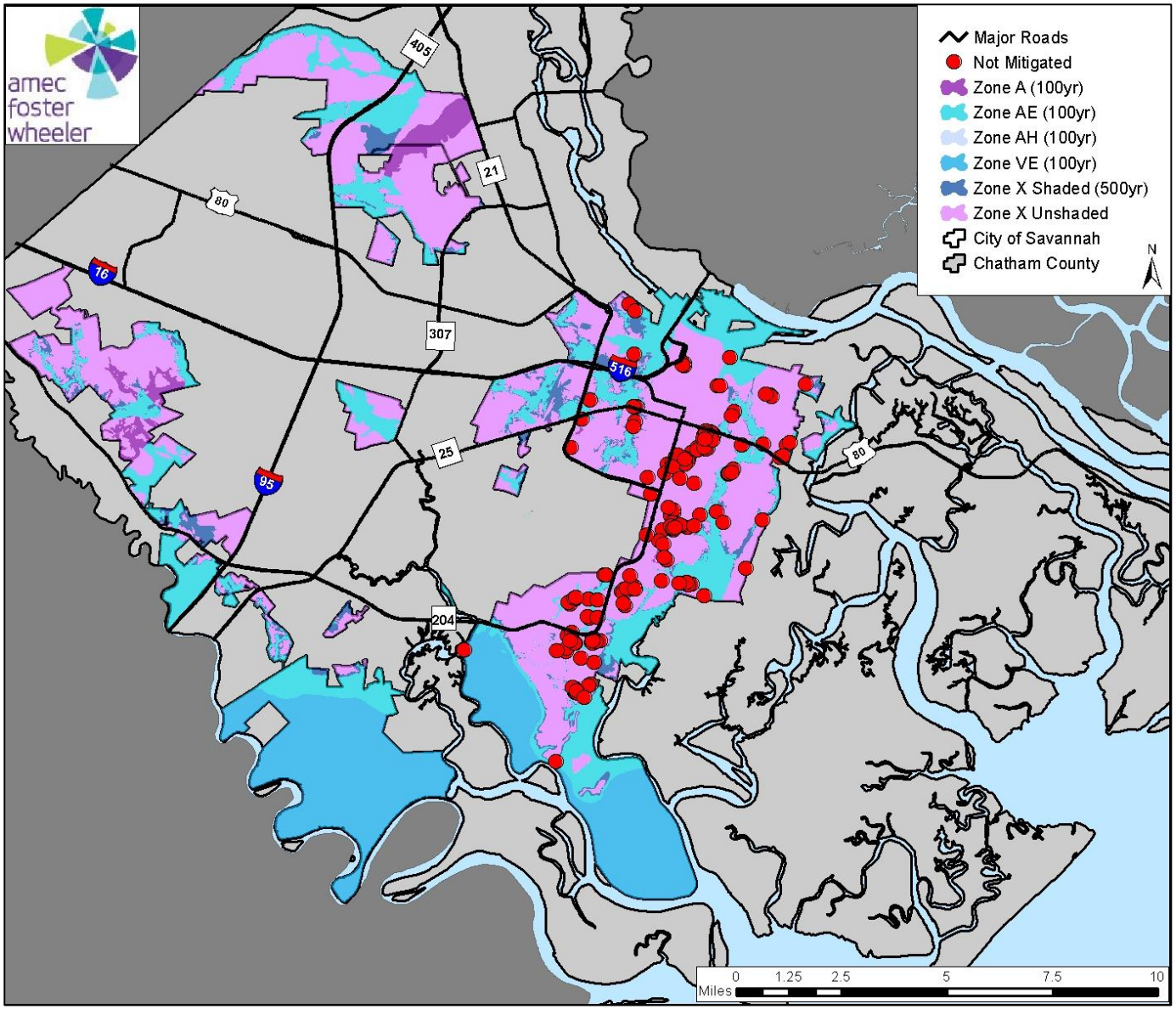
According to 2011 NFIP records, there are a total of 185 unmitigated and 142 mitigated repetitive loss properties within the City of Savannah. Fifteen properties are classified as severe repetitive loss. Of the fifteen severe repetitive loss properties, five remain unmitigated. Table 4.28 details repetitive loss building counts, FEMA flood zones and total payment for the unmitigated properties.

Table 4.28 – Unmitigated Repetitive Loss Summary – City of Savannah

Flood Zone	Building Count		Total Building Payment	Total Content Payment	Total Paid
	Insured	Uninsured			
VE	1	1	$34,776	$111,197	$145,974
AE	28	20	$1,688,087	$747,071	$2,435,157
AH	1	0	$74,041	$34,993	$109,034
A	1	0	$3,320	$0	$3,320
X (500-yr)	10	9	$487,768	$126,766	$614,533
X (unshaded)	51	63	$3,698,106	$2,351,922	$6,050,028
Total	**92**	**93**	**$5,986,098**	**$3,371,949**	**$9,358,046**

Source: NFIP Repetitive Loss Data 2011

Figure 4.33 illustrates the location of unmitigated repetitive loss properties in relation to mapped FEMA flood zones within the City.



Source: FEMA DFIRM, 7/7/14

Figure 4.33 - Savannah Repetitive Loss Properties and FEMA Flood Zones

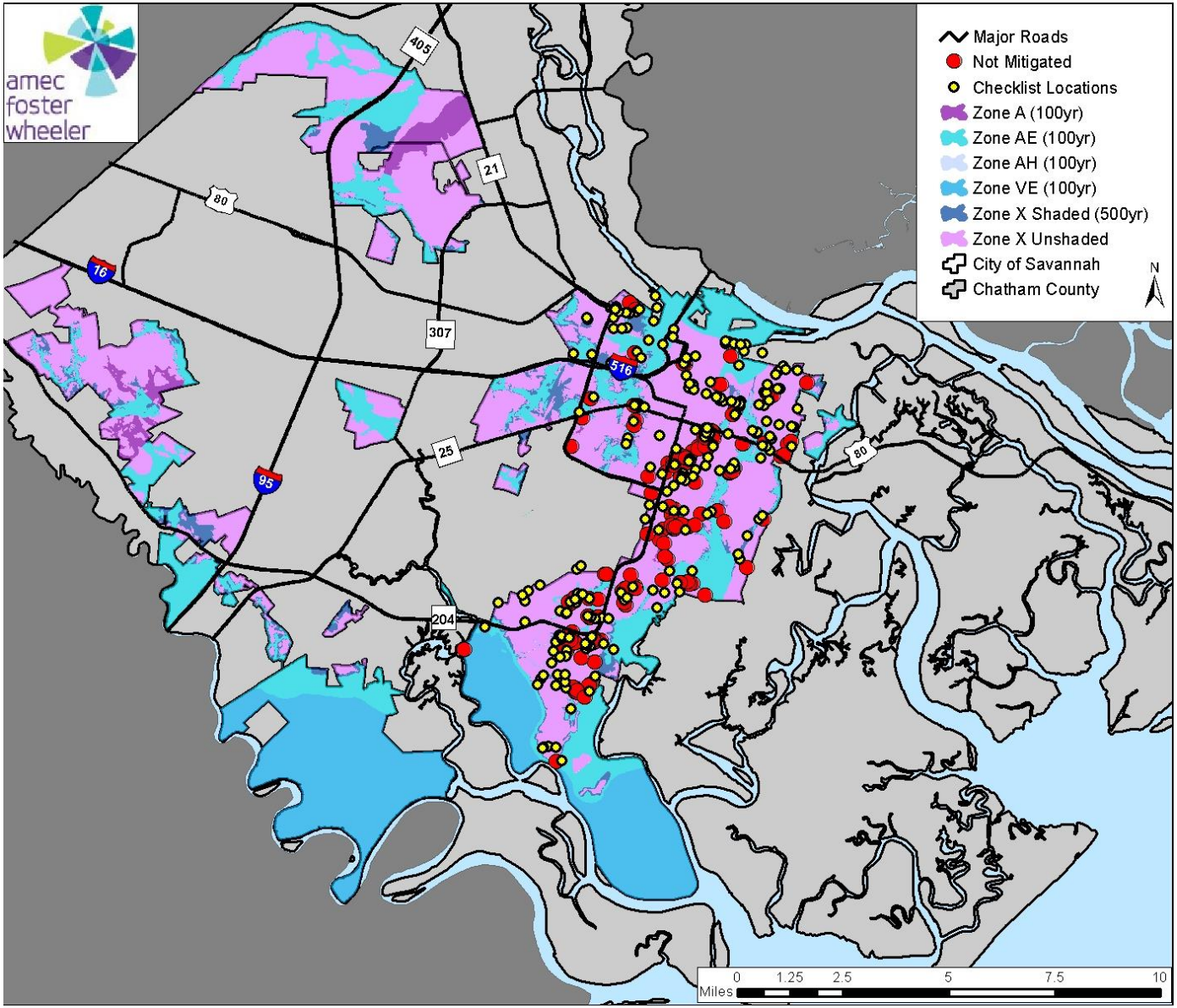
4.3.5 Flood: Stormwater/Localized Flooding Vulnerability Assessment

Likelihood of Future Occurrence—Highly Likely
Vulnerability—High

Localized flooding occurs at various times throughout the year with several areas of primary concern to the City. Localized flooding and ponding affect streets and property. Figure 4.34 below shows localized flooding locations, repetitive loss areas and FEMA flood zones. As shown in the figure, there appears to be a correlation between the Public Works crew "checklist" locations and unmitigated repetitive loss properties.

Future Development

The risk of localized flooding to future development can be minimized by accurate recordkeeping of repetitive localized storm activity and an evaluation of regional drainage issues. Mitigating the root causes of the localized flooding or choosing not to develop in areas that often are subject to localized flooding will reduce future risks of losses due to this hazard.



Source: City of Savannah, FEMA DFIRM 7/7/14

Figure 4.34- Localized Flooding Locations, Repetitive Loss Areas and FEMA Flood Zones

4.3.6 Hurricane and Tropical Storm Vulnerability Assessment

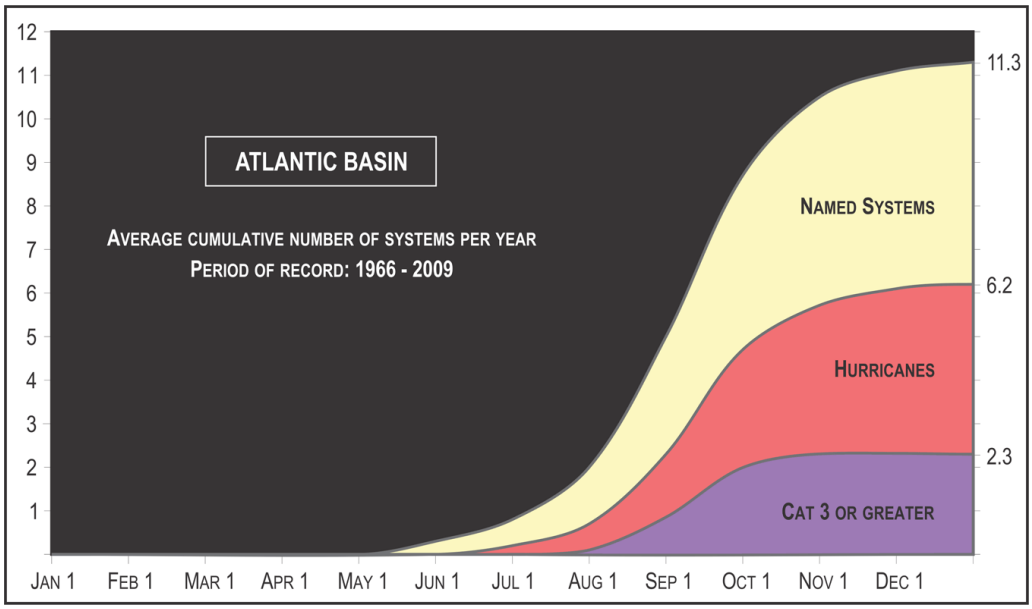
Likelihood of Future Occurrence—Occasional
Vulnerability—High

The heavy rains associated with tropical weather systems are not only responsible for major flooding in areas where the storm initially strikes, but they can also affect areas hundreds of miles inland. Torrential rains from hurricanes and tropical storms can produce extensive urban and riverine flooding, especially if the storm systems are large and slow moving. Winds from these storms located offshore can drive ocean water up the mouth of a river or canal, compounding the severity of inland overbank flooding.

In addition to the combined destructive forces of wind, rain, and lightning, hurricanes can cause a surge in the ocean, which can raise the sea level as high as 25 feet or more in the strongest hurricanes. As a hurricane approaches the coast, its winds drive water toward the shore. Once the edge of the storm reaches the shallow waters of the continental shelf, the water begins to pile up. Winds of hurricane strength eventually force the water onto the shore. At first, the water level climbs slowly, but as the eye of the storm approaches water rises rapidly. Furthermore, storm surge can also cause extensive damage on the backside of a hurricane as storm surge waters head back out to sea.

Natural resources, particularly beaches, are devastated by hurricanes. The erosion of the coastline is considerable due to the impact of wind, waves, and debris in a hurricane event. Beaches need to be replenished with appropriate materials to reduce erosion. More importantly, the dune system needs to be protected and remain intact in order to prevent having to replenish beaches. Sand dunes are the first line of defense against coastal storms and beach erosion. They absorb the impact of storm surge and high waves, preventing or delaying flooding of inland areas and damage to inland structures. They are also sand storage areas that supply sand to eroded beaches during storms and buffer windblown sand and salt spray. Storm surge and subsequent erosion of the shoreline often leads to the loss of property. Vulnerability of the City to coastal erosion is discussed in Section 4.3.3.

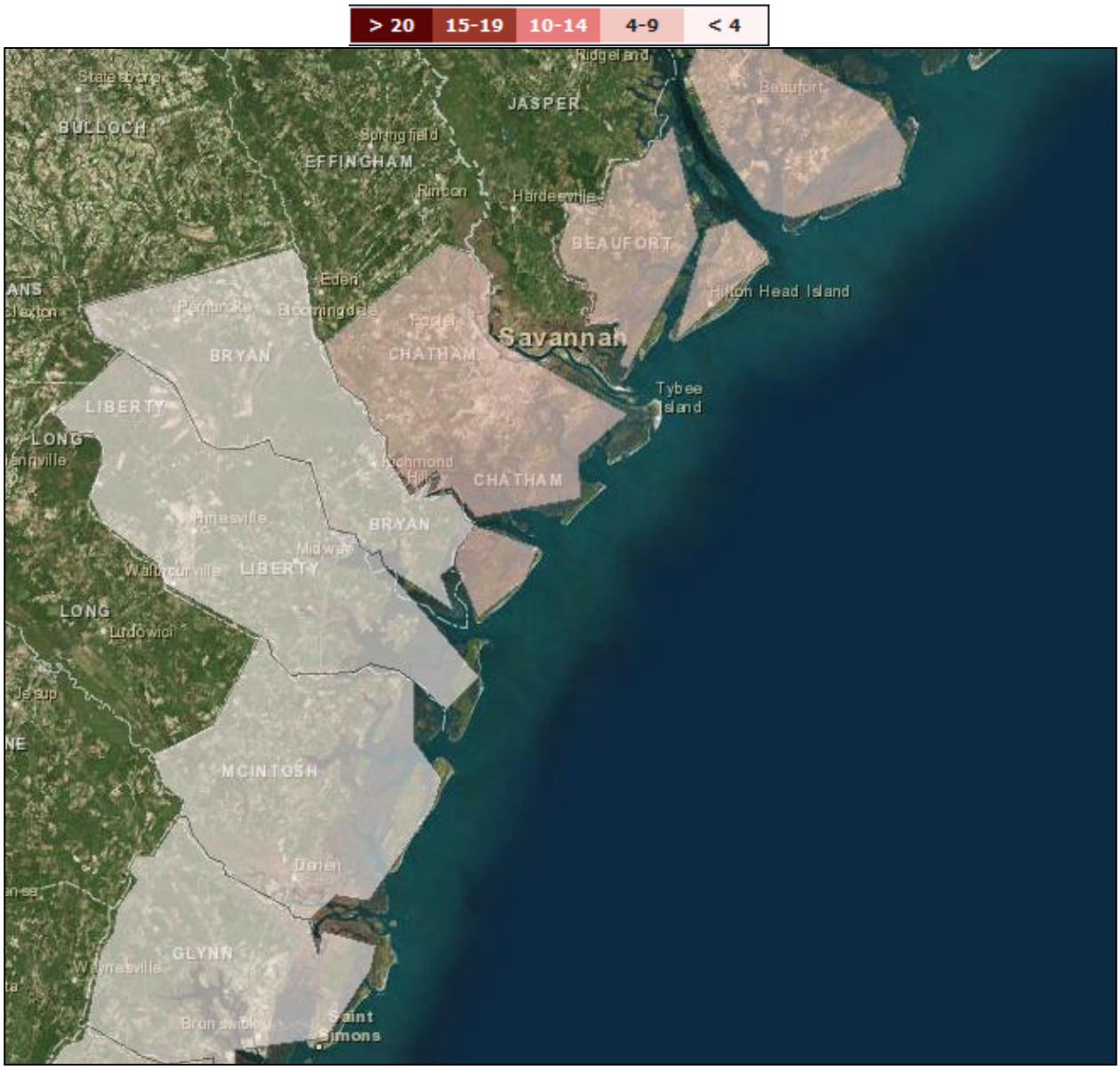
The Atlantic basin hurricane season runs from June 1st to November 30th. The Atlantic basin includes the Atlantic Ocean, Caribbean Sea, and Gulf of Mexico. Figure 4.35 shows the progress of a typical hurricane season in terms of the total number of tropical systems and hurricanes produced throughout the year in the Atlantic basin. The curves represent the average cumulative production of all named tropical systems, all hurricanes, and those hurricanes which were Category 3 or stronger in those basins.



Source: NOAA/National Hurricane Center

Figure 4.35 – Average Number of Tropical Storms per Year (Atlantic Basin)

Figure 4.36 represents the total number of major hurricane strikes for Chatham County (4-9) from 1900-2010.



Source: NOAA/National Hurricane Center

Figure 4.36 – Major Hurricane Strikes – Chatham County

Methodology

A hurricane surge analysis was conducted by intersecting the building footprint layer provided by the City with the polygon shapefile for each hurricane surge layer. The hurricane surge layer data was derived from National Hurricane Center SLOSH model runs on all the NOAA SLOSH basins throughout Georgia. The runs create outputs for all different storm simulations from all points of the compass. Each direction has a MEOW (maximum envelope of water) for each category of storm (1-5), and all directions combined result in a MOMs (maximum of maximums) set of data. The MOMs are used in this surge model. The application uses three input parameters or data: elevation (from LIDAR), SLOSH basin results, and contiguous shoreline or sea polygons.

Properties at Risk

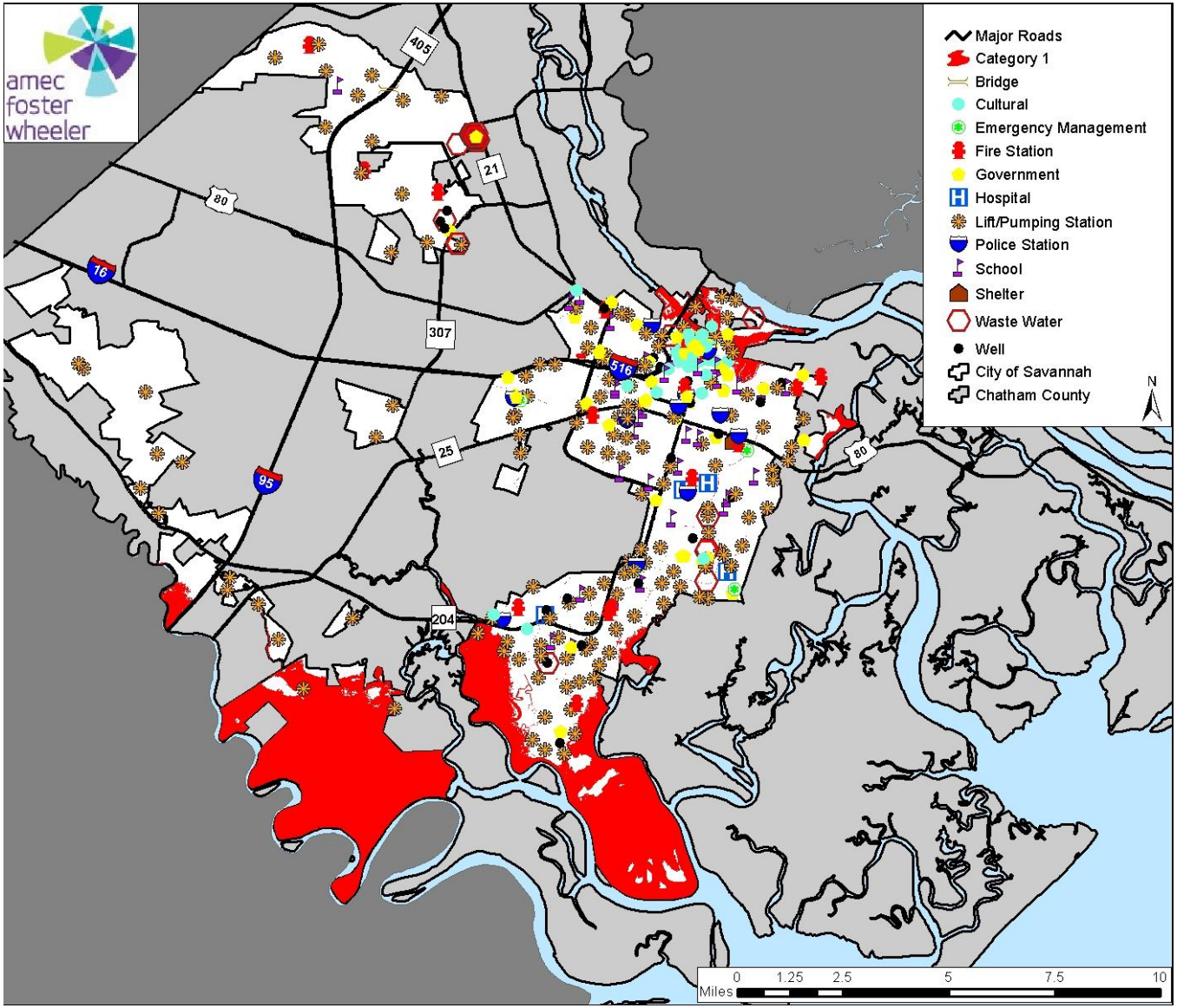
Tables 4.29 through 4.33 and Figures 4.37 through 4.41 provide a summary of assets at risk to hurricane surge based on each hurricane category. The assets at risk estimate for each hurricane category is based on the total of improved and contents value. The value of land is not included in the loss estimates as generally the land is not subject to loss from hurricane and tropical storm damage.

Table 4.29 - Assets at Risk to Category 1 Storm Surge

Land Use	Total Building Count	Total Building Value	Estimated Content Value	Total Value[1]
Commercial	20	$39,804,207	$39,804,207	$79,608,414
Education	0	$0	$0	$0
Government	3	$963,800	$963,800	$1,927,600
Industrial	2	$651,400	$977,100	$1,628,500
Religious	0	$0	$0	$0
Residential	325	$295,333,585	$147,666,793	$443,000,378
Total	**350**	**$336,752,992**	**$189,411,900**	**$526,164,892**

Source: Savannah 2014 Tax Assessor's Data, NOAA

[1]Total value does not include land value.



Source: NOAA, City of Savannah

Figure 4.37 - Category 1 Storm Surge Impact in Savannah

Table 4.30- Assets at Risk to Category 2 Storm Surge

Land Use	Total Building Count[1]	Total Building Value[1]	Estimated Content Value[1]	Total Value[1,2]
Commercial	84	$114,985,307	$115,077,707	$230,063,014
Education	4	$233,720	$233,720	$467,440
Government	8	$1,248,100	$1,388,900	$2,637,000
Industrial	26	$5,933,800	$8,900,700	$14,834,500
Religious	8	$2,315,810	$2,315,810	$4,631,620
Residential	2,124	$1,406,373,478	$703,186,739	$2,109,560,217
Total	**2,254**	**$1,531,090,215**	**$831,103,576**	**$2,362,193,791**

Source: Savannah 2014 Tax Assessor's Data, NOAA

[1]Totals are cumulative of storm surge categories 1 & 2.

[2]Total value does not include land value.

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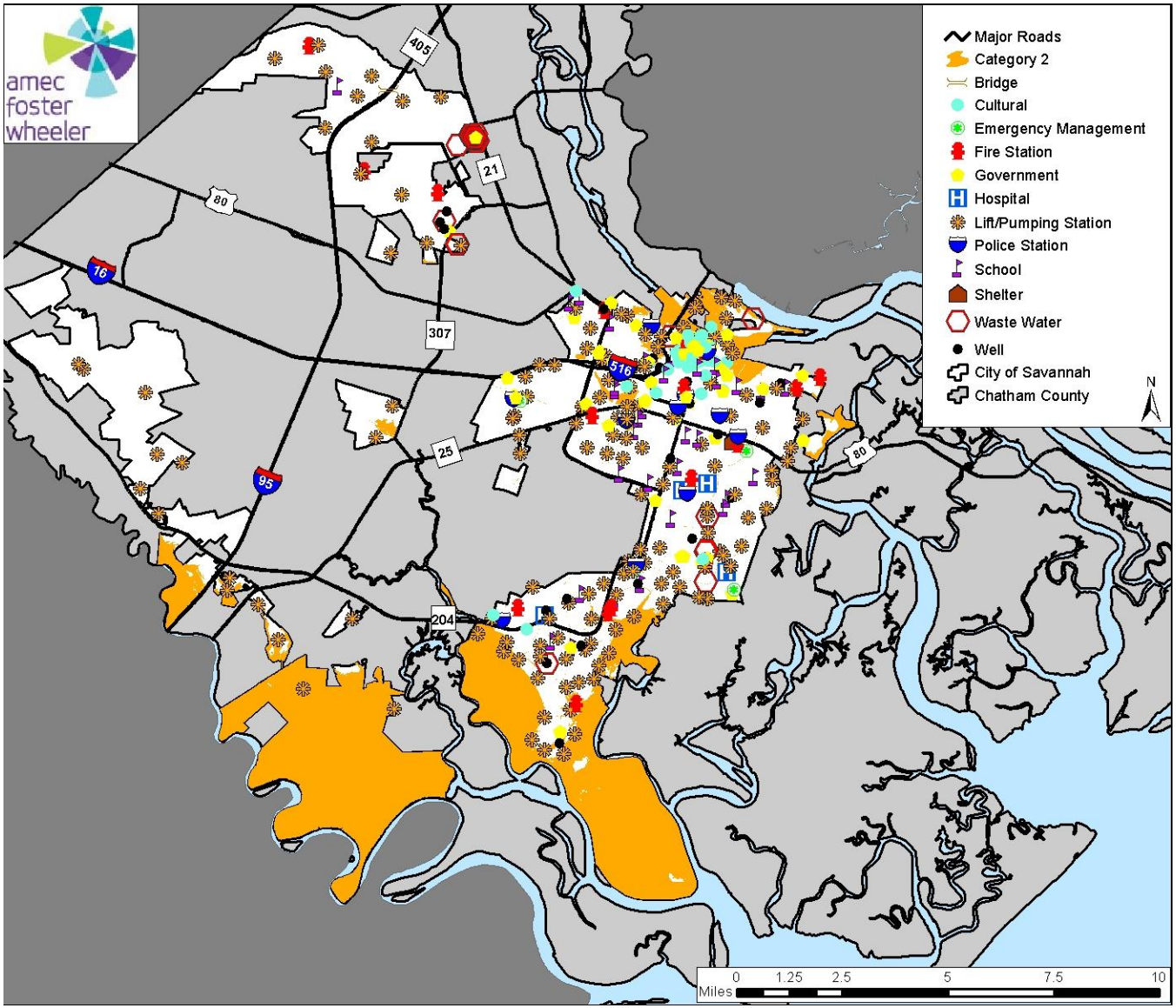


Source: NOAA, City of Savannah

Figure 4.38 - Category 2 Storm Surge Impact in Savannah

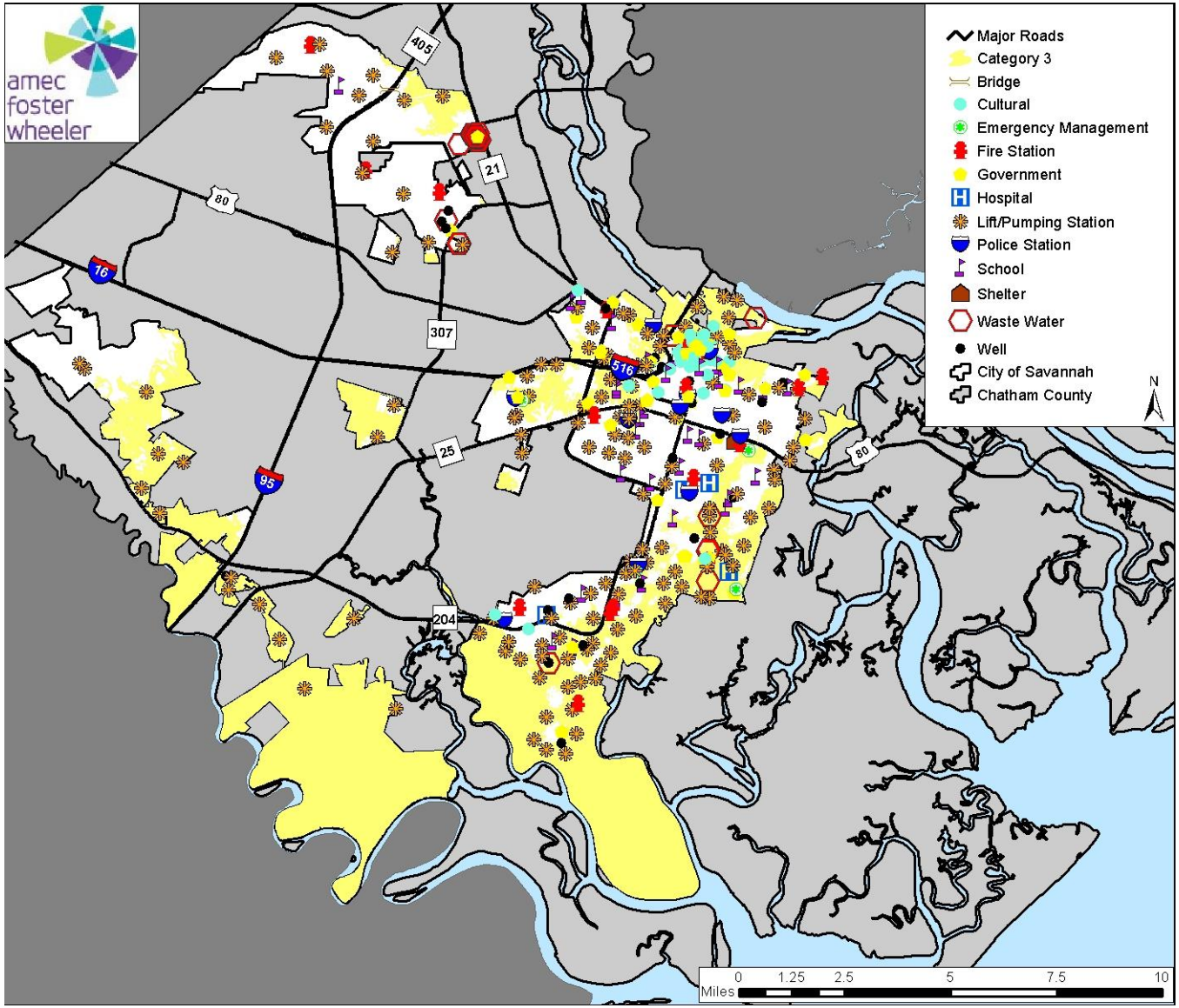
Table 4.31 - Assets at Risk to Category 3 Storm Surge

Land Use	Total Building Count[1]	Total Building Value[1]	Estimated Content Value[1]	Total Value[1,2]
Commercial	717	$7,270,400,725	$7,281,131,775	$14,551,532,500
Education	194	$18,336,940	$18,336,940	$36,673,880
Government	125	$596,243,140	$596,596,990	$1,192,840,130
Industrial	171	$226,041,647	$339,062,471	$565,104,118
Religious	64	$18,738,240	$18,738,240	$37,476,480
Residential	15,062	$21,373,327,181	$10,686,663,591	$32,059,990,772
Total	**16,333**	**$29,503,087,873**	**$18,940,530,006**	**$48,443,617,879**

Source: Savannah 2014 Tax Assessor's Data, NOAA

[1]Totals are cumulative of storm surge categories 1-3.

[2]Total value does not include land value.



Source: NOAA, City of Savannah

Figure 4.39 - Category 3 Storm Surge Impact in Savannah

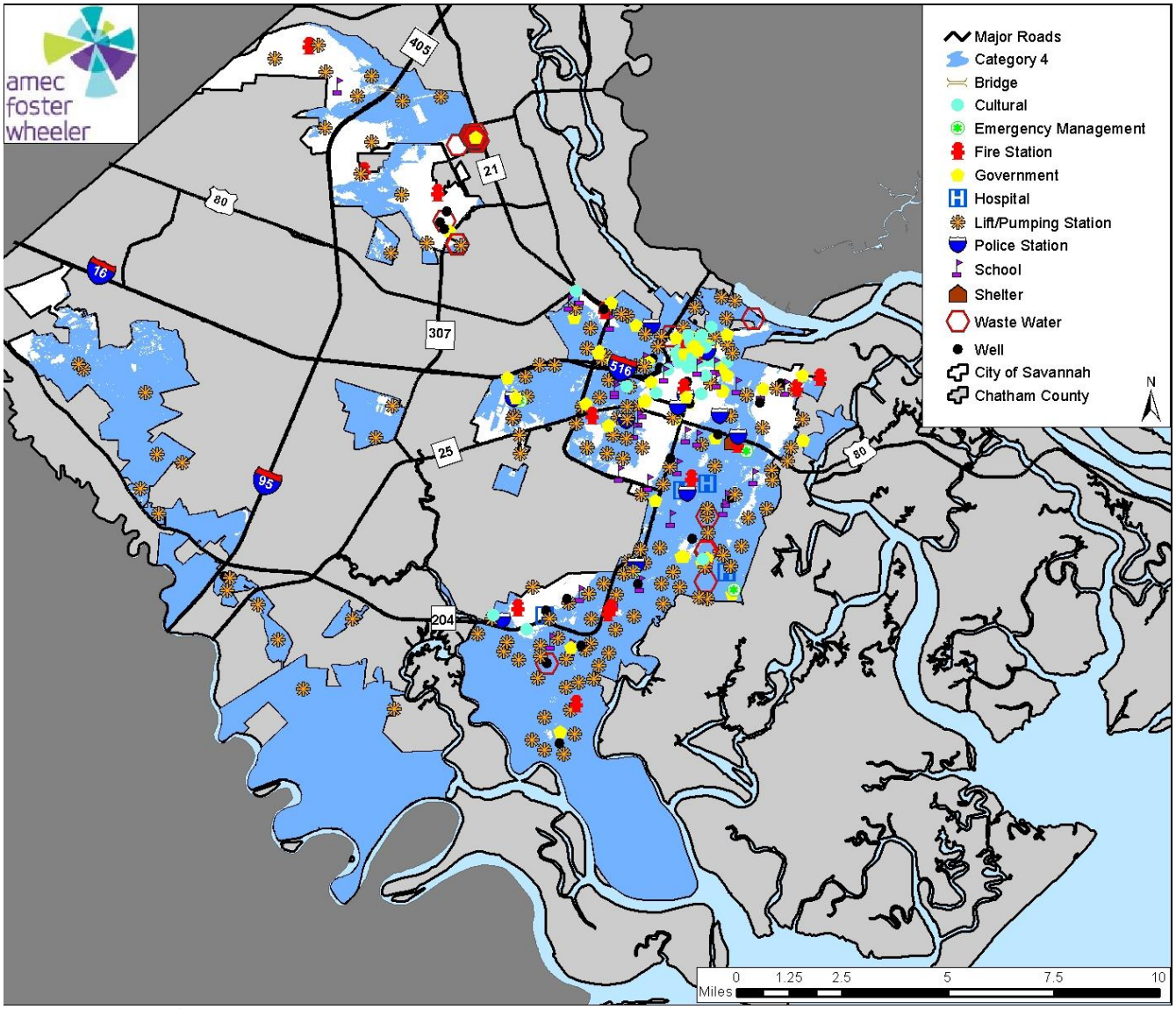
Table 4.32 - Assets at Risk to Category 4 Storm Surge

Land Use	Total Building Count[1]	Total Building Value[1]	Estimated Content Value[1]	Total Value[1,2]
Commercial	2,754	$15,934,717,806	$16,171,767,321	$32,106,485,127
Education	402	$4,189,654,270	$4,189,654,270	$8,379,308,540
Government	179	$3,614,729,790	$3,615,365,110	$7,230,094,900
Industrial	410	$490,349,509	$735,524,264	$1,225,873,773
Religious	195	$106,625,590	$106,625,590	$213,251,180
Residential	34,883	$50,723,082,468	$25,361,541,234	$76,084,623,702
Total	**38,823**	**$75,059,159,433**	**$50,180,477,789**	**$125,239,637,222**

Source: Savannah 2014 Tax Assessor's Data, NOAA

[1]Totals are cumulative of storm surge categories 1-4.

[2]Total value does not include land value.



