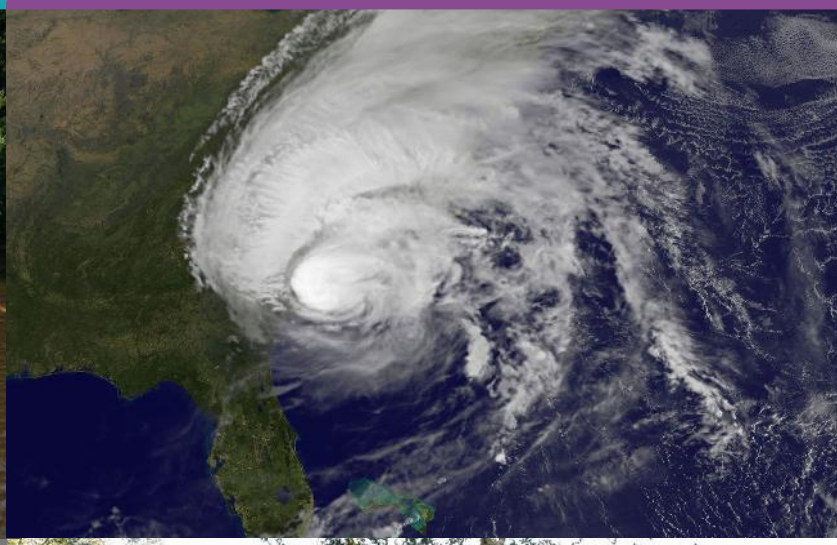
Chatham County

Multi-Jurisdictional Pre-Disaster Hazard Mitigation Plan



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1 Planning Process

Section 1 provides a general introduction to hazard mitigation and an introduction to the Chatham County Multi-Jurisdictional Hazard Mitigation Plan. This section contains the following subsections:

- 1.1 Purpose and Need, Authority, and Statement of Problem
- 1.2 Methodology, Planning Process and Participation
- 1.3 Updates and Revisions to the Plan
- 1.4 Plan Organization
- 1.5 Hazard, Risk and Vulnerability Summary
- 1.6 Multi-Jurisdictional Participation and Special Considerations
- 1.7 Adoption, Implementation, Monitoring, and Evaluation
- 1.8 Community Data

Table 1.1 – Section 1 Summary of Updates

2015 Plan Section Number	2020 Plan Section and Description of Changes
Section 1 – Introduction to the Planning Process	**Section 1 – Planning Process**
I. Purpose and Need for the Plan, Authority and Statement of Problem	1.1 Purpose and Need, Authority, and Statement of Problem – This section was rewritten but preserves the existing intent.
II. Methodology, Planning Process, and Participation	1.2 Methodology, Planning Process, and Participation – This section was reorganized and expanded to provide a full review of each planning step in the process as well as a summary of public involvement, stakeholder involvement, and outreach efforts. Meeting minutes are provided in Appendix B. Descriptions of the previous planning processes were removed, as they can be referenced if needed in the 2015 plan.
III. Updates and Revisions to the Hazard Mitigation Plan by Section	1.3 Updates and Revisions to the Plan – This section was updated to summarize changes made to each section, provide a review of changes in the hazard identification, and detail changes in action status for actions from the 2015 plan that have been completed or deleted.
IV. Organization of the Plan	1.4 Plan Organization – This section was updated to reflect the reorganization of sections.
V. Local Hazard, Risk, and Vulnerability (HRV) Summary	1.5 Hazard, Risk and Vulnerability Summary – This section was revised with data from the new risk and vulnerability assessment. A summary of the Priority Risk Index results for each hazard is provided.
VI. Multi-jurisdictional Participation and Special Considerations	1.6 Multi-Jurisdictional Participation and Special Considerations – This section was carried forward with new points of consideration added.
VII. Adoption, Implementation, Monitoring and Evaluation Process	1.7 Adoption, Implementation, Monitoring, and Evaluation – Minor edits were made to this section.
VIII. Community Data	1.8 Community Data – This section has been updated with more recent geographic, economic, housing, population, land use, and growth data.