Source: NOAA, City of Savannah

Figure 4.40 - Category 4 Storm Surge Impact in Savannah

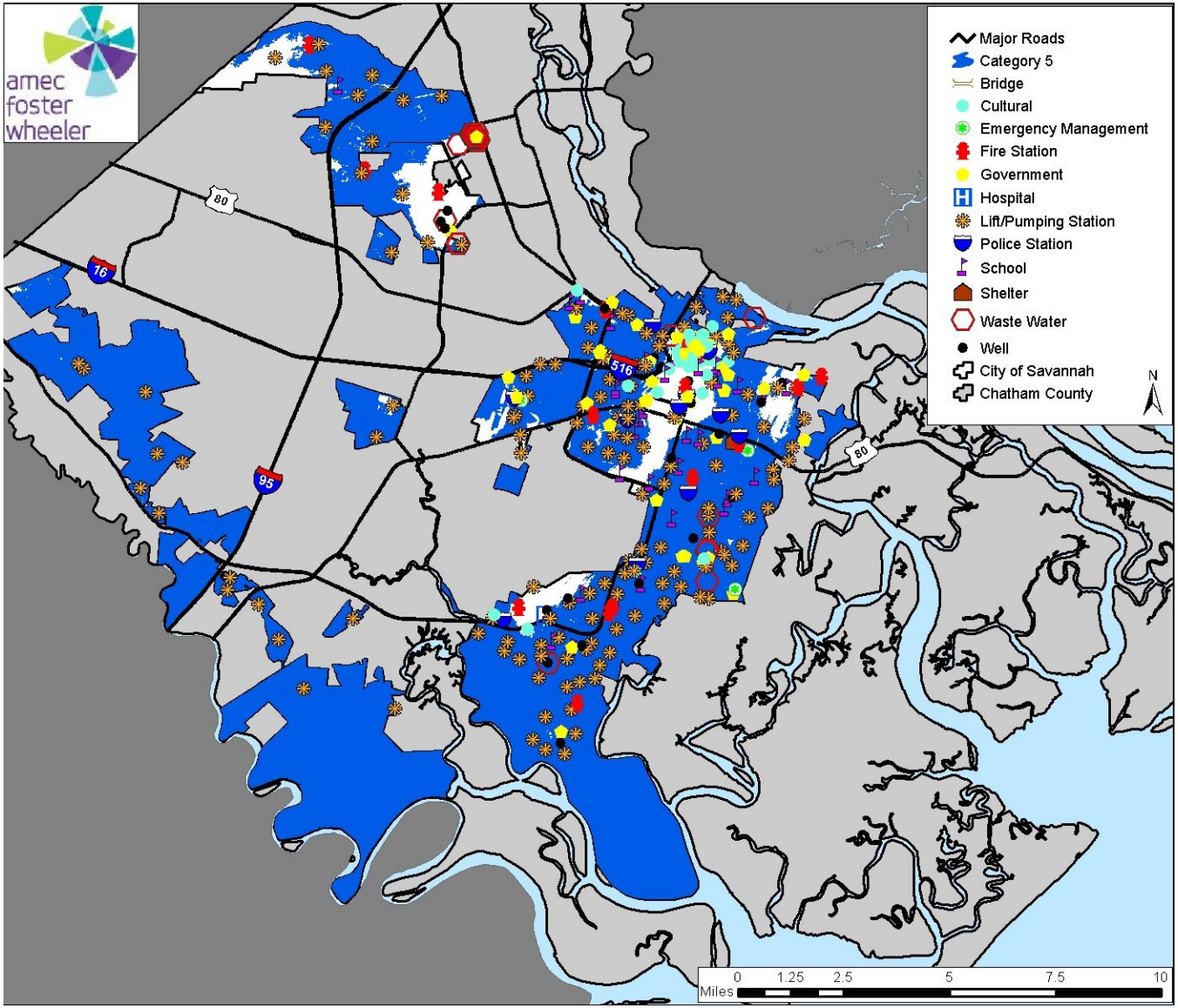
Table 4.33 - Assets at Risk to Category 5 Storm Surge

Land Use	Total Building Count[1]	Total Building Value[1]	Estimated Content Value[1]	Total Value[1,2]
Commercial	3,284	$16,667,217,217	$16,916,491,032	$33,583,708,249
Education	419	$4,410,857,149	$4,410,857,149	$8,821,714,298
Government	210	$4,541,840,090	$4,542,506,410	$9,084,346,500
Industrial	505	$752,663,849	$1,118,606,174	$1,871,270,023
Religious	285	$173,247,770	$173,247,770	$346,495,540
Residential	41,674	$71,823,733,151	$35,911,866,576	$107,735,599,727
Total	**46,377**	**$98,369,559,226**	**$63,073,575,110**	**$161,443,134,336**

Source: Savannah 2014 Tax Assessor's Data, NOAA

[1]Totals are cumulative of storm surge categories 1-5.

[2]Total value does not include land value.

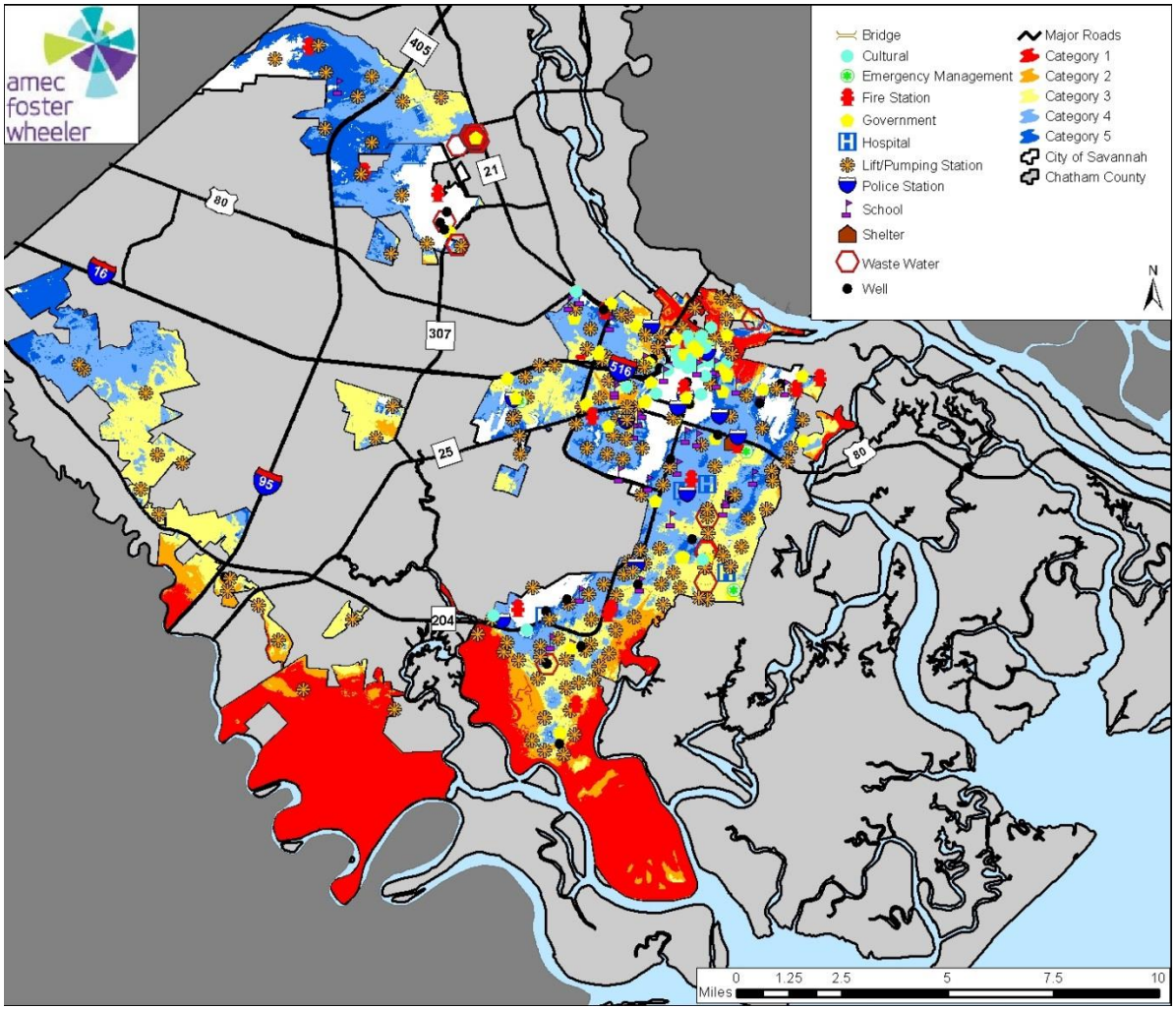


Source: NOAA, City of Savannah

Figure 4.41 - Category 5 Storm Surge Impact in Savannah

Critical Facilities at Risk

Figure 4.42 and Table 4.34 provide an overall summary of critical facilities at risk due to storm surge from a Category 1 through a Category 5 hurricane for the City of Savannah.



Source: NOAA, City of Savannah

Figure 4.42 – Savannah Storm Surge Impact (Category 1-5)

Table 4.34 - Critical Facilities at Risk by Storm Surge Category

Facility	Address	CAT 1	CAT 2	CAT 3	CAT 4	CAT 5
Sav Lift Stations #187	Savannah River Landings	✓	✓	✓	✓	✓
Sav Lift Stations #190	SEDA / 141 Hutchinson Island Rd	✓	✓	✓	✓	✓
Sav Lift Stations #168	Vallambrosa Phase 1 / 931 Chevis Rd	✓	✓	✓	✓	✓
Sav Lift Stations #196	Habersham Plantation	✓	✓	✓	✓	✓
Storm Water Pump Station	Montgomery Cross Rd	✓	✓	✓	✓	✓
Sav Lift Stations #099	Rio Road / 24 Rio Rd.	✓	✓	✓	✓	✓
Ola Wyeth Branch Library	4 E. Bay St., in Gamble Bldg.		✓	✓	✓	✓
USACE Facility & Dock	Savannah Harbor Pkwy		✓	✓	✓	✓
Police Precinct #2 (Leased)	102 E Lathrop Ave		✓	✓	✓	✓
Fire Station #10	13710 Coffee Bluff Rd		✓	✓	✓	✓
Sav Lift Stations #147	Marshedge / 130 Marshedge Ln.		✓	✓	✓	✓
Sav Lift Stations #057	White Bluff ./ Wellwood Dr. & 12802 White Bluff Rd.		✓	✓	✓	✓
Sav Lift Stations #090	Marsh Cove / 11400 White Bluff Rd.		✓	✓	✓	✓
Sav Lift Stations #091	Rose Dhu / 13814 Coffee Bluff Rd.		✓	✓	✓	✓
Sav Well #03	In City Yard Lot - Stiles Ave. @ Gwinnett St.		✓	✓	✓	✓
Sav Lift Stations #015	Wilshire #1 / 183 Wilshire Blvd.		✓	✓	✓	✓
Sav Lift Stations #021	River Street / River St. & Lincoln St.		✓	✓	✓	✓
Sav Lift Stations #026	Cloverdale #1 / Stiles Ave. @ 1806 Eleanor		✓	✓	✓	✓
Sav Lift Stations #073	Damon Street / Damon St. & Carolan St.		✓	✓	✓	✓
Sav Lift Stations #097	Coffee Bluff Plantation#1 / 22 Sutton Rd.		✓	✓	✓	✓
Sav Lift Stations #098	Coffee Bluff Plantation #2 / Cardiff Rd. @ Ramsgate Rd.		✓	✓	✓	✓
Sav Lift Stations #113	Bells Landing / 12502 Apache Ave.		✓	✓	✓	✓
Sav Lift Stations #141	Apache Avenue / 12300 Apache Ave.		✓	✓	✓	✓
Sav Lift Stations #143	Marriott / East Bay St. @ 100 General McIntosh Ave.		✓	✓	✓	✓
Sav Lift Stations #163	Hutchinson Island #1 / 540-L Grand Prize of America Ave. @ 2 Resort		✓	✓	✓	✓
Sav Lift Stations #169	Hutchinson Island #2 / The Reserve 118 Tidegate		✓	✓	✓	✓
Sav Lift Stations #170	Hutchinson Island #3 / The Reserve 818 Reserve Circle		✓	✓	✓	✓
Sav Lift Stations #175	Village of Vallambrosa /		✓	✓	✓	✓
Sav Lift Stations #101	Rose Dhu Woods / Coffee Woods Dr. @ Levee Rd.		✓	✓	✓	✓
Sav Lift Stations #164	Bradley Point / 128 Grayson Ave. @ Dunnoman Dr.		✓	✓	✓	✓
Sav Lift Stations #152	Robin Road / Rendant Ave. @ 106 Robin Rd.		✓	✓	✓	✓
Sav Lift Stations #156	Rose Dhu on the Marsh / 46 Rose Hill Dr.		✓	✓	✓	✓
Sav Lift Stations #014	Paradise #2 /3 Sheridan Cr.		✓	✓	✓	✓
Sav Lift Stations #036	Colonial Oaks / Stillwood Dr. & 600 Plantation Dr.		✓	✓	✓	✓
Sav Well #26	Coffee Bluff @ CoffeeVilla Rd.		✓	✓	✓	✓

Facility	Address	CAT 1	CAT 2	CAT 3	CAT 4	CAT 5
Chatham County Botanical Garden	1388 Eisenhower Dr.			✓	✓	✓
Hitch Branch Library	840 Hitch Dr.			✓	✓	✓
Savannah Exposition	Visitors Center - MLK, Jr. and Louisville Road			✓	✓	✓
Old Water Plant	City Lot			✓	✓	✓
Forest City Branch Library	1501 Stiles Ave.			✓	✓	✓
Oglethorpe Mall Branch Library	7 Mall Annex			✓	✓	✓
Administrative Offices	Cemetery - Bonaventure Road			✓	✓	✓
Recreation Center - Richards Street	1311 Richards St. 31401			✓	✓	✓
Vehicle Maintenance Garage	Eisenhower Drive & Sallie Mood Drive			✓	✓	✓
Recreation Center - Tremont Park Neighborhood	2010 Paige Ave. 31401			✓	✓	✓
County Public Health	1395 Eisenhower Dr.			✓	✓	✓
Recreation Center - Windsor Forest Community	414 Briarcliff Circle 31419			✓	✓	✓
Recreation Center - Crusader Park Neighborhood	81 Coffee Villa Road 31419			✓	✓	✓
Administrative Offices	Gamble Building			✓	✓	✓
Chatham County Public Works	7226 Varnedoe Dr			✓	✓	✓
Radio Tower	1801 Kerry Street			✓	✓	✓
Fire Station #07	6902 Sallie Mood Dr			✓	✓	✓
Southside Fire Dept Sta # 14	2526 East President Street			✓	✓	✓
Police New Property	3104 Edwin			✓	✓	✓
Heard Elementary	414 Lee Blvd.			✓	✓	✓
Windsor Forest Elementary	414 Briarcliff Circl			✓	✓	✓
Spencer Elementary	Bouhan & Rierdon			✓	✓	✓
Jenkins High	1800 Derenne Avenue			✓	✓	✓
Georgia Regional Hospital	1915 Eisenhower Dr.			✓	✓	✓
Sav Lift Stations #086	Packard / 1925 Packard Ave. @ Corvair Ave.			✓	✓	✓
Sav Lift Stations #027	Cloverdale #2 / 1543 Cloverdale Dr.			✓	✓	✓
Sav Well #42	Agonic Rd./Eisenhower			✓	✓	✓
Sav Lift Stations #174	Teal Lake / 12 Teal Lke Rd			✓	✓	✓
Sav Lift Stations #010	Brookview / 6001 Betty Dr. & Asbury St.			✓	✓	✓
Sav Lift Stations #065	Bacon Park / Agonic Rd. & Eisenhower Dr.			✓	✓	✓
Generator Bldg	Abercorn Street			✓	✓	✓
County Lift Station	Aubuc Park			✓	✓	✓
County Lift Station	Lake Meyer			✓	✓	✓
Sav Lift Stations #092	Holland Park / 31 Austin Dr. West of White Bluff			✓	✓	✓

Facility	Address	CAT 1	CAT 2	CAT 3	CAT 4	CAT 5
Sav Well #36	Gateway Blvd. & Hwy 204			✓	✓	✓
Sav Lift Stations #042	Wheeler Street / 410 Wheeler St. & Waters Ave.			✓	✓	✓
Sav Lift Stations #096	Cypress Landing / 8000 Waters Ave.			✓	✓	✓
Sav Lift Stations #115	Chatham Parkway #2 / Chatham Pkwy. Behind Southern Oaks			✓	✓	✓
Sav Lift Stations #137	Pritchard Street / 31 Pritchard St.			✓	✓	✓
Sav Lift Stations #140	Ross Road / 79 Ross Rd.			✓	✓	✓
Sav Lift Stations #158	Cross Roads Bus Ctr #2 / East of I-95 on SE Corner of Jimmy DeLoach & Crossroads			✓	✓	✓
Storm Water Pump Station	Vehicle Maintenance			✓	✓	✓
Sav Lift Stations #100	Savannah Mall / 12001 Rio Rd. @ Savannah Mall			✓	✓	✓
Sav Lift Stations #123	Lynes / 1021 Lynes Ave. & Gwinnett Ave.			✓	✓	✓
Sav Lift Stations #125	Savannah Festival / 11 Gateway Blvd. & Hwy. 204			✓	✓	✓
Sav Lift Stations #176	Grainger Tract			✓	✓	✓
Storm Water Pump Station	DeRenne Ave			✓	✓	✓
Sav Lift Stations #074	Baker Street / Baker St. & 101 Fell St			✓	✓	✓
Sav Lift Stations #075	Industry / Industry Dr. & E. 230 Lathrop			✓	✓	✓
Sav Lift Stations #093	Downing Ave			✓	✓	✓
Sav Lift Stations #191	Fort Argyle Villages			✓	✓	✓
Sav Lift Stations #193	S.W. Quadrant PH 2 Master			✓	✓	✓
Sav Lift Stations #008	Magnolia Park / Derenne Ave. & Woodland Dr.			✓	✓	✓
Sav Lift Stations #060	Gulf Line / 6911 Skidaway Rd.			✓	✓	✓
Sav Lift Stations #128	Clinch Street / 4216 Clinch St.			✓	✓	✓
Sav Lift Stations #080	Bacon Park / Bacon Park Dr. & 1915 Eisenhower			✓	✓	✓
Sav Lift Stations #082	Bacon Park CH / Shorty Cooper Rd. @ Club House			✓	✓	✓
Sav Lift Stations #017	Woodley / 210 Windsor Rd.			✓	✓	✓
Sav Lift Stations #018	Tanglewood / Tanglewood Rd. & 12513 Gulf Club Dr.			✓	✓	✓
Sav Lift Stations #041	Mall Station / Mall Terrace & Mall Blvd. opposite Belk's			✓	✓	✓
Sav Lift Stations #071	Thorny Bush / Stillwood Dr. & Thorney Bush Rd.			✓	✓	✓
Sav Lift Stations #095	Ogeecheeton / 2718 Ryals St.			✓	✓	✓
Sav Lift Stations #116	Chatham Parkway #3 / 1000 Chatham Pkwy. @ Hwy. 17			✓	✓	✓
Sav Lift Stations #136	Arlington Apartments / 7500 Waters Rd.			✓	✓	✓
Sav Lift Stations #145	Indigo Point/ 4750 SE LaRoche Ave.			✓	✓	✓
Water Tank	Agonic Road - 5,000,000			✓	✓	✓
Sav Lift Stations #159	Cross Roads Bus Ctr #3 / East of I-95 off S Side of Jimmy DeLoach			✓	✓	✓
Sav Lift Stations #029	Louisiana / 2614 Louisiana Ave. &			✓	✓	✓

Facility	Address	CAT 1	CAT 2	CAT 3	CAT 4	CAT 5
	Pennsylvania Ave.					
Sav Lift Stations #032	Mayfair / Sallie Mood Dr. & Montgomery X-Rds.			✓	✓	✓
Storm Water Pump Station	City Hall			✓	✓	✓
Sav Well #14	Windsor Forest on Briarcliff Cir. @ Windsor Rd.			✓	✓	✓
Sav Well #23	Largo Dr. @ Berkshire West			✓	✓	✓
Sav Lift Stations #172	Sweetwater / 225-L Sweetwater Station			✓	✓	✓
Sav Lift Stations #188	Cobblestone Subdivision			✓	✓	✓
Water Tank	Largo Drive - 500,000 Gallons			✓	✓	✓
Sav Well #06	Cornell Ave. @ Waters Ave.			✓	✓	✓
Sav Well #13	Montgomery Crossroad @ Hodgson Memorial Dr.			✓	✓	✓
Sav Lift Stations #011	Oglethorpe Park / 601 Cranman Dr. & Arthur Circle			✓	✓	✓
Sav Lift Stations #035	Windsor / Largo Dr. & 623 Windsor Rd.			✓	✓	✓
Sav Lift Stations #047	Eisenhower Drive / 34016 Eisenhower Dr. & Waters Ave.			✓	✓	✓
Sav Lift Stations #049	Greenbriar / 13000 White Bluff Rd. @ 1 Greenbriar			✓	✓	✓
Sav Lift Stations #050	Berkshire West / 201 Hoover Creek Rd.			✓	✓	✓
Sav Lift Stations #059	Nicholson Woods / 36 N. Nicholson Dr.			✓	✓	✓
Sav Lift Stations #084	Southbridge #3 / 774 Southbridge Blvd.			✓	✓	✓
Southwest Branch Library	14097 Abercorn St.				✓	✓
Port City Branch Library	3501 Houlihan Ave., Garden City				✓	✓
Recreation Center - Hudson Hill Community	Hudson Ave. &W. Lathrop Ave. 31401				✓	✓
Maintenance Bldg	Cemetery				✓	✓
Administrative Offices	City Lot / Gwinnett St. & Stiles Ave.				✓	✓
Traffic Engineering	City Lot				✓	✓
Chatham Tag Office	Eisenhower Dr				✓	✓
Recreation Center - Woodwille Community	131 Darling Street 31401				✓	✓
Warehouse	City Lot				✓	✓
Administrative Offices	Daffin Park - Victory @ Waters				✓	✓
Recreation Center - Carver Heights Community	Collat St. & W. Gwinnett St. 31401				✓	✓
Administrative Offices	Development Services - 5515 Abercorn Street				✓	✓
Administrative Offices	10 Interchange Court				✓	✓
Recreation Center - Cunningham Golden Age	36th St & Abercorn / 1401 Mills B Lane, 31401				✓	✓
JUVENILE COURT	194 CARL GRIFFIN DR				✓	✓
Savannah Morning News	1375 Chatham Pkwy				✓	✓
Scott Drive Fuel Site	John Scott Drive				✓	✓
Fire Station #04	2401 Augusta Rd				✓	✓
Police Precinct #4 (Leased)	7804 Abercorn, Unit 5				✓	✓

Facility	Address	CAT 1	CAT 2	CAT 3	CAT 4	CAT 5
Police Training Unit	Savannah Mall				✓	✓
Memorial Hospital	4700 Waters Ave				✓	✓
Candler Hospital	5353 Reynolds Ave				✓	✓
Fire Station #08	2824 Bee Rd				✓	✓
Fire Station #06	3000 Liberty Parkway				✓	✓
Police Professional Standards	5313 Paulsen				✓	✓
Fire Station #02	5 Skyline Drive				✓	✓
Oglethorpe Acad. Middle	707 Stiles Avenue				✓	✓
Largo-Tibet Elementary	430 Tibet Avenue				✓	✓
Scott Alternative Learning Center	402 Market St				✓	✓
Coastal GA Academy	2001 Cynthia Street				✓	✓
Bartlett Middle	207 Montgomery Road				✓	✓
J. G. Smith Elementary	210 Lamara Drive				✓	✓
Ellis Elementary	220 East 49th Street				✓	✓
Windsor Forest High	12419 Largo Drive				✓	✓
Beach High	3001 Hopkins Street				✓	✓
Derenne Middle	3609 Hopkins Street				✓	✓
White Bluff Elementary	9902 White Bluff Rd.				✓	✓
Low Elementary	15 Blueridge Avenue				✓	✓
Butler Elementary	1909 Cynthia Street				✓	✓
Savannah Arts High	500 Washington Ave				✓	✓
Transportation Center	16 Industrial Circle				✓	✓
Sav Well #04	Gwinnett St. @West Boundary & I-16				✓	✓
Sav Well #31	400 Chatham Pkwy beside Sav. Gas Office				✓	✓
Sav Lift Stations #114	Chatham Parkway #1 / 1668 Chatham Pkwy. @ Hwy. 17				✓	✓
Sav Lift Stations #184	New City Lot #1 / Interchange Ct				✓	✓
Sav Lift Stations #185	New City Lot #2 / Interchange Ct.				✓	✓
Sav Lift Stations #178	Remington Park / 4307 Ogeechee Rd				✓	✓
Sav Lift Stations #182	Springs at Chatham Pkwy.				✓	✓
Sav Lift Stations #200	The Palms				✓	✓
Sav Lift Stations #022	Hopkins Street / 1025 W. 41st St. & Hopkins St.				✓	✓
Water Booster Station	Abercorn Street				✓	✓
Sav Lift Stations #016	Wilshire #2 / 11013 Largo Dr.				✓	✓
Sav Lift Stations #045	Tibet Avenue / Leeds Gate Rd. & 326 Tibet Ave.				✓	✓
Sav Lift Stations #028	Woodville / Division St. @ Canal St.				✓	✓
Sav Lift Stations #054	Vassar / 1417 Vassar St.				✓	✓
Sav Lift Stations #002	Herbed /next to 2441 E. 40th St.				✓	✓
Sav Lift Stations #052	Tatumville Park / Park @ W. 64th St off Coleman St.				✓	✓
Sav Lift Stations #046	Dan Vaden / Lewis Dr. & 9393 Abercorn				✓	✓

Facility	Address	CAT 1	CAT 2	CAT 3	CAT 4	CAT 5
Sav Lift Stations #062	35 & Cedar / 1227 E. 35th St. & Cedar St.				✓	✓
Sav Lift Stations #085	Village / Sunnybrook Rd. @ Meadow Brook Rd.				✓	✓
Sav Lift Stations #088	Fairmont / Fairmont Ave. @ White Bluff Rd.				✓	✓
County Lift Station	SPA				✓	✓
Sav Well #01	Walz Dr. @ Blue Ridge Rd.				✓	✓
Sav Well #02	Stiles Ave. @ Gwinnett St.				✓	✓
Sav Lift Stations #019	Shadow Oaks / 12410 Largo Dr.				✓	✓
Sav Lift Stations #024	Carver Village #1 / 901-L Allen Ave. & Chambers				✓	✓
Sav Lift Stations #025	Flatman / 1002 Collat Ave. & Winburn St.				✓	✓
Sav Lift Stations #044	Shoney's / 7917 Abercorn St. & White Bluff Rd.				✓	✓
Sav Lift Stations #068	Graham / Graham St. & 2160 Bay St.				✓	✓
Sav Lift Stations #094	Coakley / 2321 Coakley St. @ Shell Rd.				✓	✓
Sav Lift Stations #139	Chatham Center #2 / 6001 Chatham Ctr Dr. @ Chatham Pkwy.				✓	✓
Sav Lift Stations #166	North Godley / West of I-95 on 60-P Highlands Blvd.				✓	✓
Sav Lift Stations #030	Fernwood - Parkwood / 2236 North Fernwood Dr. end of April St				✓	✓
Sav Lift Stations #076	Feiler Terrace / 48th St. & Stanley St.				✓	✓
Sav Lift Stations #003	Daffin Heights / 2245 Mason Dr. & Lorraine Dr.				✓	✓
Sav Lift Stations #004	Solomon Park / 700 Blk E. 50th St. & Harmon St.				✓	✓
Sav Lift Stations #005	Abercorn Terrace / 61st St. & 4414 Abercorn				✓	✓
Sav Lift Stations #006	Lamara Apts. / 67th Street & 5200 Habersham St.				✓	✓
Sav Lift Stations #083	St. Joseph's / 11705 Mercey Blvd				✓	✓
Sav Lift Stations #183	Dean Forest Landfill #2 / Dean Forest Rd.				✓	✓
Sav Lift Stations #150	Land Fill / Dean Forest Rd. & Southbridge Blvd.				✓	✓
Sav Lift Stations #195	Little Neck Rd.				✓	✓
Sav Lift Stations #181	Louisville Rd. & Telfair				✓	✓
Sav Lift Stations #192	S.W. Quadrant PH 2 Regional				✓	✓
Water Tank	Travis Field - 150,000 Gallons				✓	✓
Water Tank	Travis Field - 225,000 Gallons				✓	✓
Sav Well #07	Victory Dr. @ Waters Ave. (Daffin Park)				✓	✓
Sav Well #09	Columbus Dr. & Abercorn St.				✓	✓
Sav Lift Stations #007	Panama / E. 57th St & Delesseps Ave. next to 1415				✓	✓
Sav Lift Stations #013	Paradise #1 / 9610 White Bluff Rd.				✓	✓
Sav Lift Stations #040	Travis Field / End of Mikell Ave. 400 Airways				✓	✓
Sav Lift Stations #064	Bee Road / Bee Rd. & Frost Dr.				✓	✓

Facility	Address	CAT 1	CAT 2	CAT 3	CAT 4	CAT 5
Sav Lift Stations #066	Victory Drive / West Victory Dr. & 3100 Kilowatt				✓	✓
Sav Lift Stations #135	Econo Lodge / 7500 Abercorn St. @ Posey St.				✓	✓
Sav Lift Stations #077	City Lot / Gwinnett St. & Stiles Ave.				✓	✓
Sav Lift Stations #078	Tuskeegee Street / 2004 Tuskeegee St. & Liberty Parkway				✓	✓
W.W. Law Branch Library	909 E. Bolton St.					✓
County Citizens' Service Center	Eisenhower Dr					✓
Chatham County Dept. Family & Children Services	761 Wheaton St					✓
Recreation Center - W.W. Law	Harmon & Waldburg St.					✓
Recreation Center - Blackshear Basketball Complex	Harmon St. / Wheaton St. 31401					✓
Whitney Administrative Complex	2 Laura St.					✓
Grayson Stadium	Victory Drive					✓
County Sheriff's Complex Annex	1055 Carl Griffin Dr					✓
County EOC	Police Memorial Dr					✓
Fire Station #13	11 McKenna Drive					✓
Police Precinct #1, 911 (County)	295 Police Memorial					✓
County Jail	1050 Carl Griffin Dr					✓
Southside Fire Dept Sta # 01	10703 White Bluff Road					✓
Police Precinct #3	1512 Bull Street					✓
Police Precinct #3 (New)	36th and Waters					✓
Fire Station #01	535 East 63rd Street					✓
Myers Middle	2316 Brevard Circle					✓
Godley Station K-8	Godley Station					✓
East Broad Street Elementary	400 East Broad St.					✓
Hubert Middle	768 Grant Street					✓
Woodville - Tompkins	151 Coach Joe Turner Drive					✓
I-95/ Jimmy de Loach Pkwy Overpass	Intersection of I 95 and Jimmy de Loach					✓
Sav Lift Stations #155	Crossroads Business I / 100 Crossroads Pkwy. near 1 Knowlton					✓
Sav Lift Stations #148	Airport #1 / 400 Airways Ave. I-95/Sav. Airport Dr.					✓
Sav Lift Stations #034	McAlpin / Wallin St. & 42nd St.					✓
Storm Water Pump Station	Gwinnett St					✓
Sav Lift Stations #087	Vassar Terrace / 1800 Vassar St. @ Liberty Pkwy.					✓
Sav Lift Stations #138	Chatham Center #1 / 3001 Chatham Ctr Dr. @ Chatham Pkwy.					✓

Facility	Address	CAT 1	CAT 2	CAT 3	CAT 4	CAT 5
Sav Lift Stations #160	Cross Roads Bus Ctr #4 / West of I-95 off S Side of Jimmy DeLoach					✓
Sav Lift Stations #031	Alpine / 25 Alpine Dr. & White Bluff Rd.					✓
Sav Lift Stations #165	Godley West #1 / West of I-95 on 1565 Benton Blvd.					✓
Sav Lift Stations #149	Airport #2 / Agate Dr. I-95 Sav. Airport Dr.					✓
Sav Lift Stations #189	Spring Lakes / 131 Spring Lakes Dr					✓
Sav Lift Stations #171	The Highlands / West of I-95 on 406-L Highlands Blvd.					✓
Sav Well #08	Edgewood Rd. @ Pierpoint Ave.					✓
Sav Well #10	Augusta Ave. @ East Lathrop Ave.					✓
Sav Lift Stations #009	Derenne Terrace / 2238 Derenne Ave. & Emory Dr.					✓
Sav Lift Stations #051	Feiler Park / 709 W. 59th St. & Meding Rd.					✓
Sav Lift Stations #053	Mitchell Street / 1401 Mitchell St.					✓

Source: Savannah 2014 Tax Assessor's Data, NOAA

Population at Risk

A hurricane surge analysis was conducted by intersecting the improved parcel layer provided by the City of Savannah with the polygon shapefile for each hurricane surge layer. In evaluating populations at risk, only those people residing in the hurricane storm surge zones are included. Thus, those improved residential parcels intersecting the hurricane surge zones were counted and multiplied by the 2010 Census Bureau household factor for the City of Savannah (2.53) as shown in Table 4.35.

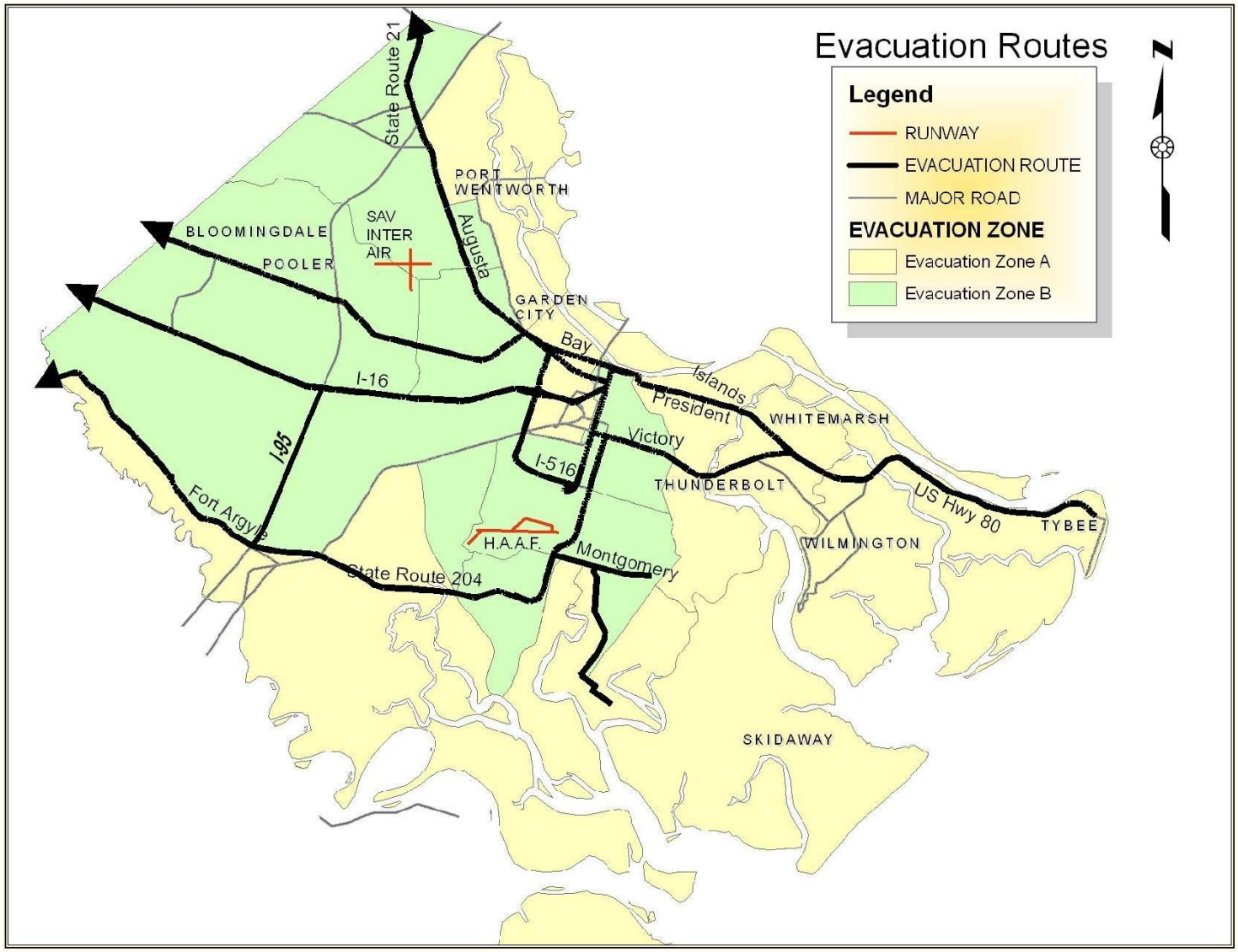
Table 4.35 - Population at Risk to Storm Surge

Surge Category	Residential Property Count	Population at Risk
Category 1	312	789
Category 2	1,231	3,114
Category 3	3,479	8,802
Category 4	5,303	13,417
Category 5	5,374	13,596
Total	**15,699**	**39,718**

Source: Savannah 2014 Tax Assessor's Data, U.S. Census Bureau (2010)

Evacuation Zones

Chatham County has two hurricane evacuation zones (Evacuation Zones 1 and 2) as shown in Figure 4.43. Once an evacuation order is issued all major roadway networks within Chatham County will be considered evacuation routes for local travel. Evacuation routes from the County to inland areas have also been designated. They include GA 204, GA 21, US 80, and I-16.



Source: Chatham County Emergency Management Agency

Figure 4.43 - Chatham County Evacuation Routes

4.4 Capability Assessment

The Metropolitan Planning Commission is a joint planning agency for the City of Savannah and Chatham County. Each governmental body appoints seven members to the board. Two of these members are the City and County Managers. These fourteen members serve without pay and represent government, private enterprise, and citizens' interest groups. Commissioners are appointed for three year overlapping terms. MPC staff, headed by an Executive Director, research and evaluate issues and prepare information for the Board's consideration and action.

SAGIS (Savannah Area Geographic Information System) is focused on providing access to geospatial data in a standardized format to all interested parties. The SAGIS mission is to consolidate geospatial information into one central location, providing a one stop access to information. SAGIS works with the City of Savannah, Chatham County, The Metropolitan Planning Commission and a variety of other non-profit and private organizations to maintain standards, manage data, educate and coordinate projects that affect the greater Savannah - Chatham County area.

Table 4.36 lists regulatory mitigation capabilities, including planning and land management tools, typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in the City of Savannah.

Table 4.36 - Regulatory Mitigation Capabilities

Regulatory Tool (ordinances, codes, plans)	Y/N	Date	Comments
Comprehensive Plan	Y	2006	Chatham County – Savannah MPC
Zoning Ordinance	Y		
Subdivision Ordinance	Y	Revised 2005	
Floodplain Ordinance	Y		
Stormwater Ordinance	Y	2012	
Erosion, Sedimentation and Pollution Control Ordinance	Y		
Building Code	Y		Georgia Building Code; International Building Code (2012 Edition)
BCEGS Rating	Y		4/4
Stormwater Management Program	Y		NPDES Permit #GAS000205
Site Plan Review Requirements	Y		
Capital Improvements Plan	Y	2013-2017	
Economic Development Plan			Economic Element of Comprehensive Plan
Local Emergency Operations Plan	Y		Chatham County Emergency Management
Flood Insurance Study or Other Engineering Study for Streams	Y	7/7/2014	
Repetitive Loss Plan	N		
Elevation Certificates	Y		

4.4.1 Administrative/Technical Mitigation Capabilities

Table 4.37 identifies personnel responsible for activities related to mitigation and loss prevention in the City of Savannah.

Table 4.37 - Administrative/Technical Capabilities

Resource	Y/N	Responsible Department
Planner/Engineer with knowledge of land development/land management practices	Y	Community Planning and Development
Engineer/Professional trained in construction practices related to buildings and/or infrastructure	Y	Development Services
Planner/Engineer/Scientist with an understanding of natural hazards	Y	Development Services
Personnel skilled in GIS	Y	SAGIS
Full time building official	Y	Development Services
Floodplain Manager	Y	Development Services
Emergency Manager	Y	Office of Emergency Management
Grant writer	Y	Department of Cultural Affairs
GIS data – Hazard areas	Y	Development Services / SAGIS
GIS data – Critical facilities	Y	Development Services
GIS data – Land use	Y	Development Services / SAGIS
GIS data – Building footprints	Y	Development Services / SAGIS
GIS data – Links to Assessor's data	Y	Development Services / SAGIS
Warning Systems/Services	Y	Office of Emergency Management

4.4.2 Fiscal Mitigation Capabilities

Table 4.38 identifies financial tools or resources that the City could potentially use to help fund mitigation activities.

Table 4.38 - Fiscal Mitigation Capabilities

Resource	Accessible/Eligible to Use (Y/N)
Community Development Block Grants	Y
Capital improvements project funding	Y
Authority to levy taxes for specific purposes	Y
Fees for water, sewer, gas or electric services	Y
Impact fees for new development	Y
Incur debt through general obligation bonds	N
Incur debt through special tax bonds	N
Incur debt through private activity bonds	N
Withhold spending in hazard prone areas	N

5 MITIGATION STRATEGY

Requirement §201.6(c)(3): [The plan shall include] a mitigation strategy that provides the jurisdiction's blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs and resources, and its ability to expand on and improve these existing tools.

This section describes the mitigation strategy process and mitigation action plan for the City of Savannah Floodplain Mitigation Plan. It describes how the City met the following requirements from the 10-step planning process:

- Planning Step 6: Set Goals
- Planning Step 7: Review Possible Activities
- Planning Step 8: Draft an Action Plan

5.1 Mitigation Strategy: Overview

The results of the planning process, the risk assessment, the goal setting, and the identification of mitigation actions led to the mitigation strategy and mitigation action plan for this FMP. Section 5.2 below identifies the goals and objectives of this plan and Section 5.4 details the new mitigation action plan. The following umbrella mitigation strategy was developed for this FMP:

Communicate the hazard information collected and analyzed through this planning process as well as FMPC success stories so that the community better understands what can happen where and what they themselves can do to be better prepared.

Implement the action plan recommendations of this plan.

Use existing rules, regulations, policies, and procedures already in existence.

Monitor multi-objective management opportunities so that funding opportunities may be shared and packaged and broader constituent support may be garnered.

5.1.1 Continued Compliance with the NFIP

Given the flood hazards in the planning area, an emphasis will be placed on continued compliance with the NFIP and participation in the CRS. The City meets or exceeds the following minimum requirements as set by the NFIP:

- Issuing or denying floodplain development/building permits
- Inspecting all development to assure compliance with the local ordinance
- Maintaining records of floodplain development
- Assisting in the preparation and revision of floodplain maps
- Helping residents obtain information on flood hazards, floodplain map data, flood insurance and proper construction measures

The City's Development Services Department is responsible for the review and approval of all development applications to the City. The Department coordinates all required plan reviews by city infrastructure departments (stormwater, water & sewer, park & tree, traffic, and streets), the zoning department, the Metropolitan Planning Commission (MPC), and building specialties (structural, plumbing, electrical, mechanical, etc.). The Department also coordinates the issuance of the Certificate of Occupancy for all new or renovated building construction, completion letters for site work and building shells and acceptance of new publicly maintained infrastructure (streets, drainage, water, sewer, etc...). Once a development begins actual construction, there are a number of periodic on-site inspections performed by trained inspection staff to ensure compliance before the construction can proceed toward completion. The Development Services Department also maintains the record of all map revisions and changes received from FEMA. As a part of the services offered to the public, the Development Services Department provides FEMA floodplain mapping information, flood insurance program information, flooding hazards, and proper construction methods within the special flood hazard area.

The CRS was created in 1990. It is designed to recognize floodplain management activities that are above and beyond the NFIP's minimum requirements. The City of Savannah is currently classified as a Class 6 community, which gives a 20% premium discount to individuals in the Special Flood Hazard Area, and a 10% discount to policyholders outside the Special Flood Hazard Area. The following is a summary of the CRS Activities for which the City of Savannah currently receives credit based on the 2009 verification report:

Activity 310 – Elevation Certificates: The Building Department maintains elevation certificates for new and substantially improved buildings. Copies of elevation certificates are made available upon request. Elevation Certificates are also kept in computer format.

Activity 320 – Map Information Service: Credit is provided for furnishing inquirers with flood zone information from the community's latest Flood Insurance Rate Map (FIRM), publicizing the service annually and maintaining records.

Activity 330 – Outreach Projects: A community brochure is mailed to all properties in the community on an annual basis. An outreach brochure is mailed annually to all properties in the community's SFHA. The community also displays flood information at public buildings and public events.

Activity 340 – Hazard Disclosure: Credit is provided for state and community regulations requiring disclosure of flood hazards.

Activity 350 – Flood Protection Information: Documents relating to floodplain management are available in the reference section of the Live Oak Public Library. Credit is also provided for floodplain information displayed on the community's website.

Activity 360 – Flood Protection Assistance: The community provides technical advice and assistance to interested property owners and annually publicizes the service.

Activity 410 – Additional Flood Data: Credit is provided for a cooperating technical partnership agreement with FEMA.

Activity 420 – Open Space Preservation: Credit is provided for preserving land in the SFHA as open space. Credit is also provided for open space land that is deed restricted.

Activity 430 – Higher Regulatory Standards: Credit is provided for enforcing regulations that require freeboard for new and substantial improvement construction, cumulative substantial improvement,

protection of critical facilities, protection of floodplain storage capacity, enclosure limits, other higher regulatory standards, state mandated regulatory standards, and for enforcing the Georgia Building Code. Credit is also provided for a Building Code Effectiveness Grading Schedule (BCEGS) Classification of 4/4 and for staff education and certification as a floodplain manager.

Activity 440 – Flood Data Maintenance: Credit is provided for maintaining and using digitized maps in the day to day management of the floodplain. Credit is also provided for establishing and maintaining a system of benchmarks and maintaining copies of all previous FIRMs and Flood Insurance Study Reports.

Activity 450 – Stormwater Management: The community enforces regulations for soil and erosion control.

Activity 510 – Floodplain Management Planning: Based on the updates made to the NFIP Report of Repetitive Losses as of September 30, 2009, the City of Savannah has 222 repetitive loss properties and is a Category C community for CRS purposes. All requirements for the 2009 cycle have been met. Credit is provided for the adoption and implementation of the Floodplain Management Plan. Since the City of Savannah is a Category C community with an approved Floodplain Management Plan, a progress report must be submitted on an annual basis.

Activity 520 – Acquisition and Relocation: Credit is provided for acquiring and relocating buildings from the community's flood hazard area.

Activity 540 – Drainage System Maintenance: A portion of the community's drainage system is inspected regularly throughout the year and maintenance is performed as needed by City of Savannah Public Works Department. Records are being maintained for both inspections and required maintenance. The community also enforces a regulation prohibiting dumping in the drainage system.

Activity 610 – Flood Warning Program: Credit is provided for a program that provides timely identification of impending flood threats, disseminates warnings to appropriate floodplain residents, and coordinates flood response activities.

Activity 630 – Dam Safety: All Georgia communities currently receive CRS credit for the state's dam safety program.

A new verification report was completed in February 2015 after the January 2015 Cycle Verification Visit. The development of this Floodplain Mitigation Plan began prior to the January 2015 visit.

5.2 Goals and Objectives

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

Section 4.0 documents the flood hazards and associated risks that threaten the City of Savannah including the vulnerability to structures, infrastructure, and critical facilities. Section 4.0 also evaluates the capacity of the City to reduce the impact of those hazards. The intent of Goal Setting is to identify areas where improvements to existing capabilities (policies and programs) can be made so that community vulnerability is reduced. Goals are also necessary to guide the review of possible mitigation measures. This Plan needs to make sure that recommended actions are consistent with what is appropriate for the City. Mitigation goals need to reflect community priorities and should be consistent with other plans in the City.

Goals: are general guidelines that explain what is to be achieved. They are usually broad-based policy type statements, long term and represent global visions. Goals help define the benefits that the plan is trying to achieve.

Objectives: are short term aims, when combined, form a strategy or course of action to meet a goal. Unlike goals, objectives are specific and measurable.

5.2.1 Coordination with Other Planning Efforts

The goals of this plan need to be consistent with and complement the goals of other planning efforts. The primary planning document where the goals of this Plan must complement and be consistent with is the Chatham County Hazard Mitigation Plan and the Chatham County-Savannah Comprehensive Plan. The Comprehensive Plan is important as it is developed and designed to guide future growth within the community. Therefore, there should be some consistency in the overall goals and how they relate to each other. Likewise, the goals of the County's Hazard Mitigation Plan play an important role as it also focuses on flood hazards and mitigation projects.

5.2.2 Goal Setting Exercise

On December 9, 2014, the Savannah FMPC conducted an exercise to outline goals for this floodplain mitigation plan. The first part of the exercise including asking each committee member: *"What would you most like to see in Savannah's future?"* Each member was given a handout which appears in Figure 5-1.

Committee members wrote down their choices on post-it-notes. Each member then explained their choices to the larger committee membership. The notes were posted on the wall and then organized by similar topics. There was some consistency in the members' topics. The handout has 20 possible statements, but the members' nominations included fewer than half of them. The resulting similar topics (in order of most nominations) are listed below:

- Educated children
- Improved/more job opportunities
- Special attention given to lower income areas
- Improved water quality
- Improved more recreation facilities
- Younger people staying/moving into area

- Less traffic congestion
- Improved/more public transportation
- Focus on crime reduction/prevention

December 9, 2014 FMPC Meeting

A second exercise was then conducted to recommend mitigation goals. Each member was given the hand out that appears in Figure 5-2 which asks *"What should be the goals of the mitigation program?"* Committee members wrote down their top three choices on post-it-notes. Each member explained their choices to the larger membership. After the notes were placed on the wall, they were then organized by similar topics. The resulting goals (in order of most nominations) are listed below:

- Protect people's lives
- Protect wetlands/environmentally sensitive areas
- Make sure future development doesn't make things worse
- Restrict development in hazardous areas
- Protect critical facilities
- Protect public health
- Protect utilities
- Protect repetitively flooded areas
- Confine new development to area already developed
- New development should pay full costs of protective measures

The goal statements selected by committee members were in line with what they wanted to see in Savannah's future. The exercise revealed important information to guide the planning effort. For example, members stressed the importance of protecting lives and property, even though improving the economy and increasing the number of jobs was an important part of their vision for the future.

5.2.3 Resulting Goals and Objectives

At the end of the exercises, the FMPC agreed upon four general goals for this planning effort. The FMPC also included objectives in support of the goals. The refined goals and objectives include:

Goal 1 - Expand the City's flood hazard communication and outreach program.

Objective 1.1: Engage the Chatham County Schools to develop a flood mitigation curriculum.

Objective 1.2: Demonstrate the flood model to school students and at science nights.

Objective 1.3: Evaluate the City's flood hazard outreach program through development of a CRS Program for Public Information (PPI).

Objective 1.4: Encourage residents to assume an appropriate level of responsibilities for their own flood protection.

Goal 2 - Reduce damage to insurable buildings in repetitively flooded areas.

Objective 2.1: Prioritize stormwater management projects that target repetitive loss areas.

Objective 2.2: Develop a property buyout master plan to identify and purchase repetitive loss properties.

Objective 2.3: Recommend purchase of flood insurance and use of the Increased Cost of Compliance (ICC) provision to mitigate flood damage.

Goal 3 - Protect critical and essential facilities from flood damage.

Objective 3.1: Prioritize critical and essential facilities in need of protection from flood damage.

Objective 3.2: Provide 100- and 500-year flood protection to critical and essential facilities for dry land access.

Objective 3.3: Leverage emergency management and other funding sources to retrofit critical facilities.

Goal 4 - Reduce damage to development through flood resilient strategies and measures.

Objective 4.1: Encourage a no adverse impact approach to reduce damage to existing development.

Objective 4.2: Consider increasing riparian impervious surface setbacks to help protect the natural and beneficial functions of the floodplain.

Objective 4.3: Purchase vulnerable lands through available funding mechanisms to protect development and provide park and recreation opportunity for residents.

Objective 4.4: Improve building checklist and technical review process to ensure buildings are constructed in accordance with the flood damage prevention ordinance and meet appropriate insurance standards.

Objective 4.5: Prioritize capital improvement projects to address areas where poor drainage causes substantial flooding.

Objective 4.6: Encourage the location of development outside the areas of special flood hazard (100-year flood zone) and provide standards to minimize public and private losses due to flood conditions in areas of special flood hazard.

Goals Exercise – Part 1

What would you most like to see in Savannah's future?

Here are possible answers to this question, listed in alphabetical order. Pick three that you think are most important. You may reword them or add new ones if you want.

You have three cards. Use one card for each of your top three answers.

- Educated children
- Improved air quality
- Improved water quality
- Less new development
- Less traffic congestion
- Improved/more businesses
- Improved/more cultural facilities
- Improved/more housing
- Improved/more public transportation
- Improved/more job opportunities
- Improved/more knowledgeable residents
- Improved/more open space
- Improved/more shopping
- New development confined to areas already developed
- Preserved historical/cultural sites
- Special attention given to elderly/disabled
- Special attention given to lower income areas
- Special attention given to newer shopping areas
- Special attention given to older business areas
- Younger people staying/moving into the area
- Other_____

Figure 5.1 - Handout for Goals Exercise – Part 1

Goals Exercise – Part 2

What should be the goals of our mitigation program?

Here are possible answers to this question, listed in alphabetical order. Pick three that you think are most important. You may reword them or add new ones if you want.

You have three cards. Use one card for each of your top three answers.

- Help people protect themselves
- Make sure future development doesn't make things worse
- Maximize the share paid by benefiting property owners
- Maximize use of state and federal funds
- Minimize property owner's expenditures
- Minimize public expenditures
- New developments should pay the full cost of protection measures
- Protect businesses from damage
- Protect cars and other vehicles
- Protect centers of employment
- Protect critical facilities
- Protect forests
- Protect homes
- Protect new/future buildings
- Protect people's lives
- Protect power stations and power lines
- Protect public health
- Protect public services (fire, police, etc.)
- Protect repetitively flooded areas
- Protect scenic areas, greenways, etc.
- Protect schools
- Protect shopping areas
- Protect streets
- Protect utilities (power, phone, water, sewer, etc.)
- Protect wetlands/environmentally sensitive areas
- Protect a particular area_____
- Protect a particular property_____
- Restrict development in hazardous areas
- Use public/private partnerships
- Other_____

Figure 5.2 - Handout for Goals Exercise – Part 2

5.3 Identification and Analysis of Mitigation Activities

Requirement §201.6(c)(3)(ii): [The mitigation strategy section shall include a] section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure. All plans approved by FEMA after October 1, 2008, must also address the jurisdiction's participation in the NFIP, and continued compliance with NFIP requirements, as appropriate.

In order to identify and select mitigation projects to support the mitigation goals, each hazard identified in Section 4.1 Hazard Identification was evaluated. The following were determined to be priority flood-related hazards:

- Climate Change and Sea Level Rise
- Coastal/Canal Bank Erosion
- Flood: 100-/500-year
- Flood: Stormwater/ Localized Flooding
- Hurricane and Tropical Storms (including Storm Surge)

Once it was determined which flood hazards warranted the development of specific mitigation actions, the FMPC analyzed viable mitigation options that supported the identified goals and objectives. The FMPC was provided with the following list of mitigation categories which are utilized as part of the CRS planning process.

- Prevention (Required to be evaluated)
- Floodplain Management Regulatory/current & future conditions
- Property Protection
- Natural Resource Protection
- Emergency Services
- Structural Projects
- Public Information and Outreach

The FMPC was also provided with examples of potential mitigation actions for each of the above categories. The FMPC was instructed to consider both future and existing buildings in evaluating possible mitigation actions. A facilitated discussion then took place to examine and analyze the options. Appendix B, Mitigation Strategy, provides a detailed discussion organized by CRS mitigation category of possible mitigation alternatives to assist the City in the review and identification of possible mitigation activities. This comprehensive review of possible mitigation activities details why some were appropriate for implementation and why others were not. As promoted by CRS, Prevention type mitigation alternatives were discussed for the flood hazards. This discussion was followed by a brainstorming session that generated a list of preferred mitigation actions by hazard.

5.3.1 Prioritization Process

Once the mitigation actions were identified, the FMPC was provided with several decision-making tools, including FEMA's recommended prioritization criteria, STAPLEE sustainable disaster recovery criteria; Smart Growth principles; and others, to assist in deciding why one recommended action might be more important, more effective, or more likely to be implemented than another. STAPLEE stands

for the following:

- Social: Does the measure treat people fairly? (e.g. different groups, different generations)
- Technical: Is the action technically feasibly? Does it solve the problem?
- Administrative: Are there adequate staffing, funding and other capabilities to implement the project?
- Political: Who are the stakeholders? Will there be adequate political and public support for the project?
- Legal: Does the jurisdiction have the legal authority to implement the action? Is it legal?
- Economic: Is the action cost-beneficial? Is there funding available? Will the action contribute to the local economy?
- Environmental: Does the action comply with environmental regulations? Will there be negative environmental consequences from the action?

In accordance with the DMA requirements, an emphasis was placed on the importance of a benefit-cost analysis in determining action priority. It was agreed that the following four criteria would be used to determine the priority of the action items:

- Contribution of the action to save life or property
- Availability of funding and perceived cost-effectiveness
- Available resources for implementation
- Ability of the action to address the problem

A comprehensive review of mitigation measures was performed using the criteria (alternatives and selection criteria) in Appendix B.

With these criteria in mind, FMPC members were asked to prioritize each mitigation project based on whether the project should be considered a short term, medium range or long range priority. The priority time frames for project implementation were determined to be as follows:

Short Range = Project should be completed in less than one year
Medium Range = Project should be completed in two to three years
Long Range = Project should be completed in more than four years

The process of identification and analysis of mitigation alternatives allowed the FMPC to come to consensus and to prioritize recommended mitigation actions. The FMPC discussed the contribution of the action to saving lives or property as first and foremost, with additional consideration given to the benefit-cost aspect of a project; however, this was not a quantitative analysis. The team agreed that prioritizing the actions collectively enabled the actions to be ranked in order of relative importance and helped steer the development of additional actions that meet the more important objectives while eliminating some of the actions which did not garner much support. Benefit-cost was also considered in greater detail in the development of the Mitigation Action Plan detailed below in Section 5.4. The cost-effectiveness of any mitigation alternative will be considered in greater detail through performing benefit-cost project analyses when seeking FEMA mitigation grant funding for eligible actions associated with this plan.

5.4 Mitigation Action Plan

Requirement §201.6(c)(3)(iii): [The mitigation strategy section shall include an] action plan describing how the actions identified in section (c)(3)(ii) will be prioritized, implemented, and administered by the local jurisdiction. Prioritization shall include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs.

This action plan was developed to present the recommendations developed by the FMPC for how the City of Savannah can reduce the risk and vulnerability of people, property, infrastructure, and natural and cultural resources to future disaster losses. Emphasis was placed on both future and existing development. The action plan summarizes who is responsible for implementing each of the prioritized actions as well as when and how the actions will be implemented. Each action summary also includes a discussion of the benefit-cost review conducted to meet the regulatory requirements of the Disaster Mitigation Act. Table 5-1 identifies the mitigation actions.

It is important to note that the City of Savannah has many existing, detailed action descriptions, which include benefit-cost estimates, in other planning documents, such as, stormwater plans, and capital improvement budgets and reports. These actions are considered to be part of this plan, and the details, to avoid duplication, should be referenced in their original source document. The FMPC also realizes that new needs and priorities may arise as a result of a disaster or other circumstances and reserves the right to support new actions, as necessary, as long as they conform to the overall goals of this plan.

Further, it should be clarified that the actions included in this mitigation strategy are subject to further review and refinement; alternatives analyses; and reprioritization due to funding availability and/or other criteria. The City is not obligated by this document to implement any or all of these projects. Rather this mitigation strategy represents the desires of the community to mitigate the risks and vulnerabilities from identified hazards. The actual selection, prioritization, and implementation of these actions will also be further evaluated in accordance with the CRS mitigation categories and criteria contained in Appendix B.

Table 5.1 - Summary of City of Savannah Mitigation Actions

ID	Action	Related to Goal	Address Current Development	Address Future Development	Continued Compliance with NFIP	Mitigation Category
Existing Mitigation Actions Carried Forward from 2010 Plan						
1	Comprehensive evaluation of drainage system and implementation of selected projects.	4	✓	✓		Structural Projects
2	Enhance Drainage system maintenance program to unclog storm drains/ clear drainage channels and a public education component on proper yard waste disposal and eliminate brush disposal in canals.	1, 4	✓	✓		Prevention, Natural Resource Protection, Public Information and Outreach
3	Ensure the City's new zoning code limits development in floodplains and wetlands to low density, and that a certain percentage of land remains protected as open space to provide a natural buffer from water bodies.	4	✓	✓		Prevention, Natural Resource Protection
4	Reserve vacant low-lying/flood-prone/wetland areas for open space through acquisition or regulation	4	✓	✓		Prevention, Natural Resource Protection
5	Evaluate FEMA-purchased properties for the highest use in floodwater/stormwater storage.	4	✓	✓		Prevention, Property Protection
6	Require in the revision of the Subdivision Ordinance that all new subdivisions dedicate 20% of land as green space.	4	✓	✓		Prevention, Property Protection
7	Designate GDOT properties that are unused as areas for flood storage.	4	✓	✓		Prevention, Property Protection
8	Reduce future vulnerability of Valambrosa area through acquisition or regulation.	2, 4	✓	✓		Prevention, Property Protection
9	Add additional higher regulations to the Flood Damage Prevention Ordinance that will prohibit enclosures of areas of	4	✓	✓	✓	Prevention, Floodplain Management Regulatory

ID	Action	Related to Goal	Address Current Development	Address Future Development	Continued Compliance with NFIP	Mitigation Category
	greater than 300 square feet below the BFE.					Property Protection
10	Continue acquisition/demolition of high-risk flood-prone properties.	2, 4	✓			Prevention, Property Protection
11	Evaluate the feasibility of a floodproofing program for homes where acquisition is not an option – especially historic structures.	2, 4	✓			Prevention, Property Protection
12	Target repetitive loss structures by conducting a detailed study as outlined in the RLAA.	2	✓			Prevention, Property Protection
13	Target critical facilities for flood mitigation.	3	✓			Prevention, Property Protection, Emergency Services
14	Post flood mitigation information at libraries, post offices, heavily trafficked municipal buildings and community centers. Develop and post "potential high water mark" signs.	1	✓		✓	Public Information and Outreach
15	Continue to enhance newly implemented City website "flood protection information' webpage.	1	✓		✓	Public Information and Outreach
16	Continue coordination with CEMA, NWS and USGS to enhance flood warning system.	4	✓	✓		Emergency Services
17	Continue flood preparedness and outreach activities at local community events	1	✓		✓	Public Information and Outreach
18	Mail information to all structures in the floodplain promoting flood insurance and sound floodplain management practices.	1	✓		✓	Public Information and Outreach
19	Organize public information campaign and organize public cleanups to reduce litter/debris in storm drains.	1	✓		✓	Public Information and Outreach, Natural Resource Protection
20	Conduct public outreach and direct	1, 2	✓		✓	Public Information and Outreach

ID	Action	Related to Goal	Address Current Development	Address Future Development	Continued Compliance with NFIP	Mitigation Category
	technical assistance – particularly targeting repetitive loss properties and discussion of potential funding.					
21	Establish program aimed at providing flood protection assistance to owners of flood-prone properties, including site visits and advice on retrofitting and other flood mitigation measures.	1,2	✓		✓	Property Protection, Public Information and Outreach
22	Educate the public on the use of permeable concrete paving and establishment of rain gardens to reduce flash flooding impacts.	1	✓	✓	✓	Public Information and Outreach
23	Interview and coverage on local news, in newspaper articles and through advertisement to promote flood mitigation.	1	✓		✓	Public Information and Outreach
24	Provide flood mitigation update and outreach to neighborhood groups and other interested parties via an email group address.	1	✓		✓	Public Information and Outreach
25	Organize annual/semi-annual single-focus public workshops/meetings to discuss flood mitigation.	1	✓		✓	Public Information and Outreach
26	Provide flood protection assistance to vulnerable populations (elderly, disabled and low-income individuals) so they can purchase flood insurance.	1	✓		✓	Public Information and Outreach
27	Strategically focus SPLOST funds toward identified drainage improvement projects.	4	✓	✓		Structural Projects
28	Complete AW-501 forms for acquired Repetitive Loss properties to remove from FEMA Repetitive Loss Property list (or classify each as “mitigated”).	2	✓		✓	Prevention, Property Protection
29	Promote flood insurance through community notification to citizens and	1	✓		✓	Public Information and Outreach

ID	Action	Related to Goal	Address Current Development	Address Future Development	Continued Compliance with NFIP	Mitigation Category
	business personnel by newspapers, letters, and public outreach.					
30	Document drainage improvements in SFHAs and request revisions to the applicable FIRM maps to reflect new conditions through the FEMA LOMR process.	4		✓	✓	Prevention
New Mitigation Actions						
1	Remove building code/insurance disconnect through education of builders/realtors and modification of technical review checklist (cross-check NFIP/Insurance/Ordinance/IBC).	4		✓	✓	Prevention, Property Protection
2	Develop outreach strategy to educate building community on new flood maps.	1		✓	✓	Public Information and Outreach
3	Modify Flood Damage Prevention Ordinance to include LiMWA criteria.	4		✓	✓	Prevention, Property Protection
4	Prioritize CIP projects to address flooding in the following areas: Victory Drive, Skidaway & 41st, 37th MLK, Montgomery & 52nd, Abercorn & 65th, Springfield Canal, Cloverdale, Detention Pond @ 52nd Derenne, Bilbo basin and Placentia basin.	2, 4				Structural Projects
5	Complete a study to evaluate the effectiveness of a stormwater utility based on impervious area and its impact on the typical homeowner.	4	✓	✓		Structural Projects
6	Chatham County Emergency Management (CEMA) will provide a prioritized list of critical facilities.	3	✓			Property Protection, Emergency Services
7	The City of Savannah will adopt the	4	✓			Emergency Services

ID	Action	Related to Goal	Address Current Development	Address Future Development	Continued Compliance with NFIP	Mitigation Category
	CEMA Post-Disaster Mitigation Plan and Pre-Disaster Mitigation Plan.					
8	Consider expanding riparian impervious surface setbacks including a 25' setback on coastal marshland and wetlands.	4		✓		Prevention, Natural Resource Protection
9	Support the Chatham County-Savannah MPC Greenway Plan and coordinate with the MPC on the Plan as needed.	4		✓		Prevention, Natural Resource Protection
10	Consider participation in FEMA's high water mark initiative.	1			✓	Public Information and Outreach
11	Coordinate with the Chatham County Resource Protection Land to acquire lands vulnerable to flooding through SPLOST funds.	4		✓		Prevention, Natural Resource Protection
12	Create a Natural Floodplain Functions Plan and a Repetitive Loss Area Analysis	2, 4	✓	✓	✓	Property Protection, Natural Resource Protection
13	Develop a Watershed Master Plan for the City	2, 3, 4	✓	✓		Prevention, Property Protection, Natural Resource Protection

5.5 Detailed Mitigation Actions

5.5.1 Existing Mitigation Actions Carried Forward from 2010 Plan

1. **Project Description:** Conduct a full-scale evaluation of comprehensive drainage system to identify needed projects and sources of funds. Implement the projects from this evaluation.

   Responsible Office: CIP Management

   Potential Funding: SPLOST

   Timeframe: On-going

2. **Project Description:** Enhance Drainage system maintenance program to unclog storm drains/ clear drainage channels and a public education component on proper yard waste disposal and eliminate brush disposal in canals. Areas to be determined through evaluation and reporting of blockage. One area routinely experiencing issues is the Ardsley Park area.

   Responsible Office: CIP Management; Facilities Maintenance

   Potential Funding: Facilities Maintenance Budget

   Timeframe: On-going

3. **Project Description:** Ensure the City's new zoning code limits development in floodplains and wetlands to low density, and that a certain percentage of land remains protected as open space to provide a natural buffer from water bodies.

   Responsible Office: Development Services

   Potential Funding: City budget

   Timeframe: On-going

4. **Project Description:** Reserve vacant low-lying/flood-prone/wetland areas for open space through acquisition or regulation.

   Responsible Office: Development and Real Property Services

   Potential Funding: City budget and FEMA mitigation grant funds

   Timeframe: On-going

5. **Project Description:** Evaluate FEMA-purchased properties for the highest use in providing floodwater/stormwater storage and in accordance with authorized uses per FEMA regulations. Consider creative flood storage uses like cisterns, constructed wetlands, etc.

   Responsible Office: Real Property Services; Stormwater Mgmt

Potential Funding: City budget

Timeframe: On-going

6. **Project Description:** Require in the revision of the Subdivision Ordinance that all new subdivisions dedicate 20% of land as green space. This land cannot be used as part of the detention or retention ponds and wetlands or marshes.

   Responsible Office: Development Services

   Potential Funding: City budget

   Timeframe: On-going

7. **Project Description:** Designate GDOT properties that are unused as areas for flood storage.

   Responsible Office: Stormwater Management

   Potential Funding: City budget

   Timeframe: On-going

8. **Project Description:** Reduce future vulnerability of Valambrosa area through acquisition or regulation.

   Responsible Office: Development Services

   Potential Funding: City budget

   Timeframe: Medium Range (Next 2-3 years)

9. **Project Description:** Add to the Flood Damage Protection Ordinance additional higher regulations that will prohibit enclosures of areas of 300 square feet or greater for enclosures below the BFE for limited storage.

   Responsible Office: Development Services

   Potential Funding: City budget

   Timeframe: On-going

10. **Project Description:** Continue acquisition/demolition mitigation of high-risk flood-prone properties. The highest priorities are properties at the greatest flood risk and where drainage improvements will not provide an adequate level of protection.

    Responsible Office: Real Property Services

    Potential Funding: FEMA mitigation grant funds and SPLOST

    Timeframe: On-going

11. **Project Description:** Evaluate the feasibility of a floodproofing program for homes where acquisition is not an option – especially historic structures (dry floodproofing of historic structures eligible under FMA/SRL programs) and elevation. While elevation has its limitations with the predominant foundation type in the City (slab-on-grade), there may be some houses where it its more feasible.

    Responsible Office: Development and Real Property Services

    Potential Funding: FEMA mitigation grant funds for eligible type projects and SPLOST

    Timeframe: On-going

12. **Project Description:** Target Repetitive Loss structures for mitigation by conducting a detailed study as outlined in the Repetitive Loss Area Analysis (RLAA) CRS activity (under Activity 510). This action may involve several different mitigation techniques including acquisition/demolition.

    Responsible Office: Development and Real Property Services

    Potential Funding: SPLOST and FEMA mitigation grant funds (SRL)

    Timeframe: On-going

13. **Project Description:** Target critical facilities for flood mitigation and set up an assessment process for each one that follows the same steps as the Repetitive Loss Area Analysis.

    Responsible Office: Various City agencies

    Potential Funding: SPLOST and FEMA mitigation grant funds

    Timeframe: On-going

14. **Project Description:** Post flood mitigation information at libraries, post offices, heavily trafficked municipal buildings, and community centers. Develop and post "potential high water mark signs" for various flood hazard events in hazardous floodplain areas. Locations include community centers and include city contacts for those who seek more information.

    Responsible Office: Development Services

    Potential Funding: City budget

    Timeframe: On-going

15. **Project Description:** Continue to enhance newly implemented City website "flood protection information' webpage.

    Responsible Office: Public Information Office

    Potential Funding: City budget

Timeframe: On-going

16. **Project Description:** Continue coordination with CEMA, the National Weather Service (NWS), and USGS to enhance flood warning system, including the use of rain/stream gauges, to provide greater warning time for citizens. NWS can use the real-time data collected to issue timely warnings

    Responsible Office: Public Safety (Emergency Management)

    Potential Funding: City budget for coordination and state/federal funds for enhancement

    Timeframe: On-going

17. **Project Description:** Continue flood preparedness and outreach activities at local community events, such as the Home Depot Hurricane Expo.

    Responsible Office: Public Information Office and Development Services

    Potential Funding: City budget

    Timeframe: On-going

18. **Project Description:** Mail information to all structures in the floodplain promoting flood insurance and sound floodplain management practices.

    Responsible Office: Development Services

    Potential Funding: City budget

    Timeframe: On-going

19. **Project Description:** Organize public information campaign and organize public cleanups to reduce litter/debris in storm drains.

    Responsible Office: Public Information Office, local environmental organizations, Facilities Maintenance

    Potential Funding: City budget

    Timeframe: On-going

20. **Project Description:** Conduct public outreach and direct technical assistance – particularly targeting repetitive loss properties and discussion of potential funding.

    Responsible Office: Development Services

    Potential Funding: City budget

    Timeframe: On-going

21. **Project Description:** Establish program aimed at providing flood protection assistance to owners of

flood-prone properties, including site visits and advice on retrofitting and other flood mitigation measures.

Responsible Office: Development Services

Potential Funding: City budget

Timeframe: On-going

22. **Project Description:** Educate the public on the use of permeable concrete paving and establishment of rain gardens to reduce flash flooding impacts.

    Responsible Office: Local environmental groups; Savannah State and Georgia Tech; Stormwater Services and Engineering

    Potential Funding: Organizational budgets

    Timeframe: On-going

23. **Project Description:** Interviews and coverage on local news, in newspaper articles and through advertisement to promote flood mitigation.

    Responsible Office: Steering Committee; Public Information Office; Savannah State; Georgia Tech

    Potential Funding: City budget

    Timeframe: On-going

24. **Project Description:** Provide flood mitigation updates and outreach to neighborhood groups and other interested parties via an email group address.

    Responsible Office: City Steering Committee and Development Services

    Potential Funding: City budget

    Timeframe: On-going

25. **Project Description:** Organize annual/semi-annual single-focus public workshops/meetings to discuss flood mitigation. A suggested time is at the start of hurricane season.

    Responsible Office: Public Information Office, Development Services, and CEMA

    Potential Funding: City budget

    Timeframe: On-going

26. **Project Description:** Provide flood protection assistance to vulnerable populations (elderly, disabled and low-income individuals) so they can purchase flood insurance.

    Responsible Office: Real Property Services; Savannah State U.

Potential Funding: City budget

Timeframe: Medium Range (Next 2-3 years)

27. **Project Description:** Strategically focus SPLOST funds toward identified drainage improvement projects.

    Responsible Office: CIP Management

    Potential Funding: City budget

    Timeframe: On-going

28. **Project Description:** Complete AW-501 forms for acquired Repetitive Loss properties to remove from FEMA Repetitive Loss Property list (or classify each as "mitigated").

    Responsible Office: Development Services

    Potential Funding: City budget

    Timeframe: On-going

29. **Project Description:** Promote flood insurance through community notification to citizens and business personnel by newspapers, letters, and public outreach.

    Responsible Office: Development Services

    Potential Funding: City budget

    Timeframe: On-going

30. **Project Description:** Document drainage improvements in SFHAs and request revisions to the applicable FIRM maps to reflect new conditions through the FEMA LOMR process.

    Responsible Office: Development Services

    Potential Funding: FEMA

    Timeframe: On-going

5.5.2 New Mitigation Actions

1. **Project Description: Remove building code/insurance disconnect through education of builders/realtors and modification of technical review checklist (cross-check NFIP/Insurance/Ordinance/IBC).**

Hazards Addressed: All flood hazards

Issue/Background: As part of a dwelling's foundation system, the IBC allows a 2X6 wall to be built to support the first floor; however the Flood Insurance industry will charge the residence a higher flood premium because the foundation is not built out of piles, piers, post, columns, or stem wall. There is a need to provide an ongoing fact sheet that looks at the different industries requirements of building construction aspects that have negative impacts on the owner, undermines the other codes, or differs from one another.

Other Alternatives: Request IBC change to the foundation system requirements

Existing Planning Mechanism(s) through which Action Will Be Implemented: City's CRS outreach program

Responsible Office: Development Services

Priority (H, M, L): High

Cost Estimate: City employee time ($30/hr. per employee)

Benefits (Losses Avoided): Lower flood insurance premiums for residents

Potential Funding: City operating budget

Timeframe: Within 12 months

2. Project Description: Develop outreach strategy to educate building community on new flood maps.

Hazards Addressed: 100 and 500-Year Floods

Issue/Background: As the new FIRMs are adopted, the BFEs and flood zones may change. For example, what was once an X Zone is now an AE Zone, or what was once an AE Zone is now in the Floodway or LiMWA Zone.

Other Alternatives: Do nothing

Existing Planning Mechanism(s) through which Action Will Be Implemented: City's CRS outreach program

Responsible Office: Development Services

Priority (H, M, L): Medium

Cost Estimate: $1,000 for design, printing, and postage of flyers.