1.1 PURPOSE AND NEED, AUTHORITY, AND STATEMENT OF PROBLEM

1.1.1 Purpose and Need

Hazards are a natural part of our environment that will inevitably continue to occur, but there is much we can do to minimize their impacts on our communities and prevent them from resulting in disasters. Every community faces different hazards, has different resources available to combat problems, and has different interests that influence the solutions to those problems. Because there are many ways to deal with 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 hazards while taking into account the unique character of a community.

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 the Chatham County Multi-Jurisdictional Pre-Disaster Hazard Mitigation Plan is to identify, assess, and mitigate hazard risk to better protect the people and property within Chatham County from the effects of natural and human-caused hazards. This plan documents progress on existing hazard mitigation planning efforts, updates the previous plan to reflect current conditions in the planning area including relevant hazards and vulnerabilities, increases public education and awareness about the plan and planning process, maintains grant eligibility for participating jurisdictions, maintains compliance with state and federal requirements for local hazard mitigation plans, and identifies and outlines strategies the County and participating jurisdictions will use to decrease vulnerability and increase resiliency.

A well-prepared hazard 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. This plan provides a framework for all interested parties to work together toward mitigation. It establishes the vision and guiding principles for reducing hazard risk and proposes specific mitigation actions to eliminate or reduce identified vulnerabilities.

1.1.2 Authority

In an effort to reduce the nation's mounting natural disaster losses, the U.S. Congress passed the Disaster Mitigation Act of 2000 (DMA 2000) to invoke new and revitalized approaches to mitigation planning. Section 322 of DMA 2000 emphasizes the need for state and local government entities to closely coordinate on mitigation planning activities and makes the development of a hazard mitigation plan a specific eligibility requirement for any local government applying for federal mitigation grant funds. These funds include the Hazard Mitigation Grant Program (HMGP), the Pre-Disaster Mitigation (PDM) program, and the Flood Mitigation Assistance (FMA) Program, all of which are administered by the Federal Emergency Management Agency (FEMA) under the Department of Homeland Security. Communities with an adopted and federally approved hazard mitigation plan thereby become pre-positioned and more apt to receive available mitigation funds before and after the next disaster strikes.

The Georgia Emergency Management Act of 1981 authorizes local emergency management agencies to conduct emergency management activities for the County. The Chatham County Emergency Management Agency (CEMA) was authorized to develop and implement a plan for mitigation actions by Local Government Resolution for Emergency Management executed by the Chatham County Commission and local municipalities on April 25, 2000.

This plan was prepared in coordination with FEMA Region IV and the Georgia Emergency Management Agency (GEMA) to ensure that it meets all applicable federal and state planning requirements. A Local Mitigation Plan Review Tool, found in Appendix A, provides a summary of FEMA's current minimum standards of acceptability and notes the location within this plan where each planning requirement is met.

This plan was developed in a joint and cooperative manner by members of a Hazard Mitigation Planning Committee (HMPC) which included representatives of County, City, and Town departments, federal and state agencies, citizens, and other stakeholders. This plan will ensure that Chatham County and its incorporated municipalities remain eligible 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.

This document comprises a Multi-Jurisdictional Pre-Disaster Hazard Mitigation Plan for Chatham County. As did the 2015 plan, this planning area includes all of Chatham County's incorporated municipalities and unincorporated areas. All participating jurisdictions are listed below:

- Chatham County
- City of Bloomingdale
- City of Garden City
- City of Pooler
- City of Port Wentworth
- City of Savannah
- Town of Thunderbolt
- City of Tybee Island
- Town of Vernonburg

The above participating jurisdiction will adopt this plan in accordance with standard local procedures. Copies of adoption resolutions will be provided in Section 5 Plan Implementation and Maintenance.