Benefits (Losses Avoided): Increased awareness of potential flood damage to structures

Potential Funding: City operating budget

Timeframe: Within 24 months

3. **Project Description: Modify Flood Damage Prevention Ordinance (FDPO) to include LiMWA criteria.**

Hazards Addressed: 100-Year Flood

Issue/Background: The current FDPO provides regulatory language for the AE and VE construction, but the ordinance does not include language for the new LiMWA zone that will be mapped on the revised FIRMs which become effective in 2016. The adoption will match the Unincorporated Chatham County FDPO.

Other Alternatives: Don't change FDPO language

Existing Planning Mechanism(s) through which Action Will Be Implemented: City's Flood Damage Prevention Ordinance

Responsible Office: Development Services

Priority (H, M, L): Medium

Cost Estimate: $200: City employee labor cost to write the new language and adopt the new FDPO.

Benefits (Losses Avoided): Awareness of damage from 1.5' to 3.0' waves on non-elevated coastal structures

Potential Funding: City operating budget

Timeframe: When the new floodplain maps become effective

4. **Project Description: Prioritize CIP projects to address flooding in the following areas: Victory Drive, Skidaway & 41st, 37th MLK, Montgomery & 52nd, Abercorn & 65th, Springfield Canal, Cloverdale, Detention Pond @ 52nd Derenne, Bilbo basin and Placentia basin.**

Hazards Addressed: Localized stormwater and poor drainage

Issue/Background: The City of Savannah continues to have nuisance flooding that hinders traffic flow on many city streets including emergency vehicle routes. Interruption of emergency vehicles to reach medical patients or fires could threaten lives and property.

Other Alternatives: Do nothing

Existing Planning Mechanism(s) through which Action Will Be Implemented: City's Capital Improvement Program

Responsible Office: Stormwater Department (CIP)

Priority (H, M, L): High

Cost Estimate: $300,000,000+

Benefits (Losses Avoided): Prevent flood damage to insurable buildings

Potential Funding: City SPLOST funding

Timeframe: Within 12 months

5. **Project Description: Complete a study to evaluate the effectiveness of a stormwater utility based on impervious area and its impact on the typical homeowner.**

Hazards Addressed: All flood hazards

Issue/Background: Storm water system requires funds to provide better customer service and to maintain and upgrade the storm water system. The funds would allow the City to provide better services to address the new State's clean water quality requirements and the increasing development that shed additional storm water to the aging pipe and canal system.

Other Alternatives: Rely on other sources of funding

Existing Planning Mechanism(s) through which Action Will Be Implemented: City's Stormwater Management Design Manual and new ordinance

Responsible Office: Stormwater Department and City Council

Priority (H, M, L): Medium

Cost Estimate: $500,000

Benefits (Losses Avoided): Reduced damage to insurable buildings

Potential Funding: City operating budget

Timeframe: Within 36 months

6. **Project Description: Chatham County Emergency Management (CEMA) will provide a prioritized list of critical facilities.**

Hazards Addressed: All flood hazards

Issue/Background: Need a list of critical facilities structures that store hazardous materials or buildings that will be used during an emergency event such as a hurricane or other natural event. These buildings will be regulated by the FDPO which requires the structure and access route to be built above the 500 year storm event.

Other Alternatives: Work form non-prioritized list of critical facilities

Existing Planning Mechanism(s) through which Action Will Be Implemented: City's Floodplain Mitigation Plan and County's Emergency Management Plan

Responsible Office: Savannah Fire & Emergency Services Hazardous Materials Team, Fire Department (Emergency Management Director), and Development Services.

Priority (H, M, L): Medium

Cost Estimate: $24,000 (Two employees x 30 days)

Benefits (Losses Avoided): Identification of facilities which are used as shelters during emergencies which also store hazardous materials that could be detrimental to the health of citizens

Potential Funding: City's operating budget

Timeframe: Within 36 months

7. **Project Description: The City of Savannah will adopt the CEMA Post-Disaster Mitigation Plan and Pre-Disaster Mitigation Plan. Continue to develop City of Savannah Pre and Post Mitigation as well as Long Term Recovery and Redevelopment Plans that are more focused on the needs of the City of Savannah in the future.**

Hazards Addressed: All flood hazards

Issue/Background: To create a more sustainable and resilient community, the City of Savannah needs to participate and adopt the CEMA's Pre and Post Mitigation Plans. Additionally, to receive future funding from federal grants for City projects the City Council will need to adopt the plans.

Other Alternatives: Do nothing

Existing Planning Mechanism(s) through which Action Will Be Implemented: Chatham County's Pre and Post Disaster Mitigation Plans

Responsible Office: CEMA and Fire Department (Emergency Management Director)

Priority (H, M, L): Medium

Cost Estimate: Staff time

Benefits (Losses Avoided): Reduced damage to insurable buildings and protection of the health, safety, and welfare of the residents

Potential Funding: Chatham County (N/A to city of Savannah)

Timeframe: Within 36 months

8. **Project Description: Consider expanding riparian impervious surface setbacks including a 25' setback on coastal marshland and wetlands.**

Hazards Addressed: All flood hazards

Issue/Background: Expansion of the setback is an effort to protect the natural and beneficial functions of the salt water marsh, wetlands, and floodplain. The City of Savannah will hold public meetings; produce flyers promoting and educating the public of the benefit; and will write and adopt an ordinance.

Other Alternatives: Leave riparian setbacks as current

Existing Planning Mechanism(s) through which Action Will Be Implemented: Zoning Ordinance

Responsible Office: Water & Sewer Director, Chatham County - Savannah Metropolitan Planning Commission, and City Council

Priority (H, M, L): Low

Cost Estimate: $24,000

Benefits (Losses Avoided): Increased setbacks from streams, channels, wetlands, and other water sources protects those features from degradation and protects buildings from potential flood damage

Potential Funding: City's operating budget

Timeframe: Within 60 months

9. Project Description: Support the Chatham County-Savannah MPC Greenway Plan and coordinate with the MPC on the Plan as needed.

Hazards Addressed: All flood hazards

Issue/Background: Greenway plans provide natural and beneficial functions of the floodplain by protecting certain areas of the city from development. Connectivity of green space (open space) benefits both Savannah and Chatham County. Working together to provide for additional greenways or open space provides not only a recreation benefit but an ecological benefit of protected land from development and intrusion into sensitive areas.

Other Alternatives: Develop a Savannah specific greenway plan

Existing Planning Mechanism(s) through which Action Will Be Implemented: City's Park and Recreation Master Plan and the Chatham County-Savannah MPC Greenway Plan

Responsible Office: Parks and Recreation Department

Priority (H, M, L): Low

Cost Estimate: Staff time

Benefits (Losses Avoided): Protected land means potential development is restricted so no insurable building can be constructed

Potential Funding: City and County combined funding of the MPO

Timeframe: Within 48 months

10. Project Description: Consider participation in FEMA's high water mark initiative.

Hazards Addressed: 100 and 500 Year Floods

Issue/Background: Need a physical high water marker that represents historic flooding depth throughout Savannah' neighborhoods and business districts. The program is designed to improve the public's awareness of flood risk and encourage them to take action to reduce it.

Other Alternatives: Non participation

Existing Planning Mechanism(s) through which Action Will Be Implemented: City CRS outreach program

Responsible Office: Development Services

Priority (H, M, L): Medium

Cost Estimate: $20,000

Benefits (Losses Avoided): Awareness of the damage associated with flooding

Potential Funding: City's operating budget

Timeframe: Within 36 months

11. Project Description: Coordinate with the Chatham County Resource Protection Land to acquire lands vulnerable to flooding through SPLOST funds and other grant opportunities.

Hazards Addressed: All flood hazards

Issue/Background: Savannah still has areas that continue to flood and may see an increase risk of flooding as higher tides and higher intensity storms pass through Savannah. The areas that continue to flood become blighted properties and raise health concerns. These properties need to be evaluated to determine if use of the property is still practical or if the property should be purchased for demolition. Purchasing the flooded areas provides a means to protect the affected families' lives and property by relocating them out of harm's way of flooding. The cleared property will provide green space not only for plant and animal habitat, but also preserve wetlands, naturally treat storm water runoff, allow for groundwater infiltration, and recreational opportunities that lead to healthier communities.

Other Alternatives: Allow development to occur everywhere

Existing Planning Mechanism(s) through which Action Will Be Implemented: Zoning and subdivision control ordinances

Responsible Office: Parks and Recreation Department in cooperation with the Chatham County-

Savannah MPO and the Savannah City Council

Priority (H, M, L): Medium

Cost Estimate: $1,000,000

Benefits (Losses Avoided): Prevention of development in hazardous areas

Potential Funding: SPLOST Funding

Timeframe: Within 36 months

12. Create a Natural Floodplain Functions Plan and a Repetitive Loss Area Analysis

Hazards Addressed: All flood hazards

Issue/Background: Planning is the key to reducing future damage to repetitive loss structures and to protect the natural and beneficial functions of the floodplain. By undertaking these planning efforts, the City of Savannah will have a multi-objective approach to floodplain management. When combined with its Floodplain Mitigation Plan, the community at large and individual buildings will be evaluated and examined in the planning context.

Other Alternatives: Don't plan

Existing Planning Mechanism(s) through which Action Will Be Implemented: N/A. New plans will be developed

Responsible Office: Development Services

Priority (H, M, L): High

Cost Estimate: $16,000

Benefits (Losses Avoided): Reduced damage to repetitive loss buildings and protection of natural resources

Potential Funding: Already obligated through contract with contractor

Timeframe: Within 6 months

13. Develop a Watershed Master Plan for the City

Hazards Addressed: All flood hazards

Issue/Background: The objective of watershed master planning is to provide the community with a tool it can use to make decisions that will reduce the increased flooding from development on a watershed-wide basis. In addition to the present- and future-conditions hydrology studies, a watershed master plan should include mitigation recommendations that are appropriate for the community. These recommendations should include the entire range of mitigation activities—regulations, public

information, structural control of runoff, non-structural programs (including stormwater management regulations), protection of sensitive natural areas, and acquisition of flood-prone properties.

A watershed master plan must, at a minimum, address the regulatory standards for new development. The modeling may show that different standards are needed for different watersheds, or for different parts of the watershed. Communities may also find as a result of their modeling that their existing stormwater management regulations are adequate or they may decide to make them more stringent to prevent development from increasing the frequency and severity of existing problems.

Other Alternatives: Don't plan

Existing Planning Mechanism(s) through which Action Will Be Implemented: N/A. New plan will be developed

Responsible Office: Development Services

Priority (H, M, L): High

Cost Estimate: $20,000

Benefits (Losses Avoided): Reduced damage to buildings and protection of natural resources

Potential Funding: SPLOST Funding

Timeframe: Within 6 months

6 PLAN ADOPTION

Requirement §201.6(c)(5): [The plan shall include] documentation that the plan has been formally approved by the governing body of the jurisdiction requesting approval of the plan (e.g., City Council, County Commissioner, Tribal Council).

The purpose of formally adopting this plan is to secure buy-in from the City of Savannah, raise awareness of the plan, and formalize the plan's implementation. The adoption of this plan completes Planning Step 9 of the 10-step planning process: Adopt the Plan, in accordance with the requirements of DMA 2000. The Savannah City Council has adopted the Floodplain Mitigation Plan by passing a resolution. A copy of the executed resolution is shown below.

Note to Reviewers: When this plan has been reviewed and approved pending adoption by FEMA Region IV, the adoption resolutions will be signed and added here.

7 PLAN IMPLEMENTATION AND MAINTENANCE

Requirement §201.6(c)(4): [The plan maintenance process shall include a] section describing the method and schedule of monitoring, evaluating, and updating the mitigation plan within a five-year cycle.

Implementation and maintenance of the plan is critical to the overall success of hazard mitigation planning. This is Planning Step 10 of the 10-step planning process. This section provides an overview of the overall strategy for plan implementation and maintenance and outlines the method and schedule for monitoring, updating, and evaluating the plan. The section also discusses incorporating the plan into existing planning mechanisms and how to address continued public involvement.

7.1 Implementation

Once adopted, the plan must be implemented in order to be effective. While this plan contains many worthwhile actions, the City of Savannah will need to decide which action(s) to undertake first. The priority assigned the actions in the planning process and funding availability will affect that decision. Low or no-cost actions most easily demonstrate progress toward successful plan implementation.

An important implementation mechanism that is highly effective and low-cost is incorporation of the Floodplain Mitigation Plan recommendations and their underlying principles into other plans and mechanisms, such as the Chatham County – Savannah Comprehensive Plan. The City already implements policies and programs to reduce losses to life and property from hazards. This plan builds upon the momentum developed through previous and related planning efforts and mitigation programs and recommends implementing actions, where possible, through these other program mechanisms.

Mitigation is most successful when it is incorporated into the day-to-day functions and priorities of government. Implementation will be accomplished by adhering to the schedules identified for each action and through constant, pervasive, and energetic efforts to network and highlight the multi-objective, win-win benefits to each program and the community. This effort is achieved through the routine actions of monitoring agendas, attending meetings, and promoting a safe, sustainable community. Additional mitigation strategies could include consistent and ongoing enforcement of existing policies and vigilant review of programs for coordination and multi-objective opportunities.

Simultaneous to these efforts, it is important to maintain a constant monitoring of funding opportunities that can be leveraged to implement some of the more costly recommended actions. This will include creating and maintaining a bank of ideas on how to meet local match or participation requirements. When funding does become available, the City will be in a position to capitalize on the opportunity. Funding opportunities to be monitored include special pre- and post-disaster funds, state and federal earmarked funds, benefit assessments, and other grant programs, including those that can serve or support multi-objective applications.

Responsibility for Implementation of Goals and Activities

Elected officials, officials appointed to head community departments and community staff are charged with implementation of various activities in the plan. During the quarterly reviews as described later in this section, an assessment of progress on each of the goals and activities in the plan will be determined and noted. At that time, recommendations will be made to modify timeframes for completion of activities, funding resources, and responsible entities. On a quarterly basis, the priority standing of

various activities may also be changed. Some activities that are found not to be doable may be deleted from the plan entirely and activities addressing problems unforeseen during plan development may be added.

7.1.1 Role of Floodplain Mitigation Planning Committee in Implementation, Monitoring and Maintenance

With adoption of this plan, the City will be responsible for the plan implementation and maintenance. The FMPC identified in Section 3 will reconvene **quarterly** each year to ensure mitigation strategies are being implemented and the City continues to maintain compliance with the NFIP. As such, the City agrees to continue its relationship with the FMPC and:

- Act as a forum for flood mitigation issues;
- Disseminate flood mitigation ideas and activities to all participants;
- Pursue the implementation of high-priority, low/no-cost recommended actions;
- Ensure flood mitigation remains a consideration for community decision makers;
- Maintain a vigilant monitoring of multi-objective cost-share opportunities to help the community implement the plan's recommended actions for which no current funding exists;
- Monitor and assist in implementation and update of this plan;
- Report on plan progress and recommended revisions to the City Council; and
- Inform and solicit input from the public.

The primary duty is to see the plan successfully carried out and report to the City Council, GEMA, FEMA, and the public on the status of plan implementation and mitigation opportunities. Other duties include reviewing and promoting mitigation proposals, considering stakeholder concerns about flood mitigation, passing concerns on to appropriate entities, and posting relevant information on the City's website (and others as appropriate).

7.2 Maintenance

Plan maintenance implies an ongoing effort to monitor and evaluate plan implementation and to update the plan as progress, roadblocks, or changing circumstances are recognized.

7.2.1 Maintenance Schedule

The City of Savannah's Development Services Department is responsible for initiating plan reviews. In order to monitor progress and update the mitigation strategies identified in the action plan, the City will revisit this plan quarterly and following a hazard event. The City will submit a five-year written update to GEMA and FEMA Region IV, unless disaster or other circumstances (e.g., changing regulations) require a change to this schedule. With this plan update anticipated to be fully approved and adopted in 2015, the next plan update for the City will occur in 2020.

7.2.2 Maintenance Evaluation Process

Evaluation of progress can be achieved by monitoring changes in vulnerabilities identified in the plan. Changes in vulnerability can be identified by noting:

- Decreased vulnerability as a result of implementing recommended actions;
- Increased vulnerability as a result of failed or ineffective mitigation actions; and/or
- Increased vulnerability as a result of new development (and/or further annexation).

Updates to this plan will:

- Consider changes in vulnerability due to action implementation;
- Document success stories where mitigation efforts have proven effective;
- Document areas where mitigation actions were not effective;
- Document any new hazards that may arise or were previously overlooked;
- Incorporate new data or studies on hazards and risks;
- Incorporate new capabilities or changes in capabilities;
- Incorporate growth and development-related changes to infrastructure inventories; and
- Incorporate new action recommendations or changes in action prioritization.

Changes will be made to the plan during the update process to accommodate for actions that have failed or are not considered feasible after a review of their consistency with established criteria, time frame, community priorities, and/or funding resources. Actions that were not ranked high but were identified as potential mitigation activities will be reviewed as well during the monitoring and update of this plan to determine feasibility of future implementation. Updating of the plan will be by written changes and submissions, as is appropriate and necessary, and as approved by the City Council. In keeping with the five-year update process, the FMPC will convene public meetings to solicit public input on the plan and its routine maintenance and the final product will be adopted by the City Council.

Specifically, the City will adhere to the following process for the next update of this FMP:

Quarterly Plan Review Process

For the 2015 Floodplain Mitigation Plan update review process, the City of Savannah's Development Services Department will be responsible for facilitating, coordinating, and scheduling reviews and maintenance of the plan. The review of the Floodplain Mitigation Plan will be conducted as follows:

- The City's Development Services Department will place an advertisement in the local newspaper advising the public of the date, time, and place for each quarterly review of the plan and will be responsible for leading the meeting to review the plan.
- Notices will be mailed to the members of the FMPC, federal, state, and local agencies, non-profit groups, local planning agencies, representatives of business interests, neighboring communities, and others advising them of the date, time, and place for the review.
- Local City officials will be noticed by email and telephone or personal visit and urged to participate.
- Members of the Chatham County – Savannah Metropolitan Planning Commission and other appointed commissions and groups will also be noticed by email and either by telephone or personal visit.
- Prior to the review, department heads and others tasked with implementation of the various activities will be queried concerning progress on each activity in their area of responsibility and asked to present a report at the review meeting.
- The local news media will be contacted and a copy of the current plan will be available for public comment.
- After the review meeting, minutes of the meeting and a quarterly report will be prepared by the FMPC and forwarded to the news media (public) and the ISO/CRS specialist for the CRS program. The report will also be presented to the City Council for review, and a request will be made that the Council take action to recognize and adopt any changes resulting from the review.

Criteria for Quarterly Reviews

The criteria recommended in 44 CFR 201 and 206 will be utilized in reviewing and updating the plan. More specifically, the quarterly reviews will include the following information:

- Community growth or change in the past quarter.
- The number of substantially damaged or substantially improved structures by flood zone
- The renovations to public infrastructure including water, sewer, drainage, roads, bridges, gas lines, and buildings.
- Natural hazard occurrences that required activation of the Emergency Operations Center (EOC) and whether or not the event resulted in a presidential disaster declaration.
- Natural hazard occurrences that were not of a magnitude to warrant activation of the EOC or a federal disaster declaration but were severe enough to cause damage in the community or closure of businesses, schools, or public services.
- The dates of hazard events descriptions.
- Documented damages due to the event.
- Closures of places of employment or schools and the number of days closed.
- Road or bridge closures due to the hazard and the length of time closed.
- Assessment of the number of private and public buildings damaged and whether the damage was minor, substantial, major, or if buildings were destroyed. The assessment will include residences, mobile homes, commercial structures, industrial structures, and public buildings, such as schools and public safety buildings.
- Review of any changes in federal, state, and local policies to determine the impact of these policies on the community and how and if the policy changes can or should be incorporated into the Floodplain Mitigation Plan. Review of the status of implementation of projects (mitigation strategies) including projects completed will be noted. Projects behind schedule will include a reason for delay of implementation.

7.2.3 Incorporation into Existing Planning Mechanisms

Another important implementation mechanism that is highly effective and low-cost is incorporation of the Floodplain Mitigation Plan recommendations and their underlying principles into other plans and mechanisms. Where possible, plan participants will use existing plans and/or programs to implement hazard mitigation actions. As previously stated, mitigation is most successful when it is incorporated into the day-to-day functions and priorities of government and development. As described in this plan's capability assessment, the City of Savannah already implement policies and programs to reduce losses to life and property from hazards. This plan builds upon the momentum developed through previous and related planning efforts and mitigation programs and recommends implementing actions, where possible, through these other program mechanisms. These existing mechanisms include:

- Chatham County Pre- and Post-Disaster Mitigation Plans
- Chatham County – Savannah Comprehensive Plans
- Emergency Management Plans
- Ordinances
- Flood/stormwater management/master plans
- Other plans, regulations, and practices with a mitigation focus

Those involved in these other planning mechanisms will be responsible for integrating the findings and recommendations of this plan with these other plans, programs, etc., as appropriate. As described in

Section 7.1 Implementation, incorporation into existing planning mechanisms will be done through the routine actions of:

- Monitoring other planning/program agendas;
- Attending other planning/program meetings;
- Participating in other planning processes; and
- Monitoring community budget meetings for other community program opportunities.

The successful implementation of this mitigation strategy will require constant and vigilant review of existing plans and programs for coordination and multi-objective opportunities that promote a safe, sustainable community.

Efforts should continuously be made to monitor the progress of mitigation actions implemented through other planning mechanisms and, where appropriate, their priority actions should be incorporated into updates of this Floodplain Mitigation Plan.

7.2.4 Continued Public Involvement

Continued public involvement is imperative to the overall success of the plan's implementation. The update process provides an opportunity to solicit participation from new and existing stakeholders and to publicize success stories from the plan implementation and seek additional public comment. The plan maintenance and update process will include continued public and stakeholder involvement and input through attendance at designated committee meetings, web postings, press releases to local media, and through public hearings.

Public Involvement Process for Quarterly Reviews

The public will be noticed by placing an advertisement in the newspaper specifying the date and time for the review and inviting public participation. The FMPC, local, state, and regional agencies will be notified and invited to attend and participate.

Public Involvement for Five-year Update

When the FMPC reconvenes for the update, they will coordinate with all stakeholders participating in the planning process—including those that joined the committee since the planning process began—to update and revise the plan. In reconvening, the FMPC plans to identify a public outreach subcommittee, which will be responsible for coordinating the activities necessary to involve the greater public. The subcommittee will develop a plan for public involvement and will be responsible for disseminating information through a variety of media channels detailing the plan update process. As part of this effort, public meetings will be held and public comments will be solicited on the plan update draft. The subcommittee will also coordinate this public outreach process with the public information program established pursuant to the most current guidelines from the CRS.

Appendix A

Appendix A: Planning Process

Planning Step 1: Organize to Prepare the Plan

Table A-1: FMPC Meeting Dates

Note: All FMPC Meetings were open to the public.

Meeting Type	Meeting Topic	Meeting Date	Meeting Location
FMPC #1 (Kick-off)	1) Introduction to DMA, CRS and the planning process 2) Organize resources: the role of the FMPC, planning for public involvement, and coordinating with other agencies and stakeholders 3) Introduction to hazard identification	August 6, 2014	City of Savannah Development Service Office
FMPC #2	1) Review/discussion of Flood Risk Assessment (Assess the Hazard) 2) Review/discussion of Vulnerability Assessment (Assess the Problem)	November 12, 2014	City of Savannah Development Service Office
FMPC #3	1) Review of existing Goals from 2008 FMP 2) Development of new Goals for 2014 FMP	December 9, 2014	City of Savannah Development Service Office
FMPC #4	1) Review/status of existing Mitigation Strategies from 2008 FMP 2) Development of new/updated Mitigation Strategies for 2014 FMP	December 10, 2014	City of Savannah Development Service Office
FMPC #5	1) Review "Draft" Floodplain Mitigation Plan 2) Solicit comments and feedback from the FMPC	February 12, 2015	City of Savannah Development Service Office

Table A-2: FMPC Invitation List

First Name	Last Name	Organization	Phone	Email	Address 1	Address 2
City/County Departments (several are on the Flood Committee)						
Dennis	Jones	Savannah-Chatham Co. Emergency Mgmt Agency	(912) 201-4500	DTJones@Chathamcounty.org	24 Bull Street, Suite 140	Savannah, Georgia 31401
Rob	Gordon	Savannah Board of Education, The Risk Management Department, Director of Risk Management	(912) 395-1080	rob.gordon@sccpss.com	208 Bull Street	Savannah, GA 31401
Willie	Weil	Savannah Water Supply INDUSTRIAL & DOMESTIC WATER HWY 21 - GARDEN CITY	(912) 964-0698	WWeil@Savannahga.Gov	P.O. Box 1027	Savannah, Georgia 31401
Jackie	Jackson-Teel	Chatham County-Savannah Metropolitan Planning	(912) 651-1454	jacksonj@thempc.org	110 East State Street	Savannah GA 31401
George	Fidler	Savannah/ Hilton Head International Airport	(912) 964-0514	GFidler@savannahairport.com	400 Airways Avenue	Savannah, GA 31408
Bill	Hodgins	City of Savannah - Stormwater	(912) 650-7855	whodgins@Savannahga.Gov	P.O. Box 1027	Savannah GA 31402
Non-Profit Organizations						
Esther	Sheppard	American Red Cross , Chapter Development Manager	(912) 651-5349 office (912) 547-3750 cell	esther.sheppard@redcross.org	41 Park of Commerce Way, Bldg 200	Savannah, GA 31405
Ellen	Harris	Chatham County-Savannah Metropolitan Planning Commission_Historic Review	(912) 651-1482	harrise@thempc.org	110 East State Street	Savannah, GA. 31401
Katherine	Moore	The Georgia Conservancy – Sustainable Growth Program Manager	(912) 447-5910 Ext 106	kmoore@gaconservancy.org	Coastal Office, 428 Bull St.	Savannah, GA 31401
Jill	Bazinet	Georgia Association of Floodplain Managers (GAFM)	(678) 297-6203	jbazinet@alpharetta.ga.us	1790 Hembree Road	Alpharetta, GA 30009

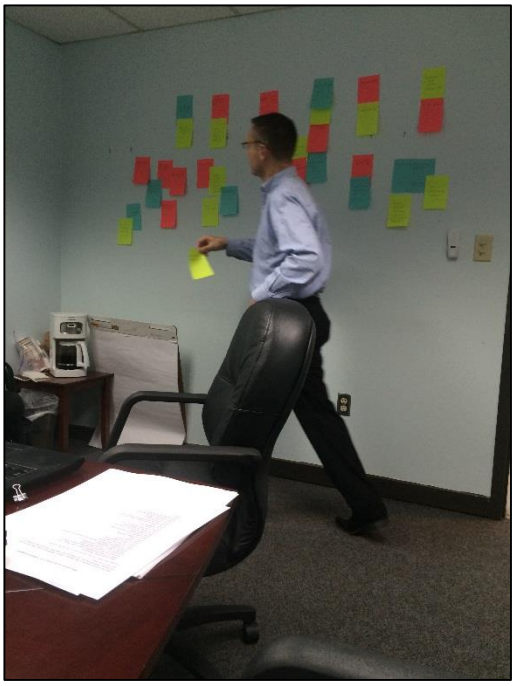
First Name	Last Name	Organization	Phone	Email	Address 1	Address 2
Judy	Jennings	Sierra Club – Coastal Group	(912) 352-0122	judy.jennings@georgia.sierraclub.org	7609 La Roche Ave	Savannah, GA 31406
John	Galvani	Coastal Georgia Audubon Society	(912) 638-3986	jgalvani@comcast.net	PO Box 21726	St. Simons Island, GA 31522
Bob	English	Savannah Boy Scouts	912-354-1188 home (912) 927-7272 office	bsa099@scouting.org	11900 Abercorn Street	Savannah, GA 31419
Educational Institutions						
Letty	Shearer,	Armstrong State University	(912) 344-2827	Letty.Shearer@armstrong.edu	11935 Abercorn Street	Savannah, Georgia 31419
D. Dionne	Hoskins	Savannah State University, Associate Graduate Professor: Fishery Biologist	(912) 358-4289	hoskins@savannahstate.edu	3219 College St	Savannah, GA 31404
Wei	Tu	Georgia Southern University, Geology & Geography	(912) 478-0668	wtu@georgiasouthern.edu	Post Office Box 8149	Statesboro, GA 30460
Helen	Morgan	Savannah College of Arts and Design	(912)525-8009 (912) 713-5101 cell		PO Box 2072	Savannah, GA 31402
Dr. Hermann	Fritz	Georgia Institute of Technology, Environmental Fluid Mechanics and Water Resources	(404) 385-1803	fritz@gatech.edu	Mason Building 2237, 790 Atlantic Drive	Atlanta, GA 30332
Dr. Marc	Fischer	Skidaway Institute of Oceanography- Educational Coordinator	(912) 598-2308	marc.frischer@skio.usg.edu	10 Ocean Science Circle	Savannah, Georgia 31411
Surrounding Municipalities						
Caroline R.	Nguyen	Town of Thunderbolt - Town Administrator	(912) 629-4650	cnguyen@thunderboltga.org	2821 River Dr	Thunderbolt, GA 31404
Terri	Turner	City of Augusta Planning & Development ASFPM Region 4 Representative	(706) 821-1796	tturner@augustaga.gov	525 Telfair Street	Augusta, GA 30901
Tom	Shillock	Georgia Dept of Natural Resources	(404) 675-1607	Tom.Shillock@dnr.state.ga.us	4220 International Parkway, Ste. 101	Atlanta, GA 30354
Jason	Allison	Wormsloe State Historic: Site Manager	(912) 353-3023	Jason.Allison@ga.dnr.org	7601 Skidaway Rd	Savannah, GA 31406

First Name	Last Name	Organization	Phone	Email	Address 1	Address 2
Terry	Lunn	Georgia Emergency Management Agency, Hazard Mitigation Unit , Director	terry.lunn@gema.ga.gov	terry.lunn@gema.ga.gov	P.O. Box 18055	Atlanta, Georgia 30316
Michael	Blakely	Chatham County Department of Engineering / Floodplain	(912) 652-7814	MBlakely@chathamcounty.org	124 Bull Street, Room 430	Savannah, Georgia 31401
Federal Government						
Tim	Russo	FEMA Region IV, Floodplain Management Branch	(770) 220-5420	Tim.Russo@fema.dhs.gov	3003 Chamblee Tucker Road	Atlanta, GA 30341
Jonathan	Lamb	National Weather Service	(843) 744-0303	Jonathan.lamb@noaa.gov	5777 South Aviation Avenue	North Charleston, SC 29406
Kelly	O'Rourke	**C**oastal Resources Specialist, Coastal Resources Division **GA** Department of Natural Resources	(912) 262-3249	Kelly.O'Rourke@dnr.state.ga.us	One Conservation Way	Brunswick, GA 31520
Business Community						
Steve	Hudson	Gulfstream	(912) 965-3371	steve.hudson@gulfstream.com	500 Gulfsteam Rd	Savannah, GA 31408
Brooke	Bass	Keller Williams Reality	(912) 655-9299	Brooke@Graciousmoves.com	1 Lachlan Ln.	Savannah, GA 31411
Alan	Vilshay	Georgia Power Co.	306-2310	ADVOLSKA@southernco.com	12016 Abercorn St	Savannah GA, 31405
Walter	Corrish	Corrish Insurance	(912) 354-2424	walterc@corishinsurance.com	6811 **Waters Ave**	Savannah, GA 31406
Russ	Riesinger	WSAV 3: Anchor/Reporter	(912) 644-6866	rriesinger@wsav.com	1430 East Victory Sr.	Savannah, GA 31404
Other Groups						
Mark	Bouy	The Home Builders Association of Greater Savannah	(912) 354-6193	patty@homebuildersofsavannah.com	7116 Hodgson Memorial Drive	Savannah, GA 31406
Karen	Jenkins	Savannah Tree Foundation, EXECUTIVE DIRECTOR	(912) 233-8733	Karen@SavannahTree.com	3025 Bull Street	Savannah, GA 31405
Ernestine	Jones	Homeowner's Association/Neighborhood Group	232-3270	cliftcjones@aol.com	1724 Stuyvesant St.	Savannah, GA 31405
Robert	Suttor	President Baldwin Park Neighbor Hood Assoc.	(919) 949-4059	rsutter017@gamail.com	652 MAUPAS AVE	Savannah, GA 31401

First Name	Last Name	Organization	Phone	Email	Address 1	Address 2
Virginia	Mobley	Thomas Square Neighborhood	238-9972	bygin@aol.com	201 E. 38th Street	Savannah, GA 31401
Jackie	Haberman	Windsor Forest Neighborhood	925-3620		511 Arlington Road	Savannah, GA 31419

FMPC Meeting Pictures, Minutes and Sign-in Sheets

November 12, 2014 FMPC Meeting



December 9, 2014 FMPC Meeting

December 10, 2014 FMPC Meeting

City of Savannah

Floodplain Mitigation Plan Committee Meeting

Development Service Office, 5515 Abercorn St. DATE: August 6, 2014 – 10:00 AM to 12:00 PM

Name	Address	Phone Number	Email
Jeff Morris	100 W. Oglethorpe Ave.	912-652-5008	jeffrey.s.morris@usace.army.mil
Jeff BRADY	5859 Abercorn St	912-356-3815	JEFFBRADY@ALLSTATE.COM
Sharyn Baggett	41 Park of Commerce	912-651-5311	Sharyn.Baggett@redcross.org
JON ALBRIGHT	Development Services	651-6510	jalbright@savannahga.gov
Jian Fei	E 802 Anderson Street	912-650-7855	jfei@savannahga.gov
Patty McIntosh	2203 Abercorn St.	912-651-6520	Pmcintosh@savannahga.gov
Jim Shirley	5 Interchange Ct	912-351-3847	JShirley@SavannahGa.Gov
DAN STOWERS	121 E. Oglethorpe Ave	912-433-9280	Dstowers01@savannahga.gov
Gloria Williams	2327A Ogeechee Rd	912 233-6331	gloriawilliams1@hotmail.com
Courtney Reich	538 E Gordon St	912 656 1316	courtney@ecologicalplanning.net

Name	Address	Phone Number	Email
DAVID STROUD	4021 Stirrup Creek Dr. Durham, NC	919-325-6497	david.stroud@amec.com
TOM MCDONALD	5515 Abercorn St Savannah GA. 31405	912-651-6530 x 1895	tmcdonald@savannahga.gov

Minutes August 6, 2014

City of Savannah Floodplain Management Planning Committee

Development Services Department

The first meeting of the City of Savannah's Floodplain Management Planning Committee (FMPC) was held on August 6, 2014 at 10 AM in the conference room of the Development Services Department. Tom McDonald, CFM welcomed committee members to the update of the city's Floodplain Management Plan (FMP).

David Stroud, CFM with AMEC Environment & Infrastructure took over the meeting to present on the planning processes for the Disaster Mitigation Act of 2000 (DMA) and Community Rating System (CRS) Activity 510 – Floodplain Management Planning requirements and how one plan can meet the requirements of both programs.

The Power Point presentation provided detail on various background data such as the spiral cost of natural disasters, recent disaster declarations in Chatham County and the City of Savannah, and the similarities between the four phases of DMA and the 10 CRS planning steps.

The presentation recapped the city flood insurance policy base, including paid claims, the number of flood insurance policies in each flood zone, and the number of repetitive loss properties.

The next portion of the presentation discussed the planning requirements of the 10 steps in the CRS planning process. Each of the planning step included information on how it will be completed, what data will need to be collected, and the responsibility of the planning committee during the planning process.

Each flood-related hazard was identified which include climate change and sea-level rise, dam and/or levee, localized stormwater flooding, coastal and canal bank erosion, hurricane and tropical storm, and the 100 and 500-Year flood.

The repetitive flooding problem was also identified as a Repetitive Loss Area Analysis (RLAA) will also be completed during the planning process. This will include surveying approximately 850 properties throughout the city. The 5 step RLAA planning process was discussed.

Finally, the presentation examined credit for preparing a Natural Floodplain Function Plan. Credit is provided for adopting plans that protect one or more natural functions within a community's floodplain.

Several questions concerning the process were answered including the timeframe to complete the FMP which is expected to take approximately 6 – 8 months. Tom McDonald mentioned that three (3) separate kickoff meetings would be held throughout the city beginning this evening. The meeting adjourned at approximately 11:50 AM.

CITY OF Savannah
DEVELOPMENT SERVICES

City of Savannah
Floodplain Mitigation Plan Committee Meeting
Development Service Office, 5515 Abercorn St. DATE: November 12, 2014
TIME: 10:00 AM to 12:00 PM

	Ben Farmer (benji598@aol.com);
✓	Courtney Reich (courtney@ecologicalplanning.net)
	Daniel Stowers01 (DStowers01@Savannahga.Gov)
✓	David Stroud (David.stroud@amec.com)
✓	Gloria Williams (Gloriawilliams1@hotmail.com)
✓	Jeffrey M. Brady (JeffBrady@allstate.com);
	Jeffrey Morris S SAS (Jeffrey.S.Morris@usace.army.mil)
✓	Jian Fei (JFei@Savannahga.Gov)
	Jim Shirley (JShirley@Savannahga.Gov)
✓	Jonathan Albright (JAlbright@Savannahga.Gov)
✓	Lewis Hodges (Lewis.Hodges@amec.com)
✓	Laura Walker (LWalker@Savannahga.Gov)
✓	Patty McIntosh (PMcIntosh@Savannahga.Gov);
	Sharyn Baggett (Sharyn.Baggett@Redcross.org)
✓	Tom McDonald (tmcdonald@Savannahga.gov)
	Vanessa Miller-Kaigler (Miller-Kaigler@sccpss.com)

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Minutes November 12, 2014

City of Savannah Floodplain Management Planning Committee

Development Services Department

A meeting of the City of Savannah's Floodplain Management Planning Committee (FMPC) was held on November 12, 2014 at 10 AM in the conference room of the Development Services Department. Tom McDonald, CFM welcomed committee members to the second meeting on the update to the city's Floodplain Management Plan (FMP).

After some introductory comments from Mr. McDonald, David Stroud, CFM with AMEC Environment & Infrastructure took over the meeting to present on the completed Hazard Identification and Risk Assessment sections of the plan. Since the last meeting, much of the time was spent on completing a comprehensive profile of all of the flood hazards and researching materials on specific flood information including state and national data bases. Additionally, Mr. Stroud reported on the progress of completing all of the field survey work for the Repetitive Loss Area Analysis (RLAA).

Mr. Stroud provided a Power Point presentation to cover the following objectives:

1. Structure of the Plan
2. Review Flood Hazards (Problems)
3. Review Flood Hazard Impacts
4. Ranking of Flood Hazards
5. Questions and Discussion

Mr. Stroud indicated that the plan would have seven (7) total chapters with 3 appendices. These would include Appendix A – detail on the planning process, Appendix B – a comprehensive review of possible mitigation measures for the six (6) mitigation categories, and Appendix C – references for the plan.

The presentation went on to discuss the profiling of each flood-related hazard to be captured in the plan. These flood-related hazards include:

1. 100-Year
2. 500-Year
3. Stormwater/Localized
4. Hurricane Tropical Storms
5. Climate Change/Sea Level Rise
6. Coastal/Canal Bank Erosion
7. Dams and Levees

Mr. Stroud then asked the FMPC to rank the hazards based on the frequency of occurrence, potential magnitude, spatial extent, and overall significance. The FMPC members debated each of the seven (7) flood-related hazards and provided ranking information on the various categories. A ranking table will be completed in the plan with this information.

The next portion of the presentation discussed the vulnerability of each flood hazard. The information included the impact on people, buildings, and infrastructure and associated past damages that have occurred in the city. Detail was provided on the overall extent of the hazard including how much of the planning area is covered by the hazard. For example, the 100 and 500 year flood extent included a map showing each flood zone and data which indicated the total number of acres for each of those flood zones. In Savannah there are 25,461 acres in the 100-year or 1% annual chance flood. Additionally, important was the fact that 9 new FIRM panels became effective in July of 2014.

A map the depth of flooding was provided (among many other maps) which showed that the southwest portion of the city will experience the deepest flooding of between 10 and 30 feet if a 100-year (1% annual chance)

flood were to occur. The depth of flooding is determined by subtracting the water surface elevation (1% chance flood) from the LIDAR ground points.

FEMA's Hazus-MH a loss estimation tool was run for the 100-year flood to determine potential damage to buildings in the city. Data in several tables were presented to the FMPC. Some questions arose over the coastal storm surge data and the number of buildings impacted by each of those zone categories.

Detail was also provided on potential damage to structures in the historic districts from the 1% (100-year) and the .2% (500-year) floods. Maps of each historic district showing the buildings located in the 100 and 500-year flood zones will be provided in the plan document.

After the presentation several questions were addressed. There was discussion on the next two meetings which will occur in the month of December. The meeting adjourned at approximately 12:05 PM.

CITY OF Savannah
DEVELOPMENT SERVICES

City of Savannah
Floodplain Mitigation Plan Committee Meeting (3rd)
Development Service Office, 5515 Abercorn St. DATE: December 9, 2014
TIME: 3:00 PM to 5:00 PM

_____	Ben Farmer (benji598@aol.com);
_____	Courtney Reich (courtney@ecologicalplanning.net)
_____	Daniel Stowers01 (DStowers01@Savannahga.Gov)
✓	David Stroud (David.stroud@amec.com)
✓	Gloria Williams (Gloriawilliams1@hotmail.com)
_____	Jeffrey M. Brady (JeffBrady@allstate.com);
_____	Jeffrey Morris S SAS (Jeffrey.S.Morris@usace.army.mil)
✓	Jian Fei (JFei@Savannahga.Gov)
✓	Jim Shirley (JShirley@Savannahga.Gov)
✓	Jonathan Albright (JAlbright@Savannahga.Gov)
✓	Laura Walker (LWalker@Savannahga.Gov)
✓	Patty McIntosh (PMcIntosh@Savannahga.Gov);
_____	Louis Carrow (louis.carrow@redcross.org);
✓	Tom McDonald (tmcdonald@Savannahga.gov)
_____	Vanessa Miller-Kaigler (Miller-Kaigler@sccpss.com)

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Minutes December 9, 2014

City of Savannah Floodplain Management Planning Committee

Development Services Department

A meeting of the City of Savannah's Floodplain Management Planning Committee (FMPC) was held on December 9, 2014 at 3 PM in the conference room of the Development Services Department. Tom McDonald, CFM welcomed committee members to the third meeting on the update to the city's Floodplain Management Plan (FMP).

After some introductory comments from Mr. McDonald, David Stroud, CFM with AMEC Environment & Infrastructure took over the meeting to facilitate a discussion on leaving the goals from the previous plan intact, refining the goal language on the goals from the previous plan, or developing new goals. Mr. Stroud indicated that the goals in the existing FMP were long and some language was awkward. Mr. Stroud recommended rewording the existing goals or developing new goals all together as the goals should be brief and to the point.

Mr. Stroud handed out 2 pieces of information to the FMPC for their consideration. The first was a listing of the goals from the existing FMP and the second was a listing of the goals from the Chatham County Multi-Jurisdictional Hazard Mitigation Plan. The goals in the update FMP must be in line with the goals in the Chatham County MJHMP.

There were six (6) goals listed in the existing 2009 FMP. No objectives toward reaching those goals were included. Mr. Stroud suggested that the new or revised goals should include objectives.

The first step was to provide a sample of possible answers to the question "What would you like to see most in Savannah's future?" Answers such as improved water quality or more or improved recreational opportunities were included on this master list. The FMPC members were tasked with writing down their top three (3) answers on large post-it-notes. Mr. Stroud indicated that 'your" answer did not have to appear on the list. The list is just to get your mind thinking about the question. Everyone's answers were posted on the wall into similar categories and a discussion occurred.

The next step was to provide a sample of possible answers to the question "What should be the goals of our mitigation program?" Once again, FMPC members were asked to write down their top three (3) answers on large post-it-notes. Everyone's answers were posted on the wall into similar categories and a discussion occurred.

Mr. Stroud then compared the grouping of what people wanted to see in the future with the potential goal categories as a starting point for revising or coming up with completely different goals for the updated FMP.

For the next hour and one half, the FMP decided upon 4 goals for the updated FMP. There was much discussion and debate on the potential new goals and the exact language for each. The FMPC came up with the following goals:

1. Expand the city's flood hazard communication and outreach program.
2. Reduce damage to insurable buildings in repetitively flooded buildings.
3. Protect critical and essential facilities from flood damage.
4. Reduce damage to development through flood resilient strategies and measure.

Mr. Stroud indicated that he would wordsmith and the finalized goals and objectives would be presented in the draft FMP. The meeting ended at 4:55 PM.

CITY OF savannah
DEVELOPMENT SERVICES

City of Savannah
Floodplain Mitigation Plan Committee Meeting (4th)
Development Service Office, 5515 Abercorn St. DATE: December 10, 2014
TIME: 8:30 AM to 12:00 PM

	Ben Farmer (benji598@aol.com);
✓	Courtney Reich (courtney@ecologicalplanning.net)
	Daniel Stowers01 (DStowers01@Savannahga.Gov)
✓	David Stroud (David.stroud@amec.com)
✓	Gloria Williams (Gloriawilliams1@hotmail.com)
✓	Jeffrey M. Brady (JeffBrady@allstate.com);
by phone	Jeffrey Morris S SAS (Jeffrey.S.Morris@usace.army.mil)
✓	Jian Fei (JFei@Savannahga.Gov)
	Jim Shirley (JShirley@Savannahga.Gov)
	Jonathan Albright (JAlbright@Savannahga.Gov)
	Lewis Hodges (Lewis.Hodges@amec.com)
✓	Laura Walker (LWalker@Savannahga.Gov)
	Patty McIntosh (PMcIntosh@Savannahga.Gov);
	Louis Carrow (louis.carrow@redcross.org);
✓	Tom McDonald (tmcdonald@Savannahga.gov)
	Vanessa Miller-Kaigler (Miller-Kaigler@sccpss.com)

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Minutes December 10, 2014

City of Savannah Floodplain Management Planning Committee

Development Services Department

A meeting of the City of Savannah's Floodplain Management Planning Committee (FMPC) was held on December 10, 2014 at 9 AM in the conference room of the Development Services Department. Tom McDonald, CFM welcomed committee members to the fourth meeting on the update to the city's Floodplain Management Plan (FMP).

After some introductory comments from Mr. McDonald, he turned the meeting over to David Stroud with AMEC Environment & Infrastructure to facilitate a discussion on revising and updating the mitigation strategies in the plan. Mr. Stroud indicated that he and Tom McDonald had worked yesterday evening after the goal setting meeting to examine the status of all mitigation projects in the current FMP. The projects were put into the following categories:

1. Completed Projects
2. Projects underway but not completed
3. Projects not yet started

The completed projects will not be brought forward into the updated plan as they are complete. Additionally, there were some projects which have not yet been started, and they also are not going to be brought forward into the updated plan. The remaining projects will be brought into the updated plan and the implementation status of each of those projects will be updated. Tom McDonald handed out his CRS reporting guide to the FMPC so they could mark the current status of each project.

Mr. Stroud then provided a brief Power Point presentation on potential projects which could be implemented under the six (6) mitigation categories. Mr. Stroud also passed around a copy of those six mitigation categories with a potential list of projects. The presentation and handout were to help the FMPC thinking about new mitigation projects for the plan update. Mr. Stroud also mentioned the need to come up with projects in each of the six mitigation categories and the projects should be in alignment with the goals set for the plan.

Over the next 2 plus hours, the FMPC discussed and debated potential projects to be included in the updated plan. A total of 12 new mitigation projects came out of this mitigation strategy session. Some of the new projects include:

1. Developing a new outreach strategy to educate building community on new flood maps
2. Educate builders and realtors on the internal subdivision checklist procedures to make sure there is a crosscheck between the NFIP, insurance, floodplain regulations, and the building code.
3. Complete a study to determine the effectiveness of a stormwater utility
4. Expand riparian impervious surface setbacks

The FMPC used FFEMA's STAPLEE process to evaluate the projects and they came up with a prioritization process for implementation of the new mitigation projects. The FMPC agreed on the following:

Short Range = Project should be completed in less than one year
Medium Range = Project should be completed in two to three years
Long Range = Project should be completed in more than four years

Mr. Stroud mentioned that there would be one additional FMPC meeting to discuss and debate the draft plan. The meeting ended at 12::05 PM.

CITY OF savannah
DEVELOPMENT SERVICES

City of Savannah
Floodplain Mitigation Plan Committee Meeting (5th)
Development Service Office, 5515 Abercorn St. DATE: February 12, 2015
TIME: 11:30 AM to 12:30 PM

____	Ben Farmer (benji598@aol.com);
____	Courtney Reich (courtney@ecologicalplanning.net)
____	Daniel Stowers01 (DStowers01@Savannahga.Gov)
✓	David Stroud (David.stroud@amec.com)
/	Gloria Williams (Gloriawilliams1@hotmail.com)
✓	Jeffrey M. Brady (JeffBrady@allstate.com);
____	Jeffrey Morris S SAS (Jeffrey.S.Morris@usace.army.mil)
✓	Jian Fei (JFei@Savannahga.Gov)
/	Jim Shirley (JShirley@Savannahga.Gov)
✓	Jonathan Albright (JAlbright@Savannahga.Gov)
/	Laura Walker (LWalker@Savannahga.Gov)
/	Patty McIntosh (PMcIntosh@Savannahga.Gov);
✓	Louis Carrow (louis.carrow@redcross.org);
✓	Tom McDonald (tmcdonald@Savannahga.gov)
____	Vanessa Miller-Kaigler (Miller-Kaigler@sccpss.com)

Page 1 of 1

P.O. BOX 1027, SAVANNAH, GA 31402
PHONE 912.651.6510 TDD 912.651.6702 FAX 912.651.6519 SAVANNAHGA.GOV

Planning Step 2: Involve the Public

Table A-3: Public Meeting Dates

Meeting Type	Meeting Topic	Meeting Date	Meeting Locations
Public Meeting #1	1) Introduction to DMA, CRS and the planning process 2) Introduction to hazard identification	August 5, 2014	W.W. Law Community Center
Public Meeting #2	1) Introduction to DMA, CRS and the planning process 2) Introduction to hazard identification	August 6, 2014	Moses Jackson Community Center
Public Meeting #3	1) Introduction to DMA, CRS and the planning process 2) Introduction to hazard identification	August 7, 2014	Windsor Forest Community Center
Public Meeting #4	1) Review complete "Draft" Floodplain Mitigation Plan 2) Solicit comments and feedback from the public	February 12, 2015	W.W. Law Community Center
Public Meeting #5	1) Public invited to review Draft Plan with City personnel at City office. This service was offered for a period of four days.	February 23-27, 2015	City of Savannah Development Service Office

Public Meeting Advertisement in Local Newspaper

from the International Franchise Association, will be available at the Entrepreneurial Center to answer questions about franchising from 10 a.m. to 1 p.m. on Aug. 6. Information on topics ranging from selecting a franchise to securing financing will be available.

City seeks input on flood hazards
Aug. 6-7. The city of Savannah is seeking help from the public to identify areas of the city that flood as part of a process to update the Flood Hazard Mitigation Plan. The plan

Savannah River Bridge Run
Dec. 6. The 2014 Enmark Savannah River Bridge Run will take place Dec. 6. The Bridge Run gives participants the chance to conquer Savannah's Talmadge Bridge, a 1.4-mile span at a 5.5 percent grade, 196 feet above the Savannah River, on foot. You can register online, in person at Fleet Feet Sports on Waters Avenue or by mail if you download the printable registration form. For more information, go to www.savannahriverbridgerun.com.

Savannah Craft Brew Festival

Boat Georgia course
9 a.m. to 12:20 p.m. Aug. 7. H.V. Jenkins High School, 1800 E. DeRenne Ave. Effective July 1, anyone born after Jan. 1, 1998, who operates any motorized vessel on the waters of Georgia, must complete a boating education course prior to the operation of such vessel. Local USCG Auxiliary Flotilla 10-2 is offering a course for children 12 years and older to satisfy this requirement. Cost of the course is $15 per student. Classes will be from 9 a.m. to 12:20 p.m. Aug. 7 at

emerging leaders — young and more seasoned — to participate in a leadership course starting in September. The Neighborhood Leadership Academy at Savannah State University is open to men and women who are 21 years and older and from Savannah/Chatham County. This free 12-session course is designed to develop participants' knowledge of our community and sharpen personal leadership and advocacy skills. Selected participants

SEE **CALENDAR,** PAGE **8B**

ANNOUNCEMENTS

Submit your event at least two weeks in advance by going to events.savannahnow.com. You can also mail to Community Calendar, P.O. Box 1088, Savannah, GA 31402. Announcements are printed daily in the Accent section as space allows. For information, call 912-652-0365.

AUG. 6

Backpack give-a-way
5-7 p.m. Aug. 6. The office

is part of an annual process being undertaken by the city that reduces flood insurance premiums by 20 percent for Savannah homeowners, and aids the city's ongoing floodplain and storm water management efforts. The public can provide input at public meetings: Aug. 6 at 6-7:30 p.m., Moses Jackson Community Center, 1410 Richards St.; and Aug. 7 at 6-7:30 p.m., Windsor Forest Community Center, 414 Briarcliff Circle.

Tickets are now on sale for the seventh annual Craft Brew Festival from 1-5 p.m. Aug. 30 at the Savannah International Trade & Convention Center. Tickets can be purchased at www.ticketmaster.com, both Habersham Beverage locations or by phone at 800-745-3000.

Kids Fishing and Coastal Water Safety
8:30 a.m.-noon. Sept. 27. Tybee Island Pier. The Gage Ochsner Kids Fishing and Coastal Water Safety event will take place from 8:30 a.m. -

the Naval JROTC Classroom at H.V. Jenkins High School. Enter through the Timberlane Street Bus Gate. Contact Kent Shockey at 912-897 7656 for enrollment. Additional information is available at www.savannahaux.com.

The Chef's Studio
6:30-8 p.m. Aug. 7. Jepson Center for the Arts, 207 W. York St., on Telfair Square. Join the Jepson Café as they bring in Chefs Patrick Zimmerman and Seth Musler from Butterhead Greens and Betty Bombers

Public Meeting Advertisements on City's website

Posted on: August 1, 2014

City seeks input on flood hazards

For Immediate Release
Date: August 1, 2014

The City of Savannah is seeking help from the public to identify areas of the City that flood as part of a process to update the Flood Hazard Mitigation Plan. The Plan is part of an annual process being undertaken by the City that reduces flood insurance premiums by 20% for Savannah homeowners, and aids the City's ongoing floodplain and storm water management efforts.

The public can provide input at three public meetings Aug. 5-7. Those meetings are:
• Tuesday, Aug. 5 -- 6-7:30 p.m., W.W. Law Community Center, 900 E. Bolton St.
• Wednesday, Aug. 6 -- 6-7:30 p.m., Moses Jackson Community Center, 1410 Richards St.
• Thursday, Aug. 7 -- 6-7:30 p.m., Windsor Forest Community Center, 414 Briarcliff Circle

The purpose of these meetings is to share information related to the project, as well as to gain input from residents, business owners and other stakeholders on current flood problems and possible mitigation solutions. The information gained from these meetings will supplement the fieldwork, technical data and studies generated in preparation of the plan. All members of the community are invited and encouraged to attend. However, if you cannot attend, you can take the survey online at savannahga.gov/floodsurvey. You can also request a pre-paid, self-addressed questionnaire to be sent to you to complete and resubmit.

The purpose of the Flood Hazard Mitigation Plan is to assess current flood hazard conditions, including historically flooded areas and the most critical repetitively flooded properties, and to develop appropriate mitigation strategies for the City to consider in reducing or eliminating future flood losses. Upon completion of the plan, the City of Savannah intends to continue its aggressive floodplain management efforts by evaluating, targeting and applying for Federal grant funds to assist in the implementation of future flood hazard mitigation projects.

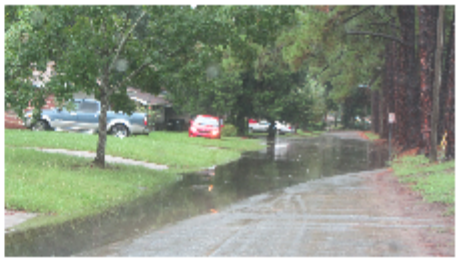
Because of the City of Savannah's participation in this process, FEMA will reduce flood insurance premiums by 20% for all property owners insured through the National Flood Insurance Program.

The final Flood Hazard Mitigation Plan will be prepared and submitted for adoption by the City Council. The adopted plan will be a stand-alone document that will be utilized to update the Flood Hazard section of the Chatham County Multi-jurisdictional Hazard Plan to provide greater focus and attention to the City of Savannah in reducing its current and future flood hazards.

Should you have any questions about the open public meetings or the development of Savannah's Flood Hazard Mitigation Plan, please contact Tom McDonald, Development Service Administrator, at (912) 651-6530.

Posted on: February 10, 2015

Public invited to flood hazard meeting



The City of Savannah will share information with the public on Thursday related to its update of the Flood Hazard Mitigation Plan. Visit the Flood Protection Information page and see the Plan documents under Your Input Needed. The Plan is part of an annual process being undertaken by the City that reduces flood insurance premiums by 20% for Savannah homeowners, and aids the City's ongoing floodplain and storm water management efforts.

The meeting will be held from 5:30-7 p.m. Thursday, Feb. 12, at the W.W. Law Community Center, 900 E. Bolton St. The purpose of the meeting is to share input received from the public during community meetings last summer, as well as the results of follow-up field inspections and data analysis conducted by staff.

The purpose of the Flood Hazard Mitigation Plan is to assess current flood hazard conditions, including historically flooded areas and the most critical repetitively flooded properties, and to develop appropriate mitigation strategies for the City to consider in reducing or eliminating future flood losses. Upon completion of the plan, the City of Savannah intends to continue its aggressive floodplain management efforts by evaluating, targeting and applying for Federal grant funds to assist in the implementation of future flood hazard mitigation projects.

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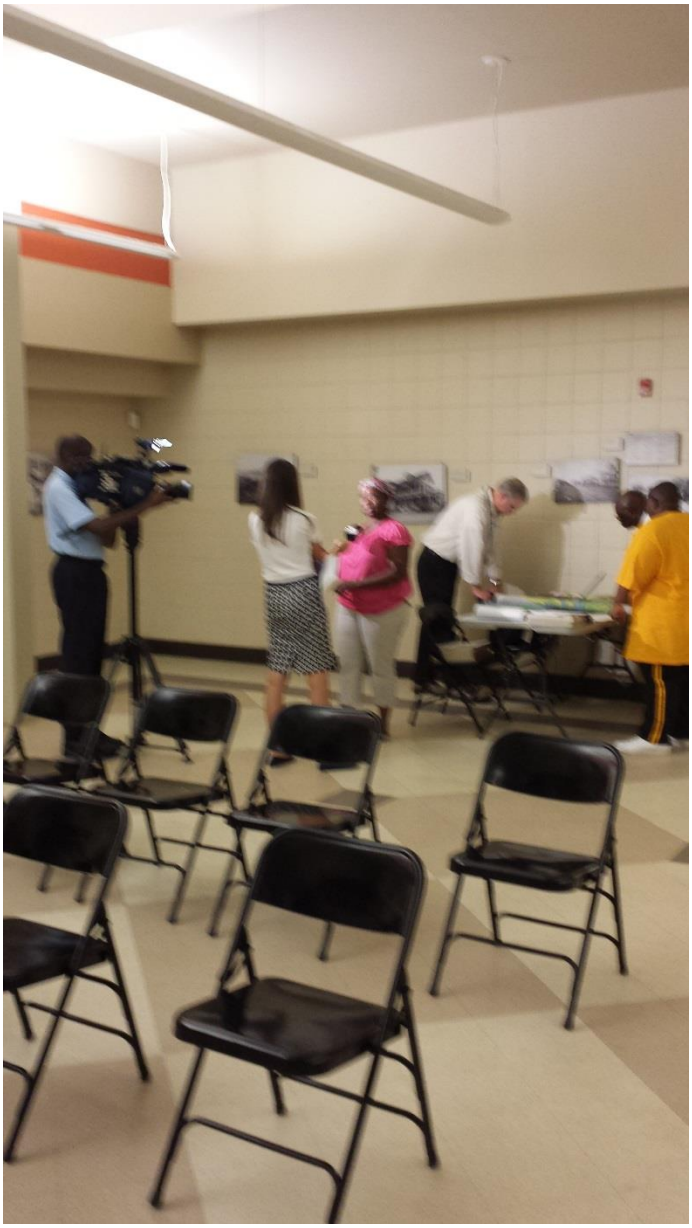
Should you have any questions about the open public meetings or the development of Savannah's Flood Hazard Mitigation Plan, please contact Tom McDonald, Development Service Administrator, at (912) 651-6530, extension 1895.

Public Meeting Pictures



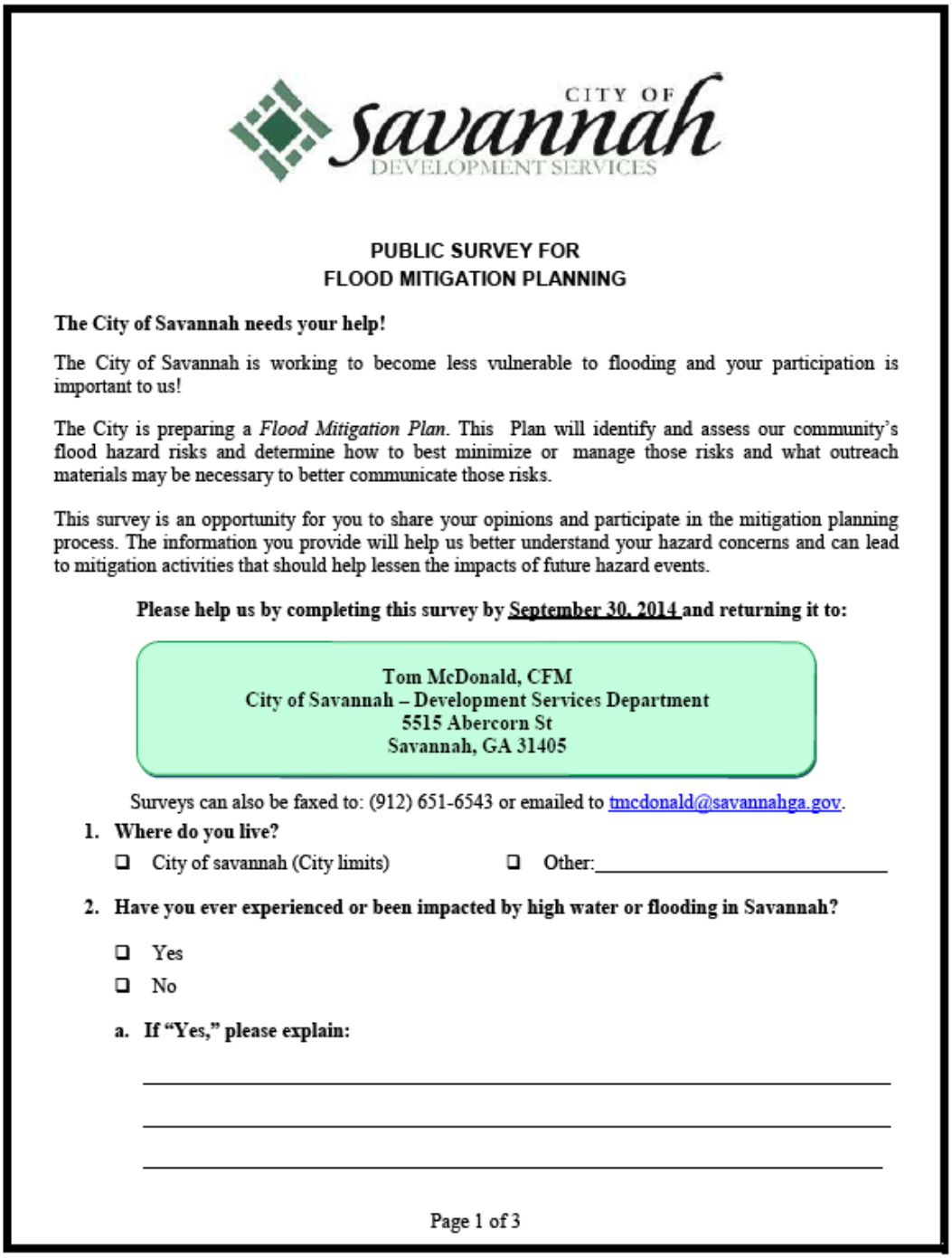
August 5, 2014 Public Meeting

August 6, 2014 Public Meeting

February 12, 2015 Public Meeting

Public Survey

The City of Savannah distributed a public survey that requested public input into the Floodplain Mitigation Plan planning process and the identification of mitigation activities that could lessen the risk and impact of future flood hazard events. The survey was provided on Savannah's website as well as distributed to attendees at the public meetings.



CITY OF Savannah
DEVELOPMENT SERVICES

PUBLIC SURVEY FOR
FLOOD MITIGATION PLANNING

The City of Savannah needs your help!

The City of Savannah is working to become less vulnerable to flooding and your participation is important to us!

The City is preparing a *Flood Mitigation Plan*. This Plan will identify and assess our community's flood hazard risks and determine how to best minimize or manage those risks and what outreach materials may be necessary to better communicate those risks.

This survey is an opportunity for you to share your opinions and participate in the mitigation planning process. The information you provide will help us better understand your hazard concerns and can lead to mitigation activities that should help lessen the impacts of future hazard events.

Please help us by completing this survey by September 30, 2014 and returning it to:

Tom McDonald, CFM
City of Savannah – Development Services Department
5515 Abercorn St
Savannah, GA 31405

Surveys can also be faxed to: (912) 651-6543 or emailed to tmcdonald@savannahga.gov.

1. **Where do you live?**
   - ❑ City of savannah (City limits)
   - ❑ Other:_____
2. **Have you ever experienced or been impacted by high water or flooding in Savannah?**
   - ❑ Yes
   - ❑ No
   - a. **If "Yes," please explain:**

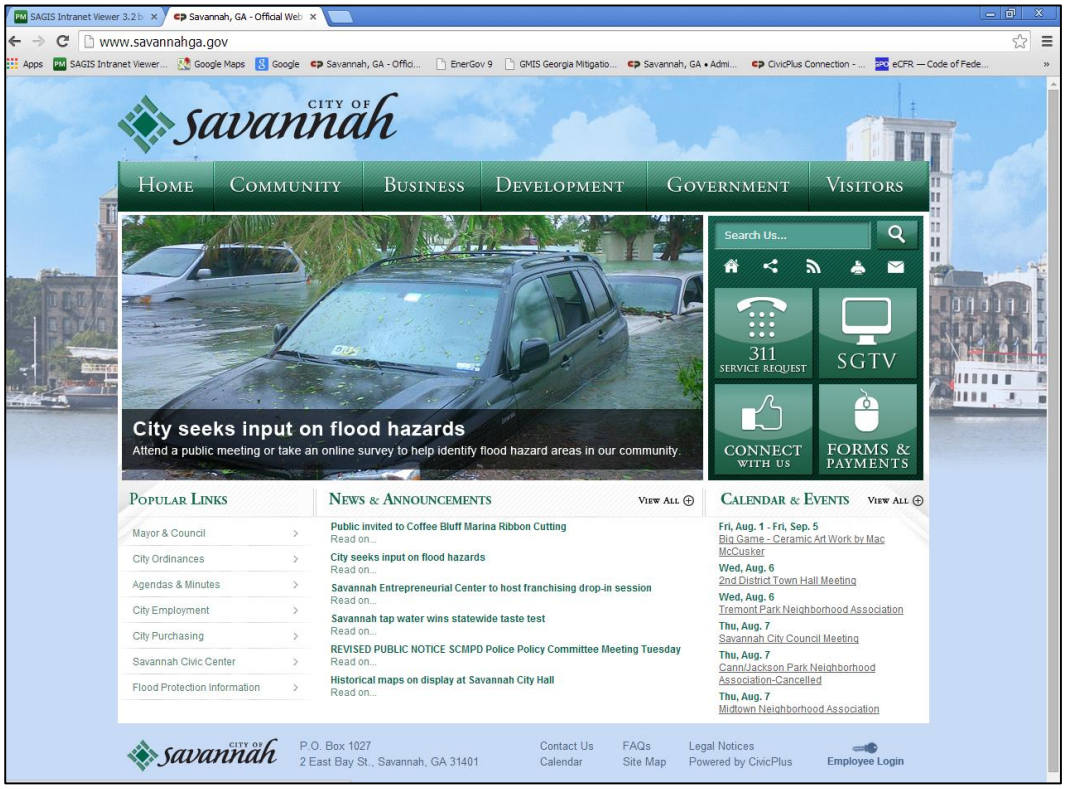
_____

_____

_____

Page 1 of 3

Public Survey posted on City's website



Press Release for Public Survey

Public Invited to Provide Flooding Concerns:

The City of Savannah is seeking help from the public to identify areas of the City that flood as part of a process to update the Flood Hazard Mitigation Plan. The Plan will help reduce flood insurance premiums, and aid the City's ongoing floodplain and stormwater management efforts in reducing the adverse impacts of flooding on businesses and citizens.

The city would like to gain input from residents, business owners and other stakeholders on current flood problems and possible mitigation solutions. The information gained from this survey will supplement the meetings, fieldwork, technical data and studies generated in preparation of the plan. **All members of community are invited and encouraged to participate by completing a questionnaire online at savannahga.gov/floodform**. The survey will need to be submitted by September 30, 2014 to be included as part of the Plan,

The purpose of the Flood Hazard Mitigation Plan is to assess current flood hazard conditions, including historically flooded areas and the most critical repetitively flooded properties, and to develop appropriate mitigation strategies for the City to consider in reducing or eliminating future flood losses. Upon completion of the plan, the City of Savannah intends to continue its aggressive floodplain management efforts by evaluating, targeting and applying for Federal grant funds to assist in the implementation of future flood hazard mitigation projects. The plan will also serve as a means to help reduce flood insurance premiums for all those property owners insured through the National Flood Insurance Program.

The final Flood Hazard Mitigation Plan will be prepared and submitted for adoption by the City Council. The adopted plan will be a stand-alone document that will be utilized to update the Flood Hazard section of the Chatham County Multi-jurisdictional Hazard Plan to provide greater focus and attention to the City of Savannah in reducing its current and future flood hazards.

Should you have any questions about the open public meetings or the development of Savannah's Flood Hazard Mitigation Plan, please contact Tom McDonald, Development Service Administrator, at (912) 651-6530 X 1895.

Public Survey posted on Survey Monkey

CITY OF savannah
DEVELOPMENT SERVICES

http://www.savannahga.gov/index.aspx?NID=936

Your Input Needed: Help Us Reduce Our Natural Hazard Risks

1. The City of Savannah will share information with the public on Thursday related to its update of the Flood Hazard Mitigation Plan. The Plan is part of an annual process being undertaken by the City that reduces flood insurance premiums by 20% for Savannah homeowners, and aids the City's ongoing floodplain and storm water management efforts.

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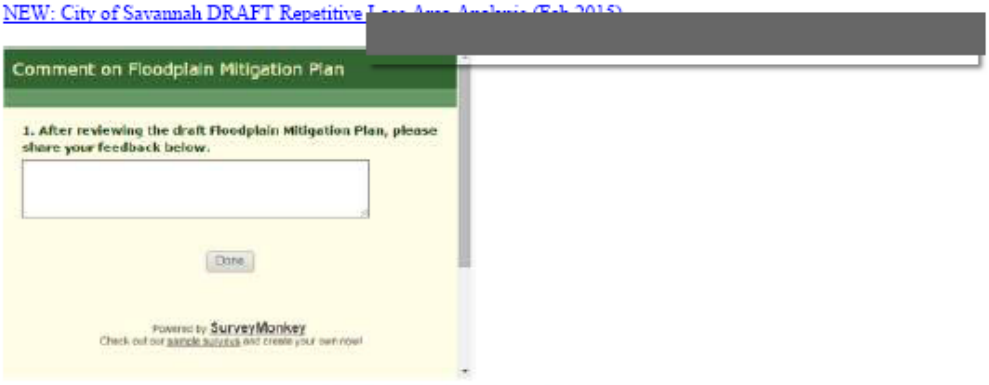
Should you have any questions about the open public meetings or the development of Savannah's Flood Hazard Mitigation Plan, please contact Tom McDonald, Development Service Administrator, at (912) 651-6530, extension 1895.

Savannah GA Risk Assessment Presentation
City of Savannah DRAFT Flood Risk Assessment (Dec 2014)
NEW: City of Savannah DRAFT Floodplain Mitigation Plan (Feb 2015)
NEW: City of Savannah DRAFT Repetitive Loss Area Analysis (Feb 2015)



P.O. BOX 1027, SAVANNAH, GA 31402
PHONE 912.651.6510 TDD 912.651.6702 FAX 912.651.6519 SAVANNAHGA.GOV

The City received four completed surveys. The following is a summary of survey responses.

Q1: Where do you live?

Answer Choices	Percentage	Number Responding
Savannah	100	4
Other	0	0
Total	**100**	**4**

Q2: Have you ever experienced or been impacted by high water or flooding in Savannah?

Answer Choices	Percentage	Number Responding
Yes	100	4
No	0	0
Total	**100**	**4**

Q3: How concerned are you about the possibility of your community being impacted by flooding?

Answer Choices	Percentage	Number Responding
Extremely concerned	100	4
Somewhat concerned	0	0
Not concerned	0	0
Total	**100**	**4**

Q4: Is your home located in a Federal Emergency Management Agency (FEMA) floodplain?

Answer Choices	Percentage	Number Responding
Yes	75	3
No	25	1
I don't know	0	0
Total	**100**	**4**

Q5: Do you have flood insurance for your home/personal property?

Answer Choices	Percentage	Number Responding
Yes	75	3
No	25	1
I don't know	0	0
Total	**100**	**4**

Q6: If "no" to previous question, why not?

Answer Choices	Percentage	Number Responding
My home is not located in a floodplain	100	1
I rent	0	0
It's too expensive	0	0
I don't need it because it never floods	0	0
I don't need it because my home is elevated or otherwise protected	0	0

Answer Choices	Percentage	Number Responding
I never really considered it	0	0
Other	0	0
Total	**100**	**1**

Q7: Have you taken any actions to protect your home from flood damage?

Answer Choices	Percentage	Number Responding
Yes	33.3	1
No	66.7	2
Total	**100**	**3**

Q8: Do you know what government agency/office to contact regarding the risks associated with flooding?

Answer Choices	Percentage	Number Responding
Yes	75	3
No	25	1
Total	**100**	**4**

Q9: What is the most effective way for you to receive information about how to make your home or neighborhood more resistant to flood damage?*

Answer Choices	Number of Responses Received
Newspaper	1
Television advertising or programs	2
Radio advertising or programs	1
Internet	3
Email	2
Mail	3
Public workshops/meetings	2
School meetings	0
Other	1
Total	**15**

***Note: Respondents were able to choose more than one answer choice

Q10: In your opinion, what are some steps your local government could take to reduce the risk of flooding in your neighborhood?

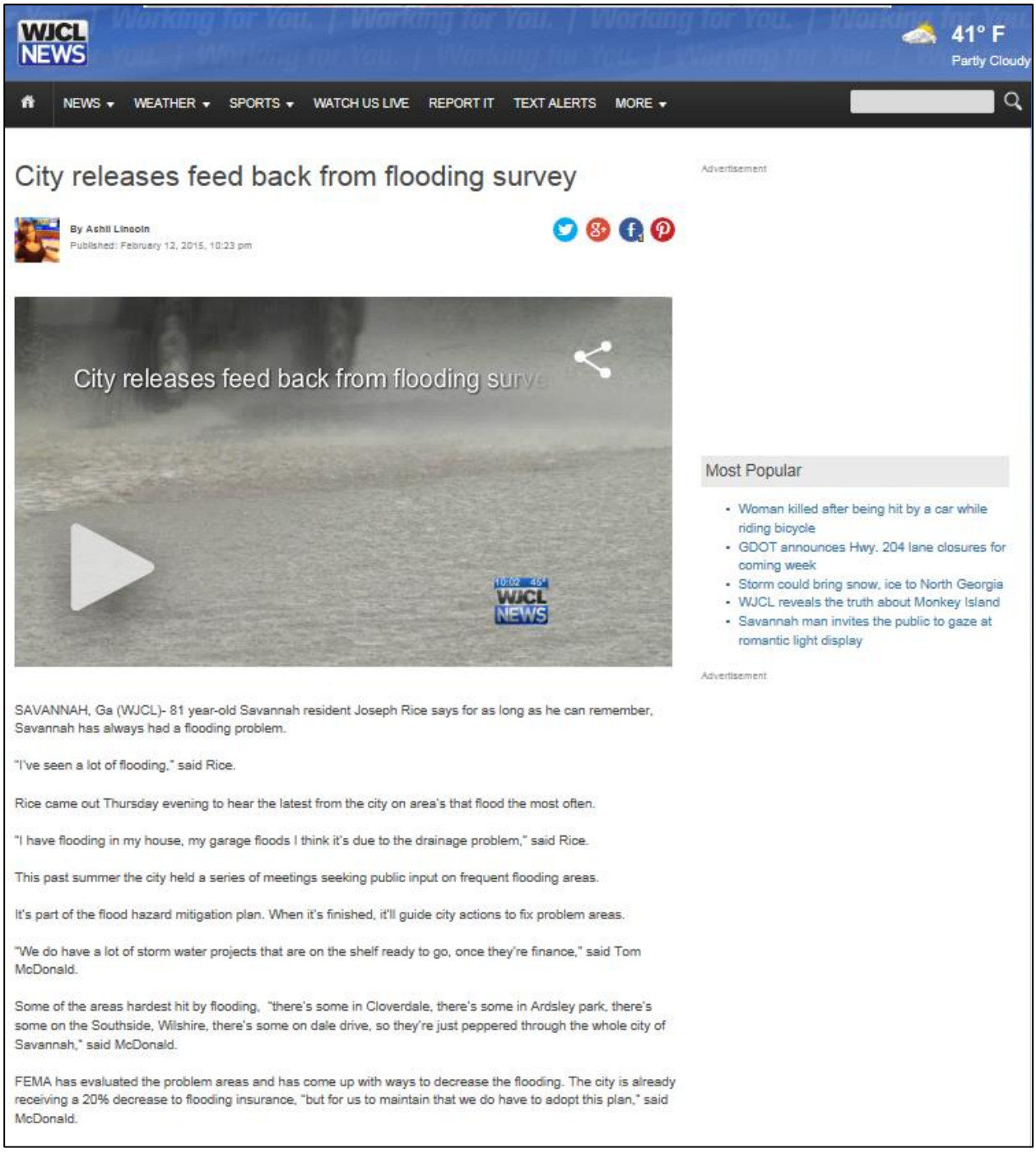
Below are the responses received to Question 10

"Replace old pipes, strainers to prevent debris from flowing in curb drains, storm drains, regular suctioning of storm drains. Cleaning the canal of debris…."

"Improve the drainage system and provide regular cleanings of the sewer system."

"Continue improving the City's storm drain infrastructure. Establish signage at locations that flood."

Local News Story on Flooding Survey



WJCL NEWS

41° F
Partly Cloudy

NEWS ▾ WEATHER ▾ SPORTS ▾ WATCH US LIVE REPORT IT TEXT ALERTS MORE ▾

City releases feed back from flooding survey

By Ashli Lincoln
Published: February 12, 2015, 10:23 pm

SAVANNAH, Ga (WJCL)- 81 year-old Savannah resident Joseph Rice says for as long as he can remember, Savannah has always had a flooding problem.

"I've seen a lot of flooding," said Rice.

Rice came out Thursday evening to hear the latest from the city on area's that flood the most often.

"I have flooding in my house, my garage floods I think it's due to the drainage problem," said Rice.

This past summer the city held a series of meetings seeking public input on frequent flooding areas.

It's part of the flood hazard mitigation plan. When it's finished, it'll guide city actions to fix problem areas.

"We do have a lot of storm water projects that are on the shelf ready to go, once they're finance," said Tom McDonald.

Some of the areas hardest hit by flooding, "there's some in Cloverdale, there's some in Ardsley park, there's some on the Southside, Wilshire, there's some on dale drive, so they're just peppered through the whole city of Savannah," said McDonald.

FEMA has evaluated the problem areas and has come up with ways to decrease the flooding. The city is already receiving a 20% decrease to flooding insurance, "but for us to maintain that we do have to adopt this plan," said McDonald.

The City of Savannah posted a **Risk Assessment Presentation** and the **Draft Risk and Vulnerability Assessment** for public review and comment on its website.

The City of Savannah posted the entire **Draft Floodplain Mitigation Plan** on its website for public review and comment.

Presenting the Plan to the Community

(Web notification) www.savannahga.gov main page

Click on the picure or topic just below the picture "Public Invited to flood meeting" will open the below web page:

When click on the hyper link "Flood Protection Information page" opens the below page

Below is the web page wording:

Your Input Needed: Help Us Reduce Our Natural Hazard Risks

1. The City of Savannah will share information with the public on Thursday related to its update of the Flood Hazard Mitigation Plan. The Plan is part of an annual process being undertaken by the City that reduces flood insurance premiums by 20% for Savannah homeowners, and aids the City's ongoing floodplain and storm water management efforts.

The meeting will be held from 5:30-7 p.m. Thursday, Feb. 12, at the W.W. Law Community Center, 900 E. Bolton St. The purpose of the meeting is to share input received from the public during community meetings last summer, as well as the results of follow-up field inspections and data analysis conducted by staff.

The purpose of the Flood Hazard Mitigation Plan is to assess current flood hazard

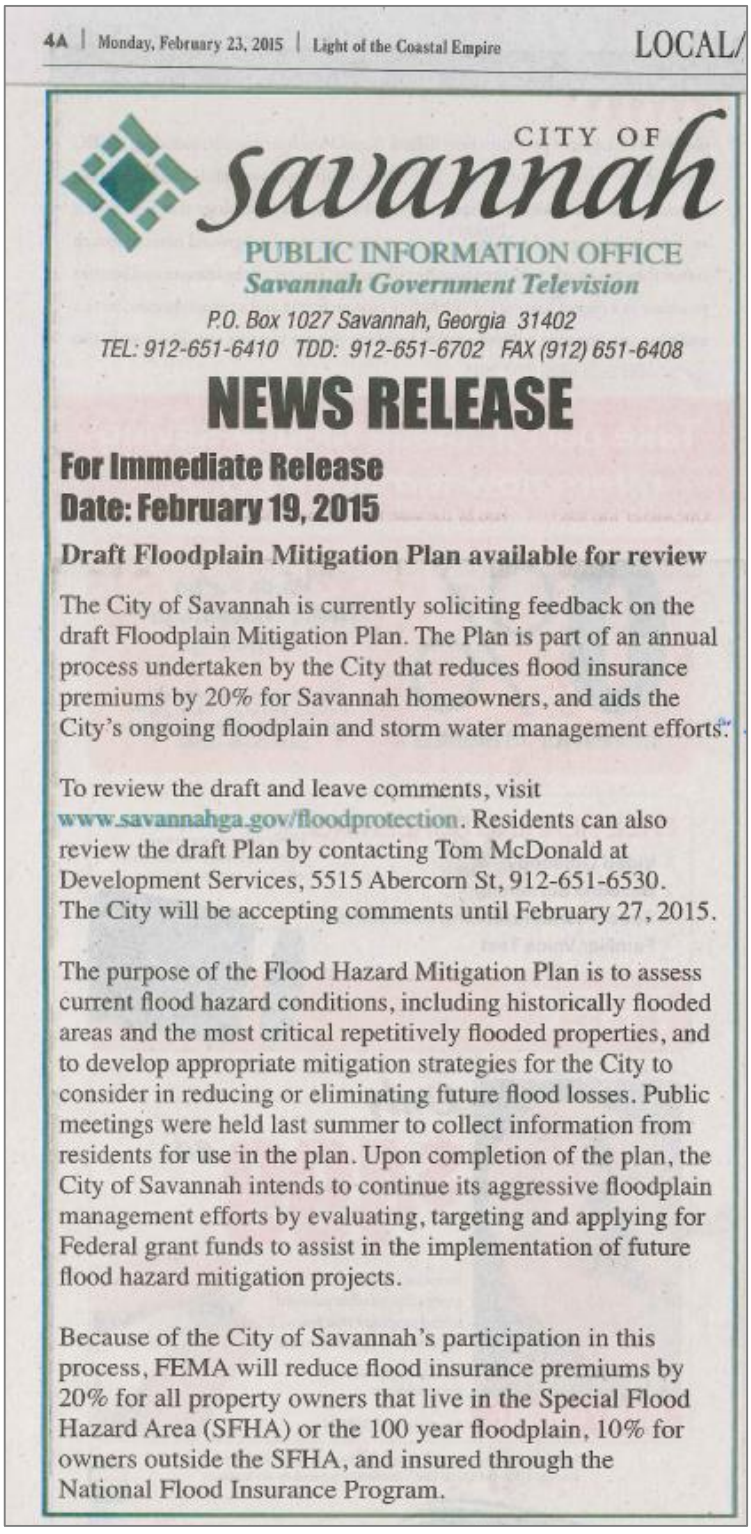
conditions, including historically flooded areas and the most critical repetitively flooded properties, and to develop appropriate mitigation strategies for the City to consider in reducing or eliminating future flood losses. Upon completion of the plan, the City of Savannah intends to continue its aggressive floodplain management efforts by evaluating, targeting and applying for Federal grant funds to assist in the implementation of future flood hazard mitigation projects.

Because of the City of Savannah's participation in this process, FEMA will reduce flood insurance premiums by 20% for all property owners insured through the National Flood Insurance Program.

The final Flood Hazard Mitigation Plan will be prepared and submitted for adoption by the City Council. The adopted plan will be a stand-alone document that will be utilized to update the Flood Hazard section of the Chatham County Multi-jurisdictional Hazard Plan to provide greater focus and attention to the City of Savannah in reducing its current and future flood hazards.

Should you have any questions about the open public meetings or the development of Savannah's Flood Hazard Mitigation Plan, please contact Tom McDonald, Development Service Administrator, at (912) 651-6530, extension 1895.
Savannah GA Risk Assessment Presentation
City of Savannah DRAFT Flood Risk Assessment (Dec 2014)
NEW: City of Savannah DRAFT Floodplain Mitigation Plan (Feb 2015)
NEW: City of Savannah DRAFT Repetitive Loss Area Analysis (Feb 2015)

Local News Story on Draft Plan Available for Review



4A | Monday, February 23, 2015 | Light of the Coastal Empire LOCAL/

CITY OF Savannah

PUBLIC INFORMATION OFFICE
Savannah Government Television

P.O. Box 1027 Savannah, Georgia 31402
TEL: 912-651-6410 TDD: 912-651-6702 FAX (912) 651-6408

NEWS RELEASE

For Immediate Release
Date: February 19, 2015

Draft Floodplain Mitigation Plan available for review

The City of Savannah is currently soliciting feedback on the draft Floodplain Mitigation Plan. The Plan is part of an annual process undertaken by the City that reduces flood insurance premiums by 20% for Savannah homeowners, and aids the City's ongoing floodplain and storm water management efforts.

To review the draft and leave comments, visit www.savannahga.gov/floodprotection. Residents can also review the draft Plan by contacting Tom McDonald at Development Services, 5515 Abercorn St, 912-651-6530. The City will be accepting comments until February 27, 2015.

The purpose of the Flood Hazard Mitigation Plan is to assess current flood hazard conditions, including historically flooded areas and the most critical repetitively flooded properties, and to develop appropriate mitigation strategies for the City to consider in reducing or eliminating future flood losses. Public meetings were held last summer to collect information from residents for use in the plan. Upon completion of the plan, the City of Savannah intends to continue its aggressive floodplain management efforts by evaluating, targeting and applying for Federal grant funds to assist in the implementation of future flood hazard mitigation projects.

Because of the City of Savannah's participation in this process, FEMA will reduce flood insurance premiums by 20% for all property owners that live in the Special Flood Hazard Area (SFHA) or the 100 year floodplain, 10% for owners outside the SFHA, and insured through the National Flood Insurance Program.

Planning Step 3: Coordinate

This planning step credits the incorporation of other plans and other agencies' efforts into the development of the Floodplain Mitigation Plan. Other agencies and organizations must be contacted to determine if they have studies, plans and information pertinent to the Floodplain Mitigation Plan, to determine if their programs or initiatives may affect the community's program, and to see if they could support the community's efforts. An example coordination letter is provided below. A copy of all coordination letters will be provided upon request.

CITY OF Savannah
DEVELOPMENT SERVICES

September 7, 2014

Mr. Jason Allison
Wormsloe State Historic: Site Manager
7601 Skidaway Rd
Savannah, GA 31406

RE: City of Savannah Flood Mitigation Plan

Dear Mr. Allison:

The City of Savannah is developing a flood mitigation plan to address the flood hazards and associated stormwater and local drainage issues that impact the community. This planning process incorporates the 10-steps of Activity 510-Floodplain Management Planning in the National Flood Insurance Program's (NFIP) Community Rating System (CRS) Program.

Our objective in reaching out to other agencies and stakeholders is to coordinate with those who may bring additional information to the planning process and associated flood issues within Savannah. Any information, studies, etc. which may supplement the work of the established Floodplain Mitigation Committee would be welcomed. Additionally, I invite your participation at our committee and public meetings throughout the planning process. I will sent you future meeting dates by email and the dates will be posted on the City's website: www.savannahga.gov

The City has teamed with Mr. David Stroud of AEMEC to help complete the 510 Plan. As the program manager for this project I can be reached at (912) 651-6530 X 1895 or tmcdonald@savannahga.gov or you may send information directly to my attention to the address on this letterhead. Additionally you can contact our planning consultant, David Stroud with AMEC at (919) 765-9986 or david.stroud@amec.com.

We look forward to hearing from you and/or participation at future committee and public meetings.

Regards,

Tom McDonald, CFM
Floodplain Administrator

P.O. BOX 1027, SAVANNAH, GA 31402
PHONE 912.651.6510 TDD 912.651.6702 FAX 912.651.6519 SAVANNAHGA.GOV

Appendix B

Appendix B: Mitigation Strategy

Hazard Identification & Profiles

Table B.1 Hazard Summary for City of Savannah

Hazard	Frequency of Occurrence	Spatial Extent	Potential Magnitude	Significance
Climate Change and Sea Level Rise	Likely	Limited	Limited	Medium
Coastal/Canal Bank Erosion	Highly Likely	Limited	Limited	Medium
Dam/Levee Failure	Unlikely	Limited	Negligible	Low
Flood: 100-/500-year	Occasional	Significant	Critical	High
Flood: Stormwater/Localized Flooding	Highly Likely	Significant	Critical	High
Hurricane and Tropical Storms (including Storm Surge)	Occasional	Extensive	Catastrophic	High

Guidelines:
Frequency of Occurrence:
Highly Likely: Nearly 100% probability within the next year.
Likely: Between 10 and 100% probability within the next year.
Occasional: Between 1 and 10% probability within the next year.
Unlikely: Less than 1% probability within the next year.

Potential Magnitude:
Catastrophic: More than 50% of the area affected.
Critical: 25 to 50% of the area affected.
Limited: 10 to 25% of the area affected.
Negligible: Less than 10% of the area affected.

Spatial Extent:
Limited: Less than 10% of planning area.
Significant: 10-50% of planning area.
Extensive: 50-100% of planning area.

Significance:
Low
Medium
High

B.1 Risk Assessment Methodology

B.1.1 Calculating Likelihood of Future Occurrence

The frequency of past events is used in this section to gauge the likelihood of future occurrences. Based on historical data, the likelihood of future occurrence is categorized into one of the following classifications:

Highly Likely: Near 100% chance of occurrence in next year, or happens every year.

Likely: Between 10 and 100% chance of occurrence in next year, or has a recurrence interval of 10 years or less.

Occasional: Between 1 and 9% chance of occurrence in the next year, or has a recurrence interval of 11 to 100 years.

Unlikely: Less than 1% chance of occurrence in next 100 years, or has a recurrence interval of greater than every 100 years.

B.1.2 Calculating Vulnerability

Vulnerability is measured in general, qualitative terms, and is a summary of the potential impact based on past occurrences, spatial extent, and damage and casualty potential:

Extremely Low: The occurrence and potential cost of damage to life and property is very minimal to non-existent.

Low: Minimal potential impact. The occurrence and potential cost of damage to life and property is minimal.

Medium: Moderate potential impact. This ranking carries a moderate threat level to the general population and/or built environment. Here the potential damage is more isolated and less costly than a more widespread disaster.

High: Widespread potential impact. This ranking carries a high threat to the general population and/or built environment. The potential for damage is widespread. Hazards in this category may have already occurred in the past.

Extremely High: Very widespread and catastrophic impact.

B.1.3 Defining Significance (Priority) of a Hazard

Defining the significance or priority of a hazard to a community is based on a subjective analysis of several factors. This analysis is used to focus and prioritize hazards and associated mitigation measures for the plan. These factors include the following:

Past Occurrences: Frequency, extent, and magnitude of historic hazard events.

Likelihood of Future Occurrences: Based on past hazard events.

Ability to Reduce Losses through Implementation of Mitigation Measures: This looks at both the ability to mitigate the risk of future occurrences as well as the ability to mitigate the vulnerability of a community to a given hazard event. It also considers the extent to which existing mitigation measures are in place to adequately address the hazard.

B.1.4 City of Savannah Hazard ID/Vulnerability/Priority Summary

Climate Change and Sea Level Rise

- Data shows climate change and sea level rise issues are affecting the Savannah planning area.
- LOFO: Likely
- Vulnerability: Medium
- Priority Hazard

Coastal/Canal Bank Erosion

- Data shows coastal erosion is a problem affecting the Savannah planning area. There are known local instances of erosion.
- LOFO: Highly Likely
- Vulnerability: Medium
- Priority Hazard

Dam/Levee Failure

- Four dams are located within Chatham (non-high hazard).
- There are no levees located within Savannah.
- There are no recorded dam breaches or levee failures within Savannah.
- LOFO: Unlikely
- Vulnerability: Low
- Non-Priority Hazard

Flood: 100-/500-year

- Extensive 100-yr floodplain coverage within the City.
- LOFO: 100-Occasional; 500-Unlikely (By Definition)
- Vulnerability: High
- Priority Hazard

Flood: Stormwater/Localized Flooding

- Localized flooding also occurs at various times throughout the year with several areas of primary concern to the City. Localized flooding and ponding affect streets and property.
- LOFO: Highly Likely
- Vulnerability: High
- Priority Hazard

Hurricane and Tropical Storm (including Storm Surge)

- According to NCDC records, Savannah has been exposed to 40 hurricanes or tropical storms since 1950.
- LOFO: Occasional
- Vulnerability: High
- Priority Hazard

B.1.5 City of Savannah Priority Hazards

Priority Hazards

- Climate Change and Sea Level Rise
- Coastal/Canal Bank Erosion
- Flood: 100/500 year
- Flood: Stormwater/ Localized Flooding
- Hurricane and Tropical Storms (including Storm Surge)

Non-Priority Hazards

- Dam/Levee Failure

B. 2 Mitigation Goals Development

B.2.1 Formulating Mitigation Goals

The FMPC collected and provided data for the City of Savannah Floodplain Mitigation Plan. From this information, a Risk Assessment was developed that describes the risk and vulnerability of the City to identified hazards and includes an assessment of the area's current capabilities for countering these threats through existing policies, regulations, programs, and projects.

This analysis identifies areas where improvements could or should be made. Formulating Goals leads to incorporating these improvements into the Mitigation Strategy portion of the plan. The planning goals should provide direction for what should be done to make the planning area more disaster resistant.

GOALS: Goals are stated without regard for implementation; that is, implementation cost, schedule, and means are not considered. Goals are defined before considering how to accomplish them so that the goals are not dependent on the means of achievement. Goals are public policy statements that:

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

B.2.2 Goal Development

The Savannah FMPC conducted an exercise to outline its goals for this Floodplain Mitigation Plan. The goal setting exercise is covered in detail in Section 5. At the end of the exercise, the FMPC agreed upon four general goals for this planning effort. The goals were refined and include:

Goal 1: Expand the City's flood hazard communication and outreach program.

Goal 2: Reduce damage to insurable buildings in repetitively flooded areas.

Goal 3: Protect critical and essential facilities from flood damage.

Goal 4: Reduce damage to development through flood resilient strategies and measures.

The FMPC also included objectives in support of the goals. The FMPC developed 15 objectives for implementing the goals. The objective numbers relate to the goal numbers above. The objectives include:

Objective 1.1: Engage the Chatham County Schools to develop a flood mitigation curriculum.

Objective 1.2: Demonstrate the flood model to school students and at science nights.

Objective 1.3: Evaluate the City's flood hazard outreach program through development of a CRS Program for Public Information (PPI).

Objective 1.4: Encourage residents to assume an appropriate level of responsibilities for their own flood protection.

Objective 2.1: Prioritize stormwater management projects that target repetitive loss areas.

Objective 2.2: Develop a property buyout master plan to identify and purchase repetitive loss properties.

Objective 2.3: Recommend purchase of flood insurance and use of the Increased Cost of Compliance (ICC) provision to mitigate flood damage.

Objective 3.1: Prioritize critical and essential facilities in need of protection from flood damage.

Objective 3.2: Provide 100- and 500-year flood protection to critical and essential facilities for dry land access.

Objective 3.3: Leverage emergency management and other funding sources to retrofit critical facilities.

Objective 4.1: Encourage a no adverse impact approach to reduce damage to existing development.

Objective 4.2: Consider increasing riparian impervious surface setbacks to help protect the natural and beneficial functions of the floodplain.

Objective 4.3: Purchase vulnerable lands through available funding mechanisms to protect development and provide park and recreation opportunity for residents.

Objective 4.4: Improve building checklist and technical review process to ensure buildings are constructed in accordance with the flood damage prevention ordinance and meet appropriate insurance standards.

Objective 4.5: Prioritize capital improvement projects to address areas where poor drainage causes substantial flooding.

Objective 4.6: Encourage the location of development outside the areas of special flood hazard (100-year flood zone) and provide standards to minimize public and private losses due to flood conditions in areas of special flood hazard.

B.3 Categories of Mitigation Measures Considered

The following categories are based on the Community Rating System.

- Prevention (Required to be evaluated)
- Floodplain Management Regulatory/current & future conditions
- Property Protection
- Natural Resource Protection
- Emergency Services
- Structural Projects
- Public Information and Outreach

B.4 Alternative Mitigation Measures per Category

Note: the CRS Credit Sections are based on the 2013 CRS Coordinator's Manual.

B.4.1 Preventative and Regulatory Measures

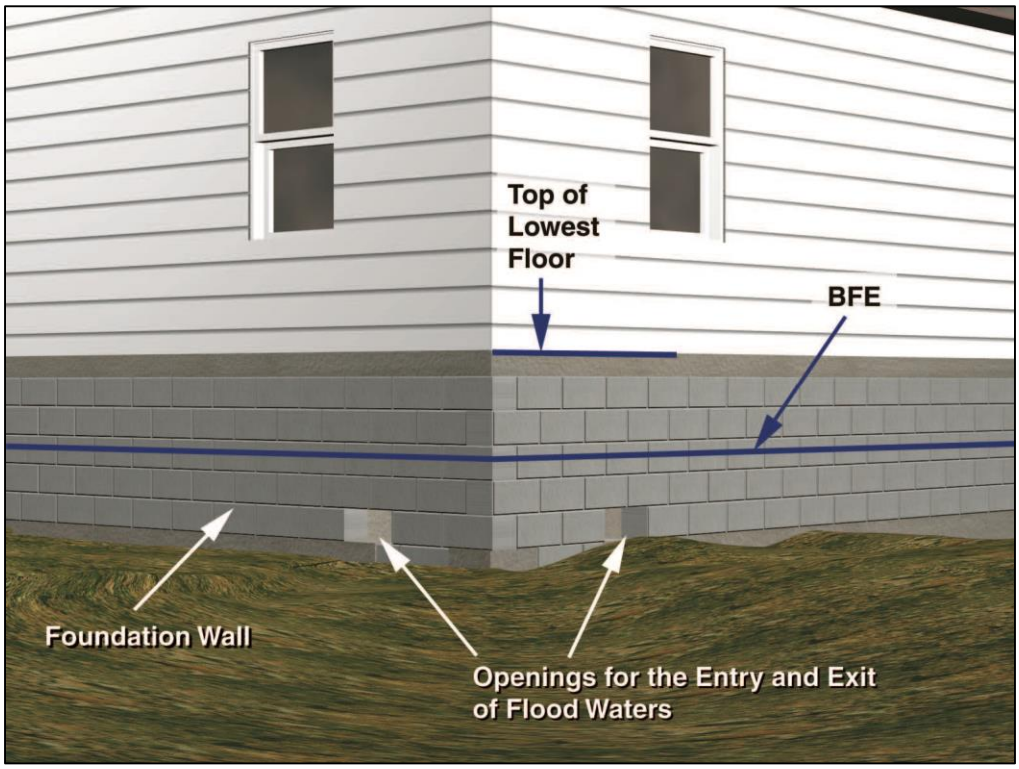
Preventative measures are designed to keep a problem - such as flooding - from occurring or from getting worse. The objective of preventative measures is to ensure that future development is not exposed to damage and does not cause an increase in damages to other properties. Building, zoning, planning and code enforcement offices usually administer preventative measures. Some examples of types of preventative measures include:

- Building codes
- Planning and zoning
- Open space preservation
- Stormwater management

Building Codes

Building codes provide one of the best methods of addressing natural hazards. When properly designed and constructed according to code, the average building can withstand many of the impacts of natural hazards. Hazard protection standards for all new and improved or repaired buildings can be incorporated into the local building code. Building codes can ensure that the first floors of new buildings are constructed to be higher than the elevation of the 100-year flood (the flood that is expected to have a one percent chance of occurring in any given year). This is shown in Figure B.1.

Just as important as having code standards is the enforcement of the code. Adequate inspections are needed during the course of construction to ensure that the builder understands the requirements and is following them. Making sure a structure is properly elevated and anchored requires site inspections at each step.



Source: FEMA Publication: *Above the Flood: Elevating Your Floodprone House, 2000*

Figure B.1 – Building Codes and Flood Elevations

Local Implementation

The City of Savannah has adopted the Georgia Building Code which adheres to the 2012 Edition of the International Building Code (IBC). In accordance with the IBC, the ground immediately adjacent to the foundation shall be sloped away from the building at a slope of not less than one unit vertical in 20 units horizontal (5-percent slope) for a minimum distance of 10 feet measured perpendicular to the face of the wall. If physical obstructions or lot lines prohibit 10 feet of horizontal distance, a 5-percent slope shall be provided to an *approved* alternative method of diverting water away from the foundation. Swales used for this purpose shall be sloped a minimum of 2 percent where located within 10 feet of the building foundation. Impervious surfaces within 10 feet of the building foundation shall be sloped a minimum of 2 percent away from the building.

ASCE 24 is a referenced standard in the International Building Code. Any building or structure that falls within the scope of the IBC that is proposed in a flood hazard area is to be designed in accordance with ASCE 24. Freeboard is required as a function of the nature of occupancy and the flood zone. Dwellings and most other buildings have 1-foot of freeboard; certain essential facilities have 2-3 feet; only agricultural facilities, temporary facilities and minor storage facilities are allowed to have their lowest floors at the BFE. The City of Savannah Flood Damage Prevention Ordinance requires all new or substantial improvement construction in the flood hazard area to be constructed with 1-foot of freeboard above the base flood elevation.

The City of Savannah Building Inspections Division is responsible for ensuring the public safety through the enforcement of federal, state, and local codes governing construction. City staff reviews plans, issues building permits, and performs inspections to ensure Code compliance related to aspects of life-safety, structural integrity, energy conversation, accessible design and electrical, plumbing, fuel gas, heating and air conditioning systems.

Reducing Future Flood Losses

Future flood losses in the City of Savannah will be reduced through the implementation of the Georgia Building Code/2012 IBC with the sloping requirement of grade away from buildings. Enforcement of the 1-foot freeboard requirement will provide an extra level of protection for buildings constructed in the City.

CRS Credit

The CRS encourages strong building codes. It provides credit in two ways: points are awarded based on the community's Building Code Effectiveness Grading Schedule (BCEGS) classification and points are awarded for adopting the International Code series. Savannah's BCEGS rating is a Class 4 for both residential and commercial. Savannah currently receives credit for Activity 430 – Higher Regulatory Standards.

Planning and Zoning

Building codes provide guidance on how to build in hazardous areas. Planning and zoning activities direct development away from these areas, particularly floodplains and wetlands. They do this by designating land uses that are compatible with the natural conditions of land that is prone to flooding, such as open space or recreation. Planning and zoning activities can also provide benefits by simply allowing developers more flexibility in arranging improvements on a parcel of land through the planned development approach.

Local Implementation

Comprehensive Plan

The Metropolitan Planning Commission is a joint planning agency for the City of Savannah and Chatham County. Each governmental body appoints seven members to the board. Two of these members are the City and County Managers. These fourteen members serve without pay and represent government, private enterprise, and citizens' interest groups. Commissioners are appointed for three year overlapping terms. The MPC meets every three weeks to consider matters of zoning and land use, as well as other studies and issues for which it has responsibility. Planning Meetings are held as needed to discuss only planning issues.

The MPC also provides administrative support for the Savannah Historic District Board of Review, the Historic Site and Monument Commission, the Chatham County Historic Preservation Commission, the City and County Zoning Boards of Appeal, and the Coastal Regional Metropolitan Planning Organization (CORE MPO) Committees.

A Comprehensive Plan, in broad terms, is a policy statement to guide the future placement and development of community facilities. It is the basis for a community's zoning, subdivision and design regulations and a community's official maps and amendments to the zoning, subdivision and design ordinances. The Chatham County – Savannah Comprehensive Plan developed by the MPC was adopted in 2006 by the Chatham County Board of Commissioners and the Mayor and Aldermen of the City of Savannah. The Comprehensive Plan represents the first phase of the two-part Tricentennial Planning Process. The Unified Zoning Ordinance, which is currently underway, is the second phase.

Zoning and Subdivision Regulations

The purpose of the City's Land Development Regulations is to provide the minimum regulations necessary to facilitate safe and orderly growth, and to also ensure that growth forms an integral part of a community of functional neighborhoods, retail and commercial centers; increases collective security and community identity to promote civic awareness and responsibility; and enhances the quality of life for the entire City to ensure the greatest possible economic and social benefits for all residents. These regulations are intended to promote consistency with the goals, objectives and policies of the City's Comprehensive Plan. The following standards for subdivisions are included in the City's Flood Damage Prevention Ordinance:

(1) In addition to meeting all requirements of the City of Savannah [Code] sections 4-11001, 8-6001, and 8-2001, all subdivision and/or development proposals shall be consistent with the need to minimize flood damage;

(2) All subdivision and/or development proposals shall have public utilities and facilities such as sewer, gas, electrical and water systems located and constructed to minimize flood damage;

(3) All subdivision and/or development proposals shall have adequate drainage provided to reduce exposure to flood hazards, and;

(4) For subdivisions and/or developments greater than 50 lots or five acres, whichever is less, base flood elevation data shall be provided for subdivision and all other proposed development, including manufactured home parks and subdivisions. After all required construction permitting is obtained, any changes or revisions to the flood data adopted herein and shown on the FIRM shall be submitted by the developer's engineer to FEMA for review as a conditional letter of map revision (CLOMR) or conditional letter of map amendment (CLOMA), whichever is applicable. Upon completion of the project, the developer is responsible for submitting the "as-built" data to FEMA in order to obtain the final LOMR. The developer's engineer shall additionally provide the development services director with all digital data needed to update local versions of the DFIRM.

(5) All subdivision plats shall delineate all zones as determined from information provided in section 8-7011, to include using the same datum, all letter of map amendments, and designed finish floors, garages, and carports.

Capital Improvement Plan

The 2013-2017 Capital Improvement Program presents the five year capital plan for the City of Savannah. Funding of Capital projects in the five-year plan is guided by the projects' potential impact on the well-being of the community at large. Capital projects are intended to create the greatest good for the greatest number of Savannah's residents. With this in mind, projects are guided by the council priorities listed below. Many of the projects may relate to multiple priorities – for instance, a project that creates good health and environment may also spur economic development. However, each project is assigned only one priority to which it primarily relates. The council priorities were developed to reflect citizen views regarding the services that government should provide. Council priorities reflected in the 2013-2017 Plan are:

- **CULTURE AND RECREATION** – To ensure citizens have a community that provides recreational and cultural opportunities that keep their minds and bodies active and that recognizes the needs of all citizens.
- **ECONOMIC GROWTH** – To provide citizens a City that encourages and supports appropriate economic growth that creates jobs, expands City revenue and improves neighborhoods and commercial corridors.
- **HEALTH & ENVIRONMENT** – To provide citizens a community that promotes health through good infrastructure (e.g. water, sewer) while preserving the environment for future generations.
- **HIGH PERFORMING GOVERNMENT** – To provide citizens with a responsible, accessible and responsive government that maximizes use of public resources for services citizens need.
- **NEIGHBORHOOD VITALITY** – To provide a City of strong and vibrant neighborhoods that are clean, safe and encourage a sense of community.
- **PUBLIC SAFETY** – To provide a City where citizens are safe and feel safe from crime, fire and other hazards anywhere in the community.

The revenue sources for the Capital Improvement Program are the General Fund, Water and Sewer Funds and SPLOST funding.

Reducing Future Flood Losses

Zoning and comprehensive planning can work together to reduce future flood losses by directing development away from hazard prone areas. The City's zoning ordinance does not provide for any additional restrictions on development in floodplains, aside from what is required under the flood damage prevention ordinance regarding building elevations. The City's subdivision regulations state that "no lot shall be approved that does not contain a suitable building site of sufficient elevation to permit construction utilizing a lowest floor elevation of at least the level of the 100-year flood. The entire lot shall be properly drained. Special emphasis will be placed on requirements as given in the city's flood damage prevention ordinance."

CRS Credit

CRS credits are available for regulations that encourage developers to preserve floodplains or other hazardous areas away from development. There is no credit for a plan, only for the enforceable regulations that are adopted pursuant to a plan. Savannah currently receives credit for Activity 430 – Higher Regulatory Standards.

Open Space Preservation

Keeping the floodplain and other hazardous areas open and free from development is the best approach to preventing damage to new developments. Open space can be maintained in agricultural use or can serve as parks, greenway corridors and golf courses.

Comprehensive and capital improvement plans should identify areas to be preserved by acquisition and other means, such as purchasing an easement. With an easement, the owner is free to develop and use private property, but property taxes are reduced or a payment is made to the owner if the owner agrees to not build on the part set aside in the easement.

Although there are some federal programs that can help acquire or reserve open lands, open space lands and easements do not always have to be purchased. Developers can be encouraged to dedicate park land and required to dedicate easements for drainage and maintenance purposes. These are usually linear areas along property lines or channels. Maintenance easements also can be donated by streamside property owners in return for a community maintenance program.

Local Implementation

The City of Savannah has developed a Community Gardens program, allowing more than 1,250 city-owned parcels, stretching from Woodville and Hudson Hill to Paradise Park and Wilshire Estates, to be made available to residents and neighborhood associations to start community gardens. The City of Savannah recognizes community gardens as valuable recreational and educational activities that can contribute to community development, environmental awareness, positive social interaction, and community education.

The City of Savannah Park and Tree Commission was created by council in December 1895, with the first meeting to be held in January 1896. The purpose of the City's Landscape and Tree Ordinance is to protect and maintain the urban forest through the management of the impact of development, to preserve the environmental and aesthetic assets of the community through requirements for tree planting and landscaping, and provide protection from removal without a permit for all trees within the City of Savannah. The provisions of the Landscape and Tree Ordinance apply to all property in the city being developed or redeveloped for commercial, industrial, institutional, multi-family and single family subdivisions.

The Savannah Tree Foundation is not-for-profit urban and community forestry organization dedicated to preserving, protecting and planting canopy trees in Savannah and Chatham County, Georgia. The Savannah Tree Foundation promotes, through direct action and education, an awareness of trees as vital environmental resources and an important part of cultural heritage.

Environmental protection priorities identified in the Land Use Element of the Chatham County-Savannah Comprehensive Plan are as follows:

- Continue to use SPLOST funds for acquisition of sites for environmental protection.

- Refine the Environmental Overlay District adopted by Chatham County in 2001 and extended in 2003
- Enhance marsh buffer protection with the use of Low Impact Development strategies and standards.
- Create new hammock protection by reducing development densities.
- Provide incentives for countywide conservation subdivisions similar to those in the Environmental Overlay District

Reducing Future Flood Losses

Creating or maintaining open space is the primary way to reduce future flood losses. The City of Savannah has many open space and natural parcels which serve to reduce future flood losses by remaining open. These parks and natural preserved areas create opportunities for the public to benefit from education and recreation while eliminating potential for future flooding.

CRS Credit

Savannah currently receives credit for Activity 420 – Open Space Preservation. Preserving flood prone areas as open space is one of the highest priorities of the Community Rating System. The credits in the 2013 manual have doubled for OSP (Open Space Preservation). Credit is based on the area of the floodplain that is designated as public undeveloped properties, parks, wildlife refuges, golf courses, or other uses that can be kept vacant through ownership or regulations.

Stormwater Management

Stormwater runoff is increased when natural ground cover is replaced by urban development. Development in the watershed that drains to a river can aggravate downstream flooding, overload the community's drainage system, cause erosion, and impair water quality. There are three ways to prevent flooding problems caused by stormwater runoff:

1) Regulating development in the floodplain to ensure that it will be protected from flooding and that it won't divert floodwaters onto other properties, and

2) Regulating all development to ensure that the post-development peak runoff will not be greater than it was under pre-development conditions.

3) Set construction standards so buildings are protected from shallow water.

Local Implementation

The City's Stormwater Management Department is responsible for the operation and maintenance of the stormwater drainage systems of the City of Savannah. This includes the operation of seven stormwater pump stations, over 390 miles of storm sewers, over 160 miles of drainage ditches and canals, and five detention ponds. Another function of the Department is to ensure compliance with a state-issued stormwater permit, which requires stormwater monitoring, private site inspections, and site development permitting. And lastly, the Department develops engineering plans, bids and installs capital drainage improvements projects.

The City of Savannah's NPDES MS-4 Permit No. GAS000205 requires that the City adopt and enforce certain environmental regulations as the permittee. These regulations require adoption of the model ordinance contained within the Coastal Stormwater Supplement (CSS) to the Georgia Stormwater Management Manual (GSMM). Therefore, the City of Savannah updated its Stormwater Management Ordinance pursuant to the permit; the updated Stormwater Management Ordinance became effective in April 2012. The following minimum stormwater design standards are included in the Ordinance:

a) There shall be no increase in the base flood elevation within the special flood hazard area (SFHA), as delineated by the latest National Flood Insurance Program (NFIP) maps, or in any areas that are known to have flooded repetitively, or areas where a hydrologic model predicts flooding will occur in the 100-year, 24-hour event. Where hydrologic model results are conflicting, the stormwater management director shall decide which model will be used.
b) Finished floor elevations for structures not included in the special flood hazard area shall be equal to or higher than that shown on the original subdivision plat or neighborhood grading and drainage plan or as determined by a registered civil engineer.
c) The post-development peak rate of runoff shall not exceed the predevelopment peak rate of runoff for the one-, five-, ten-, and 25-year, 24-hour events.
d) If drainage calculations indicate that post-development runoff will exceed predevelopment runoff, then on-site detention for the one-, five-, ten-, and 25-year, 24-hour events is required at a discharge rate equal to the pre-developed 24-hour peak rate of discharge for all storm events from the one-, five-, ten-, and including the 25-year event, or the capacity of the existing downstream conveyance system must be upgraded in capacity to accommodate the additional 25-year, 24-hour discharge generated by the new development.
e) All stormwater management systems shall be designed to comply with the requirements of the latest City of Savannah Local Design Manual and comply with the latest edition of the Coastal Stormwater Supplement to the Georgia Stormwater Management Manual.
f) Drainage and/or access easements. The width and configuration requirements of drainage and maintenance easements/rights-of-way are listed in section 4.3.8 of the Stormwater Management Local Design Manual. Access and flow-through easements shall be provided to all stormwater management structures and outfalls.

The City of Savannah Stormwater Management Local Design Manual (LDM) has been developed to serve as a comprehensive guide to implementing stormwater management facilities, controls and systems in the City of Savannah. Additionally, the City of Savannah LDM has been developed to supplement the technical guidance information contained in the Georgia Stormwater Management Manual (GSMM) first Edition (August 2001) and the Coastal Stormwater Supplement (CSS) to the GSMM, latest edition. The City's MS-4 permit requires that the City adopt a local design manual that implements the use of either the Georgia Stormwater Management Manual or an equivalent local design manual, and that, as a part of Chatham County, that the adopted manual should include the Coastal Supplement. Therefore, the Local Design Manual serves as the required manual, and the GSMM and the CSS serve as technical reference guidance for the design, construction, and maintenance of stormwater management systems within the City. Any conflicts or issues that may arise pertaining to information contained in the GSMM and the CSS should be addressed at the onset of the project through correspondence with the appropriate City Staff.

Reducing Future Flood Losses

Stormwater management and the requirement that post development runoff cannot exceed pre-development conditions is one way to prevent future flood losses. Retention and detention requirements also help to reduce future flood losses.

CRS Credit

Savannah currently receives credit for Activity 450 – Stormwater Management. The community enforces regulations for stormwater management, soil and erosion control and water quality.

Conclusions (Adoption or revisions of such plans and ordinances)

- Most zoning ordinances don't designate floodplain as a special type of district.
- At least a minimal amount of the City's floodplain is open space in public ownership.

Recommendations

- The City should continue to implement activities in the CRS Program under the guidance of the 2013 CRS Coordinator's Manual
- The City should consider creating an Open Space Plan.

B.4.2 Floodplain Management Regulatory/Current & Future Conditions

Floodplain Management Regulations

Maintaining adequate flood control is vital to a healthy and productive community. Natural floodplains protect human life and property from flood damage in the event of a storm. The beautiful, functioning wetlands, riparian buffers and marshlands offer economic and health benefits as well as their rich and diverse ecosystems. By making wise land use decisions in the development and management of floodplains, beneficial functions can be protected and negative impacts to the quality of the environment can be reduced.

The National Flood Insurance Program (NFIP) is administered by the Federal Emergency Management Agency (FEMA). As a condition of making flood insurance available for their residents, communities that participate in the NFIP agree to regulate new construction in the area subject to inundation by the 100-year (base) flood. The floodplain subject to these requirements is shown as an A or V Zone on the Flood Insurance Rate Map (FIRM).

Local Implementation

The City of Savannah's Flood Damage Prevention Ordinance requires that all construction, additions, conversions and/or development located in areas of special flood hazard comply with certain minimum standards intended to minimize damage from floods. Furthermore, any substantially improved or substantially damaged home must be brought up to the NFIP and the City's Flood Ordinance requirements. This is known as the 50% Rule. The "50% Rule" states that if the lowest finished floor of an existing house is below the base flood elevation (BFE) and the cost of repairs or renovations will increase the structure's original Fair Market Value by more than 50%, then the lowest finish floor elevation must be raised or elevated to at least the BFE. In the VE zone, the bottom of the lowest horizontal member must be brought up to or exceed the BFE.

In all areas of special flood hazard designated as A1-30, AE, AH, A (with estimated BFE), the following provisions are required:

(1) *New construction and/or substantial improvements.* Where base flood elevation data are available, new construction and/or substantial improvement of any structure or manufactured home shall have the lowest floor, including basement, elevated no lower than one foot above the base flood elevation. Should solid foundation perimeter walls be used to elevate a structure, openings sufficient to facilitate the unimpeded movements of flood waters shall be provided in accordance with standards of subsection 8-7045(4), "Elevated buildings".

All heating and air conditioning equipment and components (including ductwork), all electrical (except the main disconnect, the electric meter, and one ground fault interrupted outlet and switch), ventilation, plumbing fixtures and other service facilities shall be elevated at or above one foot above the base flood elevation.

(2) *Nonresidential construction.* New construction and/or the substantial improvement of any structure located in A1-30, AE, or AH zones, may be floodproofed in lieu of elevation. The structure, together with attendant utility and sanitary facilities, must be designed to be water-

tight to one foot above the base flood elevation, with walls substantially impermeable to the passage of water, and structural components having the capability of resisting hydrostatic and hydrodynamic loads and the effect of buoyancy. A registered professional engineer or architect shall certify that the design and methods of construction are in accordance with accepted standards of practice for meeting the provisions above, and shall provide such certification to the official as set forth above and in subsection 8-7032(6).

(3) *Standards for manufactured homes and recreational vehicles.* Where base flood elevation data are available:

(a) All manufactured homes placed and/or substantially improved on:

(i) Individual lots or parcels,

(ii) In new and/or substantially improved manufactured home parks or subdivisions,

(iii) In expansions to existing manufactured home parks or subdivisions, or

(iv) On a site in an existing manufactured home park or subdivision where a manufactured home has incurred "substantial damage" as the result of a flood, must have the lowest floor including basement, elevated no lower than one foot above the base flood elevation.

(b) Manufactured homes placed and/or substantially improved in an either existing manufactured home park or subdivision must be elevated so that:

(i) The lowest horizontal structural member to the lowest floor of the manufactured home is elevated no lower than one foot above the level of the base flood elevation, or

(ii) The manufactured home chassis is elevated and supported by reinforced piers (or other foundation elements of at least an equivalent strength) of no less than 36 inches in height above grade.

(c) All manufactured homes must be securely anchored to an adequately anchored foundation system to resist flotation, collapse and lateral movement.

(d) All recreational vehicles placed on sites must either:

(i) Be on the site for fewer than 180 consecutive days.

(ii) Be fully licensed and ready for highway use, (a recreational vehicle is ready for highway use if it is licensed, on its wheels or jacking system, attached to the site only by quick disconnect type utilities and security devices, and has no permanently attached structures or additions), or

(iii) The recreational vehicle must meet all the requirements for "New Construction", including the anchoring and elevation requirements of subsections (3)(a) and (b), above.

(4) *Floodway*. Located within areas of special flood hazard established in section 8-7011 are areas designated as floodway. A floodway may be an extremely hazardous area due to velocity floodwaters, debris or erosion potential. In addition, the area must remain free of encroachment in order to allow for the discharge of the base flood without increased flood heights. Therefore, the following provisions shall apply:

(a) Encroachments are prohibited, including earthen fill, new construction, substantial improvements or other development within the regulatory floodway. Development may be permitted however, provided it is demonstrated through hydrologic and hydraulic analyses performed in accordance with standard engineering practice that the encroachment shall not result in any increase in flood levels or floodway widths during a base flood discharge.

A registered professional engineer must provide supporting technical data and certification thereof.

(b) Only if subsection (4)(a) above is satisfied, then any new construction or substantial improvement shall comply with all other applicable flood hazard reduction provisions of this article.

The following provisions apply in special flood hazard areas where streams exist but no base flood data have been provided (A-zones), or where base flood data have been provided but a floodway has not been delineated:

(1) When base flood elevation data or floodway data have not been provided in accordance with section 8-7011, then the city engineer shall obtain, review, and reasonably utilize any scientific or historic base flood elevation and floodway data available from a federal, state, or other source, in order to administer the provisions of this article. Only if data are not available from these sources, then the following provisions ([subsections] (2) and (3)) shall apply.

(2) No encroachments, including structures or fill material, shall be located within an area equal to the width of the stream or 25 feet, whichever is greater, measured from the top of the stream bank, unless:

(a) An equal or greater volume of material is excavated from the floodway at the point of encroachment, such that there is no increase in the base flow elevation at any point within the community; and

(b) Certification by a registered professional engineer is provided demonstrating that such encroachment and its mitigation shall not result in any increase in flood levels during the occurrence of the base flood discharge.

(3) In special flood hazard areas without base flood elevation data, new construction and substantial improvements of existing structures shall have the lowest floor of the lowest enclosed area (including basement) elevated no less than three feet above the highest adjacent grade at the building site. (NOTE: Require the lowest floor to be elevated one foot above the estimated base flood elevation in A-zone areas where a limited detail study has been completed). Openings sufficient to facilitate the unimpeded movements of floodwaters shall be provided in accordance with standards of subsection 8-7045(4), "Elevated buildings".

(4) All heating and air conditioning equipment and components (including ductwork), all electrical (except the main disconnect, the electric meter, and one ground fault interrupted outlet and switch), ventilation, plumbing fixtures, and other service facilities shall be elevated no less than three feet above the highest adjacent grade at the building site.

(5) The development services director shall certify the lowest floor elevation level and the record shall become a permanent part of the permit file.

The following provisions apply in SFHAs where streams with base flood elevations are provided but no floodways have been designated (zones AE):

(1) No encroachments, including fill material, new structures or substantial improvements shall be located within areas of special flood hazard unless:

(a) Any fill material or portion of any other improvement placed inside a special flood hazard area (SFHA) below base flood elevation shall be mitigated on site or on an adjacent site by an equal or greater volume of excavated material. The mitigation excavation must be connected to the special flood hazard area at an elevation less than or equal to an elevation two feet below the 100 year flood plain elevation; or,

(b) A stormwater conveyance system is sized and constructed to convey the 100-year 24-hour storm to a suitable outfall.

In either case, certification by a registered professional engineer shall be provided demonstrating that the cumulative effect of the proposed development, when combined with all other existing and anticipated development, will not increase the water surface elevation of the base flood at any point within the community. The engineering certification should be supported by verifiable technical data that conforms to standard hydraulic engineering principles.

(2) New construction or substantial improvements of buildings shall be elevated or flood-proofed to elevations established in accordance with section 8-7046

The following provisions apply in SFHAs designated "AO" shallow flooding areas. These areas have base flood depths of one to three feet above ground, with no clearly defined channel.

(1) All new construction and substantial improvements of residential and non-residential structures shall have the lowest floor, including basement, elevated to the flood depth number specified on the flood insurance rate map (FIRM), above the highest adjacent grade. If no flood depth number is specified, the lowest floor, including basement, shall be elevated at least three feet above the highest adjacent grade. Openings sufficient to facilitate the unimpeded movements of flood waters shall be provided in accordance with standards of subsection 8-7045(4), "Elevated buildings".

The development services director shall certify the lowest floor elevation level and the record shall become a permanent part of the permit file.

(2) New construction or the substantial improvement of a nonresidential structure may be floodproofed in lieu of elevation. The structure, together with attendant utility and sanitary facilities, must be designed to be water tight to the specified FIRM flood level plus one foot, above highest adjacent grade, with walls substantially impermeable to the passage of water, and structural components having the capability of resisting hydrostatic and hydrodynamic loads and the effect of buoyancy. A registered professional engineer or architect shall certify that the design and methods of construction are in accordance with accepted standards of practice for meeting the provisions above, and shall provide such certification to the official as set forth above and as required in subsections 8-7031(1) and (2).

(3) Drainage paths shall be provided to guide floodwater around and away from any proposed structure.

The following provisions apply in areas designated as coastal high hazard areas (V-zones). These areas have special flood hazards associated with wave action and storm surge.

(1) All new construction and substantial improvements of existing structures shall not be located within the buffer of the state waters and salt marsh as determined by the Georgia Department of Natural Resources;

(2) All new construction and substantial improvements of existing structures shall be elevated on piles, columns, or shear walls parallel to the flow of water so that the bottom of the lowest supporting horizontal structural member (excluding pilings or columns) is located no lower than one foot above the base flood elevation level. All space below the lowest supporting member shall remain free of obstruction or constructed with non-supporting breakaway walls. Open wood lattice work or decorative screening may be permitted for aesthetic purposes only and must be designed to wash away in the event of abnormal wave action and in accordance with subsection (6) below;

(3) All new construction and substantial improvements of existing structures shall be securely anchored on pilings, columns, or shear walls; and

(4) All pile and column foundations and the structures attached thereto shall be anchored to resist flotation, collapse, and lateral movement due to the combined effects of wind and water loads acting simultaneously on all building components, both (nonstructural and structural). Water loading values shall equal or exceed those of the base flood. Wind loading values shall be in accordance with the most current edition of the Standard Building Code.

(5) A registered professional engineer or architect shall certify that the design, specifications and plans for construction are in compliance with the provisions contained in subsections (2), (3), and (4) herein.

(6) All space below the lowest horizontal supporting member must remain free of obstruction. Breakaway walls, open wood lattice work or decorative screening may be permitted and must be designed to wash away in the event of abnormal wave action without causing structural damage to the supporting foundation or elevated portion of the structure. The following design specifications are allowed:

(a) The design safe loading resistance of each wall shall not be less than ten nor more than 20 pounds per square foot; or

(b) If more than 20 pounds per square foot, a registered professional engineer or architect shall certify that the design wall collapse would result from a water load less than that which would occur during the base flood event, and the elevated portion of the building and supporting foundation system shall not be subject to collapse, displacement, or other structural damage due to the effects of wind and water loads acting simultaneously on all building components during the base flood event. Maximum wind and water loading values to be used in this determination shall each have one percent chance of being equaled or exceeded in any given year (100-year mean recurrence interval).

(c) Any such enclosed space shall not be used for human habitation, but shall be designed to be used only for parking of vehicles, building access, or limited storage of maintenance equipment used in connection with the premises.

(d) To have a breakaway wall, other than screening or open wood latticework, the owner must sign a non-conversion agreement stating that these areas shall not be converted to habitable space allowing the Development Services Director access to ensure the enclosed area is not in violation to this ordinance. The owner must record the agreement with the deed for future owners.

(7) Prior to construction, plans for any structures having open wood latticework or decorative screening must be submitted to the Development Services Director for approval;

(8) Any alteration, repair, reconstruction or improvement to any structure shall not enclose the space below the lowest floor except with open wood latticework or decorative screening, as provided in this Section.

(9) There shall be no fill used as structural support, or to elevate areas used for septic tank drain fields. Non-compacted fill may be used around the perimeter of a building for landscaping/aesthetic purposes provided the fill will wash out from storm surge, (thereby rendering the building free of obstruction) prior to generating excessive loading forces, ramping effects, or wave deflection. The Development Services Director may approve design plans for landscaping/aesthetic fill only after the applicant has provided an analysis by an engineer, architect, and/or soil scientist, which demonstrates that the following factors have been fully considered:

(a) Particle composition of fill material does not have a tendency for excessive natural compaction;

(b) Volume and distribution of fill will not cause wave defection to adjacent properties; and

(c) Slope of fill will not cause wave run-up or ramping.

(10) There shall be no alteration of sand dunes, mangrove stands or hammocks, which would increase potential flood damage;

(11) Prohibit the placement of manufactured homes (mobile homes), except in an existing manufactured homes park or subdivision. A replacement manufactured home may be placed on a lot in an existing manufactured home park or subdivision provided the anchoring standards of subsection (4) are met.

Reducing Future Flood Losses

In addition to residential construction, non-residential construction and substantial improvements, all standards should be:

- Designed or modified and adequately anchored to prevent flotation, collapse, or lateral movement of the structure resulting from hydrodynamic and hydrostatic loads, including the effects of buoyancy
- Constructed with electrical, heating, ventilation, plumbing, and air conditioning equipment and other service facilities, designated or located so as to prevent water from entering or accumulating within components during flooding

CRS Credit

Savannah currently receives credit for Activity 430 – Higher Regulatory Standards. The City receives credit for enforcing regulations that require freeboard for new and substantial improvement construction, other higher regulatory standards, and state mandated regulatory standards. Credit is also provided for a BCEGS classification of 4/4 and for staff education and certification as a floodplain manager. The City of Savannah has several CFMs on staff and is trying to add more.

Conclusions (Adoption or revisions of such plans and ordinances)

- The City's Flood Damage Prevention Ordinance includes a 1-food freeboard standard.
- The City's Flood Damage Prevention Ordinance complies with the 50% Rule.

Recommendations

- Requiring compensatory storage preserves areas of the floodplain that can store flood water and minimizes increases in flood heights due to development.
- Requiring full compliance with floodplain management regulations when proposed improvements or repairs are less than 50% of a building's value brings more nonconforming buildings up to current flood protection standards.
- Standards for protecting buildings from local drainage problems reduce flood losses and flood insurance claims, especially outside the floodplain.
- Requiring new construction in the coastal A Zone to meet the same standards as V Zone buildings protects it from a known, but unmapped, breaking wave hazard.

B.4.3 Property Protection Measures

Property protection measures are used to modify buildings or property subject to damage. Property protection measures fall under three approaches:

- Modify the site to keep the hazard from reaching the building,
- Modify the building (retrofit) so it can withstand the impacts of the hazard, and
- Insure the property to provide financial relief after the damage occurs.

Property protection measures are normally implemented by the property owner, although in many cases technical and financial assistance can be provided by a government agency.

Keeping the Hazard Away

Generally, natural hazards do not damage vacant areas. As noted earlier, the major impact of hazards is to people and improved property. In some cases, properties can be modified so the hazard does not reach the damage-prone improvements. For example, a berm can be built to prevent floodwaters from reaching a house.

Flooding
There are five common methods to keep a flood from reaching and damaging a building:

- Erect a barrier between the building and the source of the flooding.
- Move the building out of the flood-prone area.
- Elevate the building above the flood level.
- Demolish the building.
- Replace the building with a new one that is elevated above the flood level.

Barriers
A flood protection barrier can be built of dirt or soil (a "berm") or concrete or steel (a "floodwall"). Careful design is needed so as not to create flooding or drainage problems on neighboring properties. Depending on how porous the ground is, if floodwaters will stay up for more than an hour or two, the design needs to account for leaks, seepage of water underneath, and rainwater that will fall inside the perimeter. This is usually done with a sump or drain to collect the internal groundwater and surface water and a pump and pipe to pump the internal drainage over the barrier.

Barriers can only be built so high. They can be overtopped by a flood higher than expected. Barriers made of earth are susceptible to erosion from rain and floodwaters if not properly sloped, covered with grass, and properly maintained. A berm can also settle over time, lowering its protection level. A floodwall can crack, weaken, and lose its watertight seal. Therefore, barriers need careful design and maintenance (and insurance on the building, in case of failure).

Relocation
Moving a building to higher ground is the surest and safest way to protect it from flooding. While almost any building can be moved, the cost increases for heavier structures, such as those with exterior brick and stone walls, and for large or irregularly shaped buildings. However, experienced building movers can handle any job. In areas subject to flash flooding, deep waters, or other high hazard, relocation is often the only safe approach. Relocation is also preferred for large lots that include buildable areas outside the floodplain or where the owner has a new flood-free lot (or portion of the existing lot) available.

Building Elevation
Raising a building above the flood level can be almost as effective as moving it out of the floodplain. Water flows under the building, causing little or no damage to the structure or its contents. Raising a building above the flood level is cheaper than moving it and can be less disruptive to a neighborhood. Elevation has proven to be an acceptable and reasonable means of complying with floodplain regulations

that require new, substantially improved, and substantially damaged buildings to be elevated above the base flood elevation.

Demolition
Some buildings, especially heavily damaged or repetitively flooded ones, are not worth the expense to protect them from future damages. It is cheaper to demolish them and either replace them with new, flood protected structures, or relocate the occupants to a safer site. Demolition is also appropriate for buildings that are difficult to move - such as larger, slab foundation or masonry structures - and for dilapidated structures that are not worth protecting. Generally, demolition projects are undertaken by a government agency, so the cost is not borne by the property owner, and the land is converted to public open space use, like a park.

Pilot Reconstruction
If a building is not in good shape, elevating it may not be worthwhile or it may even be dangerous. An alternative is to demolish the structure and build a new one on the site that meets or exceeds all flood protection codes. FEMA funding programs refer to this approach as "pilot reconstruction." It is still a pilot program, and not a regularly funded option. Certain rules must be followed to qualify for federal funds for pilot reconstruction:

- Pilot reconstruction is only possible after it has been shown that acquisition or elevation are not feasible, based on the program's criteria.
- Funds are only available to people who owned the property at the time of the event for which funding is authorized.
- It must be demonstrated that the benefits exceed the costs.
- The new building must be elevated to the advisory base flood elevation.
- The new building must not exceed more than 10% of the old building's square footage.
- The new building must meet all flood and wind protection codes.
- There must be a deed restriction that states the owner will buy and keep a flood insurance policy.
- The maximum federal grant is 75% of the cost, up to $150,000. FEMA is developing a detailed list of eligible costs to ensure that disaster funds are not used to upgrade homes.
-

Local Implementation
The City of Savannah does currently receive credit for Activity 520 – Acquisition and Relocation. The City's Real Properties Department has submitted and received HMGP approval for 17 houses to be demolished in high-risk, flood-prone areas. Furthermore, the City's Real Properties Department has a list of repetitive loss properties on file for demolition once additional mitigation funds become available. The City does not currently receive credit for Activity 530 – Flood Protection.

CRS Credit
The CRS provides the most credit points for acquisition and relocation under Activity 520, because this measure permanently removes insurable buildings from the floodplain. The CRS credits barriers and elevating existing buildings under Activity 530. Elevating a building above the flood level will also reduce the flood insurance premiums on that individual building. Because barriers are less secure than elevation, not as many points are provided. Higher scores are possible, but they are based on the number of buildings removed compared to the number remaining in the floodplain.

Retrofitting

An alternative to keeping the hazard away from a building is to modify or retrofit the site or building to minimize or prevent damage. There are a variety of techniques to do this, as described below.

Dry Floodproofing
Dry floodproofing means making all areas below the flood protection level watertight. Walls are coated with waterproofing compounds or plastic sheeting. Openings, such as doors, windows and vents, are closed, either permanently, with removable shields, or with sandbags. Dry floodproofing of new and existing nonresidential buildings in the regulatory floodplain is permitted under state, FEMA and local regulations. Dry floodproofing of existing residential buildings in the floodplain is also permitted as long as the building is not substantially damaged or being substantially improved. Owners of buildings located outside the regulatory floodplain can always use dry floodproofing techniques.

Dry floodproofing is only effective for shallow flooding, such as repetitive drainage problems. It does not protect from the deep flooding along lakes and larger rivers caused by hurricanes or other storms.

Wet Floodproofing
The alternative to dry floodproofing is wet floodproofing: water is let in and everything that could be damaged by a flood is removed or elevated above the flood level. Structural components below the flood level are replaced with materials that are not subject to water damage. For example, concrete block walls are used instead of wooden studs and gypsum wallboard. The furnace, water heater and laundry facilities are permanently relocated to a higher floor. Where the flooding is not deep, these appliances can be raised on blocks or platforms.

Local Implementation
The City of Savannah does not currently receive credit for Activity 530 – Flood Protection.

CRS Credit
The credit for Activity 530 is based on the combination of flood protection techniques used and the level of flood protection provided. Points are calculated for each protected building. Bonus points are provided for the protection of repetitive loss buildings and critical facilities.

Insurance

Technically, insurance does not mitigate damage caused by a natural hazard. However, it does help the owner repair, rebuild, and hopefully afford to incorporate some of the other property protection measures in the process. Insurance offers the advantage of protecting the property, as long as the policy is in force, without requiring human intervention for the measure to work.

Private Property
Although most homeowner's insurance policies do not cover a property for flood damage, an owner can insure a building for damage by surface flooding through the NFIP. Flood insurance coverage is provided for buildings and their contents damaged by a "general condition of surface flooding" in the area. Most people purchase flood insurance because it is required by the bank when they get a mortgage or home improvement loan. Usually these policies just cover the building's structure and not the contents. Contents coverage can be purchased separately. Renters can buy contents coverage, even if the owner does not buy structural coverage on the building. Most people don't realize that there is a 30-day waiting period to purchase a flood insurance policy and there are limits on coverage.

Public Property
Governments can purchase commercial insurance policies. Larger local governments often self-insure and absorb the cost of damage to one facility, but if many properties are exposed to damage, self-

insurance can drain the government's budget. Communities cannot expect federal disaster assistance to make up the difference after a flood.

Under Section 406(d) of the Stafford Act:

> "If an eligible insurable facility damaged by flooding is located in a [mapped floodplain] … and the facility is not covered (or is underinsured) by flood insurance on the date of such flooding, FEMA is required to reduce Federal disaster assistance by the maximum amount of insurance proceeds that would have been received had the buildings and contents been fully covered under a National Flood Insurance Program (NFIP) standard flood insurance policy. [Generally, the maximum amount of proceeds for a non-residential property is $500,000.]

Communities Need to:

- Identify all insurable facilities, and the type and amount of coverage (including deductibles and policy limits) for each. The anticipated insurance proceeds will be deducted from the total eligible damages to the facilities.
- Identify all facilities that have previously received Federal disaster assistance for which insurance was required. Determine if insurance has been maintained. A failure to maintain the required insurance for the hazard that caused the disaster will render ineligible for Public Assistance funding…
- [Communities] must obtain and maintain insurance to cover [their] facility - buildings, equipment, contents and vehicles - for the hazard that caused the damage in order to receive Public Assistance funding. Such coverage must, at a minimum, be in the amount of the eligible project costs. FEMA will not provide assistance for that facility in future disasters if the requirement to purchase insurance is not met. - FEMA Response and Recovery Directorate Policy No. 9580.3, August 23, 2000
- In other words, the law expects public agencies to be fully insured as a condition of receiving federal disaster assistance.

Local Implementation

Flood insurance information for the City is provided in Section 4.3.4.

CRS Credit

There is no credit for purchasing flood insurance, but the CRS does provide credit for local public information programs that explain flood insurance to property owners. The CRS also reduces the premiums for those people who do buy NFIP coverage. The City of Savannah currently receives credit for Activity 330 – Outreach Projects.

Conclusions

- There are several ways to protect properties from flood damage. The advantages and disadvantages of each should be carefully examined for that particular situation.
- Property owners can implement some property protection measures at little cost, especially for sites in areas of low level flooding.
- Approximately 33% of properties in Savannah located in a SFHA have a flood insurance policy.
- The local government can promote and support property protection through outreach and financial incentives.
- Property protection measures can protect the most flood-prone buildings in the City such as those which are repetitively flooded.

Recommendations

- Encourage homeowners to take responsibility for protecting their own properties by providing retrofitting advice and assistance.
- Encourage the promotion of flood insurance to increase the policy base in Savannah.
- Target Repetitive loss properties by leveraging, local, state, and federal funding opportunities.

B.4.4 Natural Resource Protection

Resource protection activities are generally aimed at preserving (or in some cases restoring) natural areas. These activities enable the naturally beneficial functions of fields, floodplains, wetlands, and other natural lands to operate more effectively. Natural and beneficial functions of watersheds, floodplains and wetlands include:

- Reduction in runoff from rainwater and snow melt in pervious areas
- Infiltration that absorbs overland flood flow
- Removal and filtering of excess nutrients, pollutants and sediments
- Storage of floodwaters
- Absorption of flood energy and reduction in flood scour
- Water quality improvement
- Groundwater recharge
- Habitat for flora and fauna
- Recreational and aesthetic opportunities

As development occurs, many of the above benefits can be achieved through regulatory steps for protecting natural areas or natural functions. This section covers the resource protection programs and standards that can help mitigate the impact of natural hazards, while they improve the overall environment. Six areas are reviewed:

- Wetland protection
- Erosion and sedimentation control
- Stream/River restoration
- Best management practices
- Dumping regulations
- Farmland protection

Wetland Protection

Wetlands are often found in floodplains and topographically depressed areas of a watershed. Many wetlands receive and store floodwaters, thus slowing and reducing downstream flows. They also serve as a natural filter, which helps to improve water quality, and they provide habitat for many species of fish, wildlife and plants.
The coast of Georgia comprises a vast array of wetlands ranging from freshwater non-tidal and tidal wetlands to estuarine wetlands, or saltmarshes. With approximately 100 linear miles of coastline, Georgia boasts approximately 348,000 acres of estuarine tidal marsh.

These marshes are ecologically significant as habitat for aquatic organisms, including fish, shellfish, waterfowl, and other wildlife species. In addition to serving as habitat for specific organisms, saltmarshes also function as feeding grounds for terrestrial vertebrates, as a buffer to protect against coastal storm surge, and as a natural filtration system to improve water quality, transform nutrients and retain sediment.

Local Implementation

In 1970, the State of Georgia established the Coastal Marshlands Protection Act (CMPA) to protect the marsh and estuarine areas, and to regulate the activities within these public trust lands that are held for the citizens of Georgia. Through the Georgia Department of Natural Resources, Coastal Resources Division (GADNR-CRD), the CMPA is enacted to protect the estuarine area. Activities and structures in the coastal marshlands are regulated to ensure that the values and functions of the coastal marshlands are not impaired. GADNR-CRD allows for the sustainable use of the estuarine area through permits and other methods of authorization that will preserve the condition of the marsh while still allowing for its enjoyment.

CRS Credit

There is credit for preserving open space in its natural condition or restored to a state approximating its natural condition. The credit is based on the percentage of the floodplain that can be documented as wetlands protected from development by ownership or local regulations. The City of Savannah currently receives credit for Activity 420 – Open Space Preservation.

Erosion and Sedimentation Control

Farmlands and construction sites typically contain large areas of bare exposed soil. Surface water runoff can erode soil from these sites, sending sediment into downstream waterways. Erosion also occurs along stream banks and shorelines as the volume and velocity of flow or wave action destabilize and wash away the soil.

Sediment suspended in the water tends to settle out where flowing water slows down. This can clog storm drains, drain tiles, culverts and ditches and reduce the water transport and storage capacity of river and stream channels, lakes and wetlands. When channels are constricted and flooding cannot deposit sediment in the bottomlands, even more sediment is left in the channels. The result is either clogged streams or increased dredging costs.

Not only are the drainage channels less able to perform their job, but the sediment in the water reduces light, oxygen and water quality, and often carries chemicals, heavy metals and other pollutants. Sediment has been identified by the US EPA as the nation's number one nonpoint source pollutant for aquatic life.

There are two principal strategies to address these problems: minimize erosion and control sedimentation. Techniques to minimize erosion include phased construction, minimal land clearing, and stabilizing bare ground as soon as possible with vegetation and other soil stabilizing practices.

If erosion occurs, other measures are used to capture sediment before it leaves the site. Silt fences, sediment traps and vegetated filter strips are commonly used to control sediment transport. Runoff from the site can be slowed down by terraces, contour strip farming, no-till farm practices, hay or straw bales, constructed wetlands, and impoundments (e.g., sediment basins and farm ponds). Slowing surface water runoff on the way to a drainage channel increases infiltration into the soil and reduces the volume of topsoil eroded from the site.

Erosion and sedimentation control regulations mandate that these types of practices be incorporated into construction plans. The most common approach is to require applicants for permits to submit an erosion and sediment control plan for the construction project. This allows the applicant to determine the best practices for the site.

Local Implementation

Savannah's Soil Erosion, Sedimentation and Pollution Control Ordinance contains the following minimum requirements:

a) *General provisions.* Excessive soil erosion and resulting sedimentation can take place during land-disturbing activities if requirements of the chapter and the NPDES general permit are not met. Therefore, plans for those land-disturbing activities which are not exempted by this chapter shall contain provisions for application of soil erosion, sedimentation and pollution control measures and practices. The provisions shall be incorporated into the erosion, sedimentation and pollution control plans. Soil erosion, sedimentation and pollution control measures and practices shall conform to the minimum requirements of subsections (b) and (c) of this section. The application of measures and practices shall apply to all features of the site, including street and utility installations, drainage facilities and other temporary and permanent improvements. Measures shall be installed to prevent or control erosion, sedimentation and pollution during all stages of any land-disturbing activity in accordance with requirements of this chapter and the NPDES General Permit.

b) Minimum requirements/BMPS.

1) Best management practices as set forth in this subsection and subsection (c) shall be required for all land-disturbing activities. Proper design, installation, and maintenance of best management practices shall constitute a complete defense to any action by the director or to any other allegation of noncompliance with subsection (b)(2) or any substantially similar terms contained in a permit for the discharge of stormwater issued pursuant to subsection (f) of O.C.G.A. § 12-5-30, the "Georgia Water Quality Control Act". As used in this subsection the terms "proper design" and "properly designed" mean designed in accordance with the hydraulic design specifications contained in the "Manual for Erosion and Sediment Control in Georgia" specified in O.C.G.A. § 12-7-6(b).
2) A discharge of stormwater runoff from disturbed areas where best management practices have not been properly designed, installed, and maintained shall constitute a separate violation of any land-disturbing permit issued by a local issuing authority or of any state general permit issued by the division pursuant to subsection (f) of O.C.G.A. § 12-5-30, the "Georgia Water Quality Control Act", for each day on which such discharge results in the turbidity of receiving waters being increased by more than 25 nephelometric turbidity units for waters supporting warm water fisheries or by more than ten nephelometric turbidity units for waters classified as trout waters. The turbidity of the receiving waters shall be measured in accordance with guidelines to be issued by the director. This paragraph shall not apply to any land disturbance associated with the construction of single-family homes which are not part of a larger common plan of development or sale unless the planned disturbance for such construction is equal to or greater than five acres.
3) Failure to properly design, install, or maintain best management practices shall constitute a violation of any land-disturbing permit issued by a local issuing authority or of any state general permit issued by the division pursuant to subsection (f) of O.C.G.A. § 12-5-30, the "Georgia Water Quality Control Act", for each day on which such failure occurs.
4) The director may require, in accordance with regulations adopted by the board, reasonable and prudent monitoring of the turbidity level of receiving waters into which discharges from land-disturbing activities occur.
5) The LIA may set more stringent buffer requirements than stated in subsections (c)(15) and (16), in light of O.C.G.A. § 12-7-6(c).

c) *[Minimum requirements.]* The rules and regulations, ordinances, or resolutions adopted pursuant to O.C.G.A. § 12-7-1 et. seq. for the purpose of governing land-disturbing activities shall require, as a minimum, protections at least as stringent as the state general permit; and best management practices, including sound conservation and engineering practices to prevent and minimize erosion and resultant sedimentation, which are consistent with, and no less stringent than, those practices contained in the Manual for Erosion and Sediment Control in Georgia published by the Georgia Soil and Water Conservation Commission as of January 1 of the year in which the land-disturbing activity was permitted, as well as the following:

1) Stripping of vegetation, regrading and other development activities shall be conducted in a manner so as to minimize erosion;
2) Cut-fill operations must be kept to a minimum;
3) Development plans must conform to topography and soil type so as to create the lowest practicable erosion potential;
4) Whenever feasible, natural vegetation shall be retained, protected and supplemented;
5) The disturbed area and the duration of exposure to erosive elements shall be kept to a practicable minimum;
6) Disturbed soil shall be stabilized as quickly as practicable;
7) Temporary vegetation or mulching shall be employed to protect exposed critical areas during development;
8) Permanent vegetation and structural erosion control practices shall be installed as soon as practicable;
9) To the extent necessary, sediment in runoff water must be trapped by the use of debris basins, sediment basins, silt traps, or similar measures until the disturbed area is stabilized. As used in this paragraph, a disturbed area is stabilized when it is brought to a condition of continuous compliance with the requirements of O.C.G.A. § 12-7-1 et seq.;
10) Adequate provisions must be provided to minimize damage from surface water to the cut face of excavations or the sloping of fills;
11) Cuts and fills may not endanger adjoining property;
12) Fills may not encroach upon natural watercourses or constructed channels in a manner so as to adversely affect other property owners;
13) Grading equipment must cross flowing streams by means of bridges or culverts except when such methods are not feasible, provided, in any case, that such crossings are kept to a minimum;
14) Land-disturbing activity plans for erosion, sedimentation and pollution control shall include provisions for treatment or control of any source of sediments and adequate sedimentation control facilities to retain sediments on-site or preclude sedimentation of adjacent waters beyond the levels specified in subsection (b)(2);
15) Except as provided in paragraph (16) of this subsection, there is established a 25-foot buffer along the banks of all state waters, as measured horizontally from the point where vegetation has been wrested by normal stream flow or wave action, except where the director determines to allow a variance that is at least as protective of natural resources and the environment, where otherwise allowed by the director pursuant to O.C.G.A. § 12-2-8, where a drainage structure or a roadway drainage structure must be constructed, provided that adequate erosion control measures are incorporated in the project plans and specifications, and are implemented; or along any ephemeral stream. As used in this provision, the term "ephemeral stream" means a stream that under normal circumstances has water flowing only during and for a short duration after precipitation events; that has the channel located above the groundwater table year round; for which groundwater is not a source of water; and for which runoff from precipitation is the

primary source of water flow. Unless exempted as along an ephemeral stream, the buffers of at least 25 feet established pursuant to part 6 of article 5, chapter 5 of title 12 [O.C.G.A. § 12-5-6 et seq.], the "Georgia Water Quality Control Act", shall remain in force unless a variance is granted by the director as provided in this paragraph. The following requirements shall apply to any such buffer:

a. No land-disturbing activities shall be conducted within a buffer and a buffer shall remain in its natural, undisturbed state of vegetation until all land-disturbing activities on the construction site are completed. Once the final stabilization of the site is achieved, a buffer may be thinned or trimmed of vegetation as long as a protective vegetative cover remains to protect water quality and aquatic habitat and a natural canopy is left in sufficient quantity to keep shade on the stream bed; provided, however, that any person constructing a single-family residence, when such residence is constructed by or under contract with the owner for his or her own occupancy, may thin or trim vegetation in a buffer at any time as long as protective vegetative cover remains to protect water quality and aquatic habitat and a natural canopy is left in sufficient quantity to keep shade on the stream bed; and
b. The buffer shall not apply to the following land-disturbing activities, provided that they occur at an angle, as measured from the point of crossing, within 25 degrees of perpendicular to the stream; cause a width of disturbance of not more than 50 feet within the buffer; and adequate erosion control measures are incorporated into the project plans and specifications and are implemented:
    1. Stream crossings for water lines; or
    2. Stream crossings for sewer lines; and

16) There is established a 50-foot buffer as measured horizontally from the point where vegetation has been wrested by normal stream flow or wave action, along the banks of any state waters classified as "trout streams" pursuant to article 2 of chapter 5 of title 12 [O.C.G.A. § 12-5-2 et seq.], the "Georgia Water Quality Control Act", except where a roadway drainage structure must be constructed ; provided, however, that small springs and streams classified as trout streams which discharge an average annual flow of 25 gallons per minute or less shall have a 25-foot buffer or they may be piped, at the discretion of the landowner, pursuant to the terms of a rule providing for a general variance promulgated by the board, so long as any such pipe stops short of the downstream landowner's property and the landowner complies with the buffer requirement for any adjacent trout streams. The director may grant a variance from such buffer to allow land-disturbing activity, provided that adequate erosion control measures are incorporated in the project plans and specifications and are implemented. The following requirements shall apply to such buffer:

a. No land-disturbing activities shall be conducted within a buffer and a buffer shall remain in its natural, undisturbed, state of vegetation until all land-disturbing activities on the construction site are completed. Once the final stabilization of the site is achieved, a buffer may be thinned or trimmed of vegetation as long as a protective vegetative cover remains to protect water quality and aquatic habitat and a natural canopy is left in sufficient quantity to keep shade on the stream bed: provided, however, that any person constructing a single-family residence, when such residence is constructed by or under contract with the owner for his or her own occupancy, may thin or trim vegetation in a buffer at any time as long as protective vegetative cover remains to protect water quality and aquatic habitat and a natural canopy is left in sufficient quantity to keep shade on the stream bed; and
b. The buffer shall not apply to the following land-disturbing activities, provided that they occur at an angle, as measured from the point of crossing, within 25 degrees of perpendicular to the stream; cause a width of disturbance of not more than 50 feet within

the buffer; and adequate erosion control measures are incorporated into the project plans and specifications and are implemented:

1. Stream crossings for water lines; or
2. 2. Stream crossings for sewer lines.

d) Nothing contained in O.C.G.A. § 12-7-1 et seq. shall prevent any local issuing authority from adopting rules and regulations, ordinances, or resolutions which contain stream buffer requirements that exceed the minimum requirements in subsections (b) and (c).

e) The fact that land-disturbing activity for which a permit has been issued results in injury to the property of another shall neither constitute proof of nor create a presumption of a violation of the standards provided for in this chapter or the terms of the permit.

CRS Credit

Credit is available for the Erosion and Sediment Control (ESC) element under Activity 450 for regulating activities throughout the watershed to minimize erosion on construction sites that result could in sedimentation and water pollution. Savannah does currently receive credit for soil and erosion control regulations under Activity 450 – Stormwater Management.

Stream/River Restoration

There is a growing movement that has several names, such as "stream conservation," "bioengineering," or "riparian corridor restoration." The objective of these approaches is to return streams, stream banks and adjacent land to a more natural condition, including the natural meanders. Another term is "ecological restoration," which restores native indigenous plants and animals to an area.

A key component of these efforts is to use appropriate native plantings along the banks that resist erosion. This may involve retrofitting the shoreline with willow cuttings, wetland plants, or rolls of landscape material covered with a natural fabric that decomposes after the banks are stabilized with plant roots.

In all, restoring the right vegetation to a stream has the following advantages:

- Reduces the amount of sediment and pollutants entering the water
- Enhances aquatic habitat by cooling water temperature
- Provides food and shelter for both aquatic and terrestrial wildlife
- Can reduce flood damage by slowing the velocity of water
- Increases the beauty of the land and its property value
- Prevents property loss due to erosion
- Provides recreational opportunities, such as hunting, fishing and bird watching
- Reduces long-term maintenance costs

Local Implementation

The Coastal Georgia Regional Development Center prepared a Regional River Corridor Protection Plan that describes the ten local governments and the associated rivers that are affected by the River Corridor Protection Act, and puts forward a regional plan for the protection of river corridors. The plan provides for construction of road crossings, acceptable uses of river corridors, maintenance of a vegetative buffer along rivers for a minimum of 100 feet from the river's edge (residential structures are allowed within the buffer zone), timber production standards, wildlife and fisheries management, recreation, and other uses. Chatham County is one of the eight coastal counties affected by the River Corridor Protection Act and therefore, as required, has adopted a Regional River Corridor Protection Plan for the Savannah River. The maintenance of a 100-foot natural vegetative buffer, often referred to as a “riparian buffer”, on both sides of any protected river is required under the River Corridor Protection Act. Similarly, under the State of

Georgia Erosion and Sedimentation Act, one provision requires that land-disturbing activities shall not be conducted within 25 feet of the banks of any State waters, thus mandating a riparian buffer 25 feet in width.

Savannah's Soil Erosion, Sedimentation and Pollution Control Ordinance establishes a 50-foot buffer as measured horizontally from the point where vegetation has been wrested by normal stream flow or wave action, along the banks of any state waters classified as "trout streams" pursuant to article 2 of chapter 5 of title 12 [O.C.G.A. § 12-5-2 et seq.], the "Georgia Water Quality Control Act". No land-disturbing activities shall be conducted within a buffer and a buffer shall remain in its natural, undisturbed, state of vegetation until all land-disturbing activities on the construction site are completed.

CRS Credit

The City of Savannah currently receives credit for Activity 420 – Open Space Preservation. The CRS provides credit for preserving open space in its natural condition or restored to a state approximating its natural condition. There are also credits for channel setbacks, buffers and protecting shorelines.

Best Management Practices

Point source pollutants come from pipes such as the outfall of a municipal wastewater treatment plant. They are regulated by the US EPA. Nonpoint source pollutants come from non-specific locations and harder to regulate. Examples of nonpoint source pollutants are lawn fertilizers, pesticides, other chemicals, animal wastes, oils from street surfaces and industrial areas, and sediment from agriculture, construction, mining and forestry. These pollutants are washed off the ground's surface by stormwater and flushed into receiving storm sewers, ditches and streams.

The term "best management practices" (BMPs) refers to design, construction and maintenance practices and criteria that minimize the impact of stormwater runoff rates and volumes, prevent erosion, protect natural resources and capture nonpoint source pollutants (including sediment). They can prevent increases in downstream flooding by attenuating runoff and enhancing infiltration of stormwater. They also minimize water quality degradation, preserve beneficial natural features onsite, maintain natural base flows, minimize habitat loss, and provide multiple usages of drainage and storage facilities.

Local Implementation

In accordance with the City's Stormwater Management Ordinance, all stormwater management systems shall be designed to comply with the requirements of the latest City of Savannah Local Design Manual and comply with the latest edition of the Coastal Stormwater Supplement to the Georgia Stormwater Management Manual. The City of Savannah Local Design Manual requires stormwater runoff reduction and stormwater water quality BMPs. Post-construction stormwater management and site planning and design criteria must be applied to all new development and redevelopment activities that are subject to the Stormwater Management Ordinance. The criteria include a natural resources inventory, use of Green Infrastructure/Low Impact Development practices, stormwater runoff reduction, stormwater quality management and protection, aquatic resource protection and energy dissipation, overbank flood protection, and extreme flood protection.

CRS Credit

The City of Savannah currently receives credit for Activity 450 – Stormwater Management. To receive WQ credit, the community's stormwater management regulations must either specify one or more measures or refer to BMPs as published in an official government reference.

Dumping Regulations

BMPs usually address pollutants that are liquids or are suspended in water that are washed into a lake or stream. Dumping regulations address solid matter, such as shopping carts, appliances and landscape waste that can be accidentally or intentionally thrown into channels or wetlands. Such materials may not pollute the water, but they can obstruct even low flows and reduce the channels' and wetlands' abilities to convey or clean stormwater.

Many cities have nuisance ordinances that prohibit dumping garbage or other "objectionable waste" on public or private property. Waterway dumping regulations need to also apply to "non-objectionable" materials, such as grass clippings or tree branches, which can kill ground cover or cause obstructions in channels. Regular inspections to catch violations should be scheduled.

Many people do not realize the consequences of their actions. They may, for example, fill in the ditch in their front yard without realizing that is needed to drain street runoff. They may not understand how regarding their yard, filling a wetland, or discarding leaves or branches in a watercourse can cause a problem to themselves and others. Therefore, a dumping enforcement program should include public information materials that explain the reasons for the rules as well as the penalties.

Local Implementation

The City of Savannah prohibits dumping in ditches as outlined in Code Sec. 4-11004 and 5-2005. Citizens are instructed to not sweep or blow yard leaves, pine needles, grass clippings or soil into the street or storm water system and to keep the banks of drainage ditches clear of brush and debris. Citizens are also requested to report someone dumping debris in the canals to the City. A portion of the community's drainage system is inspected regularly throughout the year and maintenance is performed as needed by the City of Savannah Public Works Department. Records are being maintained for both inspections and required maintenance.

CRS Credit

The City of Savannah currently receives credit for Activity 540 – Drainage System Maintenance. Credit is provided under the Stream Dumping Regulations (SDR) element if the community has and publicizes regulations prohibiting dumping in streams and ditches.

Farmland Protection

Farmland protection is an important piece of comprehensive planning and zoning throughout the United States. The purpose of farmland protection is to provide mechanisms for prime, unique, or important agricultural land to remain as such, and to be protected from conversion to nonagricultural uses.

Frequently, farm owners sell their land to residential or commercial developers and the property is converted to non-agricultural land uses. With development comes more buildings, roads and other infrastructure. Urban sprawl occurs, which can lead to additional stormwater runoff and emergency management difficulties.

Farms on the edge of cities are often appraised based on the price they could be sold for to urban developers. This may drive farmers to sell to developers because their marginal farm operations cannot afford to be taxed as urban land. The Farmland Protection Program in the United States Department of Agriculture's 2002 Farm Bill (Part 519) allows for funds to go to state, tribal, and local governments as well as nonprofit organizations to help purchase easements on agricultural land to protect against the development of the land. Eligible land includes cropland, rangeland, grassland, pastureland, or forest

land that is part of an agricultural operation. Certain lands within historical or archaeological resources are also included.

The hazard mitigation benefits of farmland protection are similar to those of open space preservation:

- Farmland is preserved for future generation,
- Farmland in the floodplain keeps damageable structures out of harm's way
- Farmland keeps more stormwater on site and lets less stormwater runoff downstream
- Rural economic stability and development is sustained
- Ecosystems are maintain, restored or enhanced
- The rural character and scenic beauty of the area is maintained

Local Implementation

According to the Georgia Guide, Chatham County had 228 farms in 1964, 51 farms in 1987 and 42 in 1997. The average size of a farm in 1997 was 207 acres, down from 209 acres in 1987. Lastly, there were 927 acres of harvested cropland in Chatham County in 1997. In 1997, Chatham County ranked 154 out of 159 counties statewide with the percent of total land being used as farms. Only 3.1 percent of the total land area of the county was being used for agriculture.

According to the Chatham County-Savannah Comprehensive Plan Natural Resources Element, Chatham County has 92,980 acres of timberland. This equates to 32.8 percent of all land in the county. There are 10,999 acres of long-leaf slash pine; 25,873 acres of loblolly-shortleaf pine; 14,305 acres of oak-pine; 23,810 acres of oak-hickory; and 17,993 acres of oak-gum-cypress. And the ownership of the forest land is classified either as government (17.3 percent), forest industry (39.5 percent) and other private (43.2 percent).

The City of Savannah is highly urbanized with exceptionally large areas of mixed use development. Except for the western airport area, the city is largely built-out and growing chiefly through annexation. However, urban neighborhoods that have declined in population and former industrial lands represent an opportunity for land preservation.

CRS Credit

The City of Savannah currently receives credit for Activity 420 – Open Space Preservation. The CRS provides credit for preserving open space in its natural condition or restored to a state approximating its natural condition.

Conclusions

- A hazard mitigation program can use resource protection programs to support protecting natural features that can mitigate the impacts of flooding.
- Savannah ordinances prohibit illicit discharges into public drainage areas or onto public or private property.
- In Georgia, there are no freshwater wetland protection laws or regulations.
- Preserving open space and natural areas will serve to benefit the natural resource areas and protect natural occurring processes and help to protect certain species of plants and animals.

Recommendations

- The City should develop freshwater wetland protection regulations.
- Savannah should identify additional parcels that will not be well suited for development and encourage a public/private partnership to maintain them as open space.

- The City should target outreach to its residents on the benefits of natural resource protection
- Revise local ordinance to require that landscapers be registered with the City.

B.4.5 Emergency Services Measures

Emergency services measures protect people during and after a disaster. A good emergency management program addresses all hazards, and it involves all local government departments. This section reviews emergency services measures following a chronological order of responding to an emergency. It starts with identifying an impending problem (threat recognition) and continues through post-disaster activities.

Threat Recognition

The first step in responding to a flood is to know when weather conditions are such that an event could occur. With a proper and timely threat recognition system, adequate warnings can be disseminated.

The National Weather Service (NWS) is the prime agency for detecting meteorological threats. Severe weather warnings are transmitted through NOAA's Weather Radio System. Local emergency managers can then provide more site-specific and timely recognition after the Weather Service issues a watch or a warning. A flood threat recognition system predicts the time and height of a flood crest. This can be done by measuring rainfall, soil moisture, and stream flows upstream of the community and calculating the subsequent flood levels.

On smaller rivers and streams, locally established rainfall and river gauges are needed to establish a flood threat recognition system. The NWS may issue a "flash flood watch." This is issued to indicate current or developing hydrologic conditions that are favorable for flash flooding in and close to the watch area, but the occurrence is neither certain nor imminent. These events are so localized and so rapid that a "flash flood warning" may not be issued, especially if no remote threat recognition equipment is available. In the absence of a gauging system on small streams, the best threat recognition system is to have local personnel monitor rainfall and stream conditions. While specific flood crests and times will not be predicted, this approach will provide advance notice of potential local or flash flooding.

Local Implementation

The Chatham County Emergency Operations Center (EOC) operates at one of three levels of readiness in order to carry out its mission. CEMA is constantly monitoring the County for threats, unusual events, or situations. A CEMA Duty Officer (DO) is on-call 24 hours a day, 7 days a week, and is advised of any such events by dispatch, the National Weather Service, concerned citizens, or other agencies. The Duty Officer also has the responsibility to monitor and follow-up on any threat, unusual event, or situation that has the potential to impact Chatham County such as media reports, weather advisories, etc. It is important to note that although CEMA is constantly monitoring the progression of events within the County, the EOC is not considered activated. During day-to-day operations where no specific situation is occurring, the EOC is not activated.

CRS Credit

The City of Savannah currently receives credit for Activity 610 – Flood Warning Program. Credit can be received for using National Hurricane Center warnings and river flood stage predictions for the NWS's gages. The actual score is based on how much of the community's floodplain is affected by these systems.

Warning

The next step in emergency response following threat recognition is to notify the public and staff of other agencies and critical facilities. More people can implement protection measures if warnings are early and include specific detail.

The NWS issues notices to the public using two levels of notification:

- Watch: conditions are right for flooding, thunderstorms, tornadoes or winter storms.
- Warning: a flood, tornado, etc., has started or been observed.

A more specific warning may be disseminated by the community in a variety of ways. The following are the more common methods:

- Commercial or public radio or TV stations
- The Weather Channel
- Cable TV emergency news inserts
- Telephone trees/mass telephone notification
- NOAA Weather Radio
- Tone activated receivers in key facilities
- Outdoor warning sirens
- Sirens on public safety vehicles
- Door-to-door contact
- Mobile public address systems
- Email notifications

Multiple or redundant systems are most effective - if people do not hear one warning, they may still get the message from another part of the system. Each has advantages and disadvantages:

- Radio and television provide a lot of information, but people have to know when to turn them on. They are most appropriate for hazards that that develop over more than a day, such as a tropical storm, hurricane, or winter storm.
- NOAA Weather Radio can provide short messages of any impending weather hazard or emergency and advise people to turn on their televisions for more information, but not everyone has a Weather Radio.
- Outdoor warning sirens can reach many people quickly as long as they are outdoors. They do not reach people in tightly-insulated buildings or those around loud noise, such as at a factory, during a thunderstorm, or in air conditioned homes. They do not explain what hazard is coming, but people should know to turn on a radio or television when they hear the siren.
- Automated telephone notification services are also fast, but can be expensive and do not work when phone lines are down. Nor do they work for unlisted numbers, call screening services, or cellular service, unless people sign up for notifications.

Just as important as issuing a warning is telling people what to do in case of an emergency. A warning program should include a public information component.

StormReady

The National Weather Service established the StormReady program to help local governments improve the timeliness and effectiveness of hazardous weather related warnings for the public. To be officially StormReady, a community must:

- Establish a 24-hour warning point and emergency operations center
- Have more than one way to receive severe weather warnings and forecasts and to alert the public
- Create a system that monitors weather conditions locally
- Promote the importance of public readiness through community seminars
- Develop a formal hazardous weather plan, which includes training severe weather spotters and holding emergency exercises

Being designated a StormReady community by the National Weather Service is a good measure of a community's emergency warning program for weather hazards. It is also credited by the CRS.

Local Implementation

In the entire Chatham County area, the Chatham Emergency Management Agency (CEMA) manages the flood warning system. Once CEMA receives a potential dangerous warning, sirens will be activated. The sirens can give as little as fifteen minutes warning time. When you hear the sirens, information can be heard on the television (WTOC, WSAV, or WJCL) or on the radio at WCHY (94.1) on what to do. Information can be heard on the NOAA weather radio broadcast at frequency 162.40. Local evacuation routes can be found in the phone book.

The City of Savannah is not currently designated as a StormReady community; however, Chatham County is designated as StormReady. Should a storm threaten Chatham County, the Emergency Operations Center will activate. During activation, the county will give regularly advisories to the media and to local municipalities.

CRS Credit

The City of Savannah currently receives credit for Activity 610 – Flood Warning Program. Community Rating System credits are based on the number and types of warning media that can reach the community's flood prone population. Depending on the location, communities can receive credit for the telephone calling system and more credits if there are additional measures, like telephone trees. Being designated as a StormReady community can provide additional credits.

Response

The protection of life and property is the most important task of emergency responders. Concurrent with threat recognition and issuing warnings, a community should respond with actions that can prevent or reduce damage and injuries. Typical actions and responding parties include the following:

- Activating the emergency operations center (emergency preparedness)
- Closing streets or bridges (police or public works)
- Shutting off power to threatened areas (utility company)
- Passing out sand and sandbags (public works)
- Holding children at school or releasing children from school (school superintendent)
- Opening evacuation shelters (the American Red Cross)
- Monitoring water levels (public works)
- Establishing security and other protection measures (police)

An emergency action plan ensures that all bases are covered and that the response activities are appropriate for the expected threat. These plans are developed in coordination with the agencies or offices that are given various responsibilities.

A flood stage forecast map shows areas that will be under water at various flood stages. Different flood levels are shown as color coded areas, so the emergency manager can quickly see what will be affected. Emergency management staff can identify the number of properties flooded, which roads will be under water, which critical facilities will be affected, and who to warn. With this information, an advance plan can be prepared that shows problem sites and determines what resources will be needed to respond to the predicted flood level.

Emergency response plans should be updated annually to keep contact names and telephone numbers current and to ensure that supplies and equipment that will be needed are still available. They should be critiqued and revised after disasters and exercises to take advantage of the lessons learned and of changing conditions. The end result is a coordinated effort implemented by people who have experience working together so that available resources will be used in the most efficient manner possible.

Local Implementation
Activation of the Chatham County EOC will be determined by CEMA's Director and Assistant Director (AD). The expected, actual or perceived severity of the incident is paramount in determining the level of activation. In the event the EOC is activated, the AD will make notifications to CEMA Staff and the GEMA Area V Field Coordinator. The Director will make notifications to County Commissioners as required, the County Manager and appropriate County Department Heads.

CRS Credit
The City of Savannah currently receives credit for Activity 610 – Flood Warning Program.

Evacuation and Shelter

There are six key components to a successful evacuation:

- Adequate warning
- Adequate routes
- Proper timing to ensure the routes are clear
- Traffic control
- Knowledgeable travelers
- Care for special populations (e.g., the handicapped, prisoners, hospital patients, and schoolchildren)

Those who cannot get out of harm's way need shelter. Typically, the American Red Cross will staff a shelter and ensure that there is adequate food, bedding, and wash facilities. Shelter management is a specialized skill. Managers must deal with problems like scared children, families that want to bring in their pets, and the potential for an overcrowded facility.

Local Implementation
Once an evacuation order is issued all major roadway networks within Chatham County will be considered evacuation routes for local travel. Evacuation routes from the County to inland areas have also been designated. They include GA 204, GA 21, US 80, and I-16. Before any anticipated or actual evacuation orders are issued, CEMA will communicate and coordinate with its counterparts in adjacent coastal and inland risk counties, including those in South Carolina. They will be informed of the level and type of evacuation, the time it will begin, anticipated volume of traffic and the status of I-16. Periodic status reports on evacuation progress will also be issued to these jurisdictions. In all cases the Georgia Emergency Management Agency will be kept informed and included in any and all coordinating activities.

Georgia's Public Broadcast Systems are Peach State Public Radio (PSPR) and Georgia Public Television (GPTV). They are under the Georgia Public Telecommunications Commission and will be collaborating with GEMA and other state agencies to broadcast taped and live interviews and provide "real-time" information to the rapidly changing events of a hurricane threat. Some information could be transmitted on television but the PSPR network will be a more likely resource for evacuees because they will be able to have access as they travel. The PSPR station for Savannah is 91.1FM WSVH.

CRS Credit

Because it is primarily concerned with protecting insurable buildings, the CRS does not provide any special credit for evacuation or sheltering of people (minimal credit is given in Activity 510 - Floodplain Management for evacuation policies and procedures). It is assumed that the emergency response plan would include all necessary actions in response to a flood.

Post-Disaster Recovery and Mitigation

After a disaster, communities should undertake activities to protect public health and safety and facilitate recovery. Appropriate measures include:

- Patrolling evacuated areas to prevent looting
- Providing safe drinking water
- Monitoring for diseases
- Vaccinating residents for tetanus and other diseases
- Clearing streets
- Cleaning up debris and garbage

Following a disaster, there should be an effort to help prepare people and property for the next disaster. Such an effort would include:

- Public information activities to advise residents about mitigation measures they can incorporate into their reconstruction work.
- Evaluating damaged public facilities to identify mitigation measures that can be included during repairs.
- Identifying other mitigation measures that can lessen the impact of the next disaster.
- Acquiring substantially or repeatedly damaged properties from willing sellers.
- Planning for long-term mitigation activities.
- Applying for post-disaster mitigation funds.

Regulating Reconstruction

Requiring permits for building repairs and conducting inspections are vital activities to ensure that damaged structures are safe for people to reenter and repair. There is a special requirement to do this in floodplains, regardless of the type of disaster or the cause of damage. The NFIP requires that local officials enforce the substantial damage regulations. These rules require that if the cost to repair a building in the mapped floodplain equals or exceeds 50% of the building's market value, the building must be retrofitted to meet the standards of a new building in the floodplain. In most cases, this means that a substantially damaged building must be elevated above the base flood elevation.

Local Implementation

This Chatham County Post-Disaster Recovery Plan (2013) was developed for use by County and local governments and volunteer organizations to ensure a timely recovery from emergencies affecting

Chatham County. This Plan was designed to identify potential actions required and the assistance necessary to support the citizens of Chatham County and to return the County to normal conditions.

The City's Flood Damage Prevention Ordinance requires that all new residential construction or substantial improvement shall have the lowest floor, including the basement, elevated to no lower than one foot above the base flood elevation.

CRS Credit

The CRS does credit post-disaster mitigation procedures if the policies and procedures are incorporated into a flood mitigation or multi-hazard plan through Activity 510 - Floodplain Management Planning.

Conclusions

- Chatham County performs most emergency management functions for the City of Savannah.

Recommendations

- Savannah's emergency managers should work to identify vulnerable populations for evacuation purposes.
- Savannah should work with Chatham County to protect critical facilities and infrastructure that are potentially exposed to flood damage.
- The City of Savannah will adopt the 2013 Chatham County Post-Disaster Recovery Plan.

B.4.6 Structural Projects

Four general types of flood control projects are reviewed here: levees, reservoirs, diversions, and dredging. These projects have three advantages not provided by other mitigation measures:

- They can stop most flooding, protecting streets and landscaping in addition to buildings.
- Many projects can be built without disrupting citizens' homes and businesses.
- They are constructed and maintained by a government agency, a more dependable long-term management arrangement than depending on many individual private property owners.

However, as shown below, structural measures also have shortcomings. The appropriateness of using flood control depends on individual project area circumstances.

- Advantages
    - They may provide the greatest amount of protection for land area used
    - Because of land limitations, they may be the only practical solution in some circumstances
    - They can incorporate other benefits into structural project design, such as water supply and recreational uses
    - Regional detention may be more cost-efficient and effective than requiring numerous small detention basins

- Disadvantages
    - They can disturb the land and disrupt the natural water flows, often destroying wildlife habitat
    - They require regular maintenance
    - They are built to a certain flood protection level that can be exceeded by larger floods
    - They can create a false sense of security
    - They promote more intensive land use and development in the floodplain

Levees and Floodwalls

Probably the best known flood control measure is a barrier of earth (levee) or concrete (floodwall) erected between the watercourse and the property to be protected. Levees and floodwalls confine water to the stream channel by raising its banks. They must be well designed to account for large floods, underground seepage, pumping of internal drainage, and erosion and scour. Key considerations when evaluating the use of a levee include:

- Design and permitting costs
- Right of way acquisition
- Removal of fill to compensate for the floodwater storage that will be displaced by the levee
- Internal drainage of surface flows from the area inside the levee
- Cost of construction
- Cost of maintenance
- Mitigation of adverse impacts to wetlands and other habitats
- Loss of river access and views
- Creating a false sense of security, because while levees may reduce flood damage for smaller more frequent rain events, they may also overtop or breach in extreme flood events and subsequently create more flood damage than would have occurred without the levee

Reservoirs and Detention

Reservoirs reduce flooding by temporarily storing flood waters behind dams or in storage or detention basins. Reservoirs lower flood heights by holding back, or detaining, runoff before it can flow downstream. Flood waters are detained until the flood has subsided, and then the water in the reservoir or detention basin is released or pumped out slowly at a rate that the river can accommodate downstream.

Reservoirs can be dry and remain idle until a large rain event occurs. Or they may be designed so that a lake or pond is created. The lake may provide recreational benefits or water supply (which could also help mitigate a drought).

Flood control reservoirs are most commonly built for one of two purposes. Large reservoirs are constructed to protect property from existing flood problems. Smaller reservoirs, or detention basins, are built to protect property from the stormwater runoff impacts of new development.

Diversion

A diversion is a new channel that sends floodwaters to a different location, thereby reducing flooding along an existing watercourse. Diversions can be surface channels, overflow weirs, or tunnels. During normal flows, the water stays in the old channel. During floods, the floodwaters spill over to the diversion channel or tunnel, which carries the excess water to a receiving lake or river.

Dredging

Dredging is often viewed as a form of conveyance improvement. However, it has the following problems:

- Given the large volume of water that comes downstream during a flood, removing a foot or two from the bottom of the channel will have little effect on flood heights.
- Dredging is often cost prohibitive because the dredged material must be disposed of somewhere.
- Unless in-stream or tributary erosion is corrected upstream, the dredged areas usually fill back in within a few years, and the process and the expense have to be repeated.
- If the channel has not been disturbed for many years, dredging will destroy the habitat that has developed.

To protect the natural values of the stream, federal law requires a U.S. Army Corps of Engineers permit before dredging can proceed. This can be a lengthy process that requires a lot of advance planning and many safeguards to protect habitats, which adds to the cost of the project.

Local Implementation
The City of Savannah does not currently receive credit for Activity 530 - Flood Protection.

CRS Credit
Structural flood control projects that provide 100-year flood protection and that result in revisions to the Flood Insurance Rate Map are not credited by the CRS in order to avoid duplicating the larger premium reduction provided by removing properties from the mapped floodplain.

The CRS credits smaller flood control projects that meet the following criteria:

- They must provide protection to at least the 25-year flood
- They must meet certain environmental protection criteria
- They must meet federal, state and local regulations, such as the Corps of Engineers' 404 permit and State dam safety rules
- They must meet certain maintenance requirements

These criteria ensure that credited projects are well-planned and permitted. Any of the measures reviewed in this section would be recognized under Activity 530 - Flood Protection. Credit points are based on the type of project, how many buildings are protected, and the level of flood protection provided.

Conclusions
- There are many areas identified that experience flooding due to inadequate drainage systems.
- Installing new outfalls can improve local street drainage in certain areas of the City.

Recommendations
- Improve drainage through the implementation of several projects identified in the City's Capital Improvement Program.

B.4.7 Public Information

Outreach Projects
Outreach projects are the first step in the process of orienting property owners to the hazards they face and to the concept of property protection. They are designed to encourage people to seek out more information in order to take steps to protect themselves and their properties.

Awareness of the hazard is not enough; people need to be told what they can do about the hazard. Thus, projects should include information on safety, health and property protection measures. Research has shown that a properly run local information program is more effective than national advertising or publicity campaigns. Therefore, outreach projects should be locally designed and tailored to meet local conditions.

Community newsletters/direct mailings: The most effective types of outreach projects are mailed or distributed to everyone in the community. In the case of floods, they can be sent only to floodplain property owners.

News media: Local newspapers can be strong allies in efforts to inform the public. Local radio stations and cable TV channels can also help. These media offer interview formats and cable TV may be willing to broadcast videos on the hazards.

Other approaches: Examples of other outreach projects include:

- Presentations at meetings of neighborhood, civic or business groups
- Displays in public buildings or shopping malls
- Signs in parks, along trails and on waterfronts that explain the natural features (such as the river) and their relation to the hazards (such as floods)
- Brochures available in municipal buildings and libraries
- Special meetings, workshops and seminars

Local Implementation
A community brochure is mailed to all properties in the community on an annual basis. An outreach brochure is mailed annually to all properties in the SFHA. The community also provides flood information at public buildings and public events. Savannah maintains a City website that provides flood protection information including flood insurance, property protection, flood warning system, permit requirements, and drainage system maintenance.

CRS Credit
The City of Savannah currently receives credit under Activity 330 – Outreach Projects as well as Activity 350 – Flood Protection Information.

Real Estate Disclosure
Many times after a flood or other natural disaster, people say they would have taken steps to protect themselves if they had known they had purchased a property exposed to a hazard. There are some federal and state requirements about such disclosures:

- Federal law: Federally regulated lending institutions must advise applicants for a mortgage or other loan that is to be secured by an insurable building whether the property is in a floodplain as shown on the Flood Insurance Rate Map. If so, flood insurance is required for buildings located within the floodplain if the mortgage or loan is federally insured.
- State law: State laws set standards for real estate sales and licensing of agents and brokers.

Local Implementation
Savannah currently receives credits under Activity 340 – Hazard Disclosure for requiring local real estate agents to disclose flood hazards to prospective buyers.

Libraries and Websites
The two previous activities tell people that they are exposed to a hazard. The next step is to provide information to those who want to know more. The community library and local websites are obvious places for residents to seek information on hazards, hazard protection, and protecting natural resources.
Books and pamphlets on hazard mitigation can be given to libraries, and many of these can be obtained for free from state and federal agencies. Libraries also have their own public information campaigns with displays, lectures and other projects, which can augment the activities of the local government. Today, websites are commonly used as research tools. They provide fast access to a wealth of public and private sites for information. Through links to other websites, there is almost no limit to the amount of up to date information that can be accessed on the Internet.

In addition to online floodplain maps, websites can link to information for homeowners on how to retrofit for floods or a website about floods for children.

Local Implementation
The City of Savannah provides documents relating to floodplain management in the reference section of the Live Oak Public Library. Savannah maintains a City website that provides flood protection information including flood insurance, property protection, flood warning system, permit requirements, and drainage system maintenance.

CRS Credit
The City of Savannah currently receives credit under Activity 350 – Flood Protection Information. The Community Rating System provides credits for having a variety of flood references in the local public library and for providing similar material on municipal websites.

Technical Assistance

Hazard Information
Residents and business owners that are aware of the potential hazards can take steps to avoid problems or reduce their exposure to flooding. Communities can easily provide map information from FEMA's Flood Insurance Rate Maps (FIRMs) and Flood Insurance Studies. They may also assist residents in submitting requests for map amendments and revisions when they are needed to show that a building is located outside the mapped floodplain.

Some communities supplement what is shown on the FIRM with information on additional hazards, flooding outside mapped areas and zoning. When the map information is provided, community staff can explain insurance, property protection measures and mitigation options that are available to property owners. They should also remind inquirers that being outside the mapped floodplain is no guarantee that a property will never flood.

Property Protection Assistance
While general information provided by outreach projects or the library is beneficial, most property owners do not feel ready to retrofit their buildings without more specific guidance. Local building department staffs are experts in construction. They can provide free advice, not necessarily to design a protection measure, but to steer the owner onto the right track. Building or public works department staffs can provide the following types of assistance:

- Visit properties and offer protection suggestions
- Recommend or identify qualified or licensed contractors
- Inspect homes for anchoring of roofing and the home to the foundation
- Explain when building permits are needed for home improvements.

Local Implementation
FEMA floodplain maps are available on Savannah's website, and the City responds to requests on whether a property is located in s Special Flood Hazard Area. Property protection measures are also included on the City's website. Savannah also responds to drainage complaints and provides technical advice and assistance to interested property owners and annually publicizes the service.

CRS Credit
Savannah currently receives credit under Activity 360 – Flood Protection Assistance.

Public Information Program

A Program for Public Information (PPI) is a document that receives CRS credit. It is a review of local conditions, local public information needs, and a recommended plan of activities. A PPI consists of the following parts, which are incorporated into this plan:

- The local flood hazard
- The property protection measures appropriate for the flood hazard
- Flood safety measures appropriate for the local situation
- The public information activities currently being implemented within the community, including those being carried out by non-government agencies
- Goals for the community's public information program
- The outreach projects that will be done each year to reach the goals
- The process that will be followed to monitor and evaluate the projects

Local Implementation

The City of Savannah has not developed a PPI.

CRS Credit

The CRS provides credit for a PPI under Activity 330 – Outreach Projects.

Conclusions

- Savannah has a public awareness and outreach program.
- The City targets citizens through its website, news media, public meetings, neighborhood meetings, and special events.

Recommendations

- Consider developing a PPI in conjunction with Chatham County.
- Work to improve flood insurance coverage in Savannah.
- Work with Insurance and Real Estate Agents to educate them on the flood risk.

B.5 Mitigation Alternative Selection Criteria

The process for evaluating mitigation alternatives is located in section 5.3. The following criteria were used to select and prioritize proposed mitigation measures:

STPLE/E

- Social: Does the measure treat people fairly? (different groups, different generations)
- Technical: Will it work? (Does it solve the problem? Is it feasible?)
- Administrative: Do you have the capacity to implement and manage project?
- Political: Who are the stakeholders? Did they get to participate? Is there public support? Is political leadership willing to support?
- Legal: Does the organization have the authority to implement? Is it legal? Are there liability implications?
- Economic: Is it cost-beneficial? Is there funding? Does it contribute to the local economy or economic development?
- Environmental: Does it comply with environmental regulations?

Sustainable Disaster Recovery

- Quality of life
- Social equity
- Hazard mitigation
- Economic development
- Environmental protection/enhancement
- Community participation

Smart Growth Principles

- Infill versus sprawl
- Efficient use of land resources
- Full use of urban resources
- Mixed uses of land
- Transportation options
- Detailed, human-scale design

Other

- Does measure address area with highest risk?
- Does measure protect…
    - The largest # of people exposed to risk?
    - The largest # of buildings?
    - The largest # of jobs?
    - The largest tax income?
    - The largest average annual loss potential?
    - The area impacted most frequently?
    - Critical infrastructure
- What is timing of available funding?

- What is visibility of project?
- Community credibility

Prioritization Process

Since there was a FMPC that developed this Floodplain Mitigation Plan, a thorough discussion of each mitigation category occurred. Then within each specific mitigation category, a variety of projects were discussed and debated.

Consensus was reached on the specific projects identified in the mitigation action plan. The prioritization of Short, Range, Medium Range and Long Range was reached based on the significance of the project and the overall impact to the goals and objectives of the plan. The FMPC was given this guidance for prioritization:

Priority Classification

Short Range = Project should be completed in less than one year
Medium Range = Project should be completed in two to three years
Long Range = Project should be completed in more than four years

If the FMPC felt the project warranted a certain classification, they may have extended the timeframe for completion beyond what is described above because they believed the project was significant and would have an impact on reducing flooding in Savannah.

Appendix C

Appendix C: References

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