1.1.3 Statement of Problem

Each year in the United States, natural and human-caused hazards take the lives of hundreds of people and injure thousands more. Nationwide, taxpayers pay billions of dollars annually to help communities, organizations, businesses, and individuals recover from disasters. These monies only partially reflect the true cost of disasters, because additional expenses incurred by insurance companies and non-governmental organizations are not reimbursed by tax dollars. Many natural disasters are predictable, and much of the damage caused by these events can be reduced or even eliminated.

Chatham County previously developed a Pre-Disaster Multi-Jurisdictional Hazard Mitigation Plan in 2015 and has remained committed to mitigation and the planning process, which enables regular review of the changing exposure, vulnerability, and risk in the planning area.

The focus of this plan update is on those hazards deemed "high" or "moderate" priority hazards for the planning area, as determined through the risk and vulnerability assessments. Lower priority hazards will continue to be evaluated but may not be prioritized for mitigation in the action plan.

Chatham County and its participating jurisdictions followed the planning process prescribed by the Federal Emergency Management Agency (FEMA), and this plan was developed under the guidance of a Hazard

Mitigation Planning Committee (HMPC) comprised of representatives of County, City, and Town departments; citizens; and other stakeholders. The HMPC led a risk assessment that identified and profiled hazards that pose a risk to the planning area, assessed the planning area's vulnerability to these hazards, and examined the capabilities in place to mitigate them. The hazards profiled in this plan include:

- Dam Failure
- Drought
- Earthquake
- Erosion
- Extreme Heat
- Flood
- Hurricane and Tropical Storm
- Sea Level Rise
- Severe Weather (Thunderstorm Wind, Lightning, Hail)
- Severe Winter Weather
- Tornado
- Wildfire
- Hazardous Materials Incident
- Terror Threat

1.2 METHODOLOGY, PLANNING PROCESS, AND PARTICIPATION

Requirement §201.6(b): An open public involvement process is essential to the development of an effective plan. 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 section provides a review of the planning process followed for the development of the Chatham County Multi-Jurisdictional Pre-Disaster Hazard Mitigation Plan. It consists of the following sub-sections:

- 1.2.1 Preparing the Plan
- 1.2.2 Hazard Mitigation Planning Committee
- 1.2.3 Involving the Public
- 1.2.4 Outreach Efforts
- 1.2.5 Involving Stakeholders

1.2.1 Preparing the Plan

The planning process for preparing the Chatham County Multi-Jurisdictional Pre-Disaster Hazard 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 planning consultant 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 1.2 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 1.2 – 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 process followed for the preparation of this plan, as outlined in Table 1.2 above, is as follows:

1.2.1.1 Phase I – Planning Process

Planning Step 1: Organize to Prepare the Plan

With the County's commitment to participate in the DMA planning process, community 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. The Chatham County Emergency Management Emergency Preparedness Manager led the County's effort to reorganize and coordinate for the plan update. Consultants from Wood Environment and Infrastructure Solutions, Inc. assisted the County through the planning process and preparation of the plan document.

Planning Step 2: Involve the Public

Public involvement in the development of the plan was sought using various methods, as detailed in Section 1.2.3.

Planning Step 3: Coordinate

The HMPC formed for development of the 2015 Plan was reconvened for this plan update. More details on the HMPC are provided in Section 1.2.2. Stakeholder coordination was incorporated into the formation of the HMPC and was sought through additional outreach methods, detailed in Section 1.2.5.

Coordination with Other Community Planning Efforts and Hazard Mitigation Activities

In addition to stakeholder involvement, coordination with other community planning efforts was also seen as 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. Chatham County and its participating jurisdictions use a variety of planning mechanisms, such as Comprehensive Plans, subdivision regulations, building codes, and ordinances to guide growth and development. Integrating existing planning efforts, mitigation policies, and action strategies into this plan establishes a credible and comprehensive plan that ties into and supports other community programs. As detailed in Table 1.3, the development of this plan incorporated information from existing plans, studies, reports, and initiatives as well as other relevant data from neighboring communities and other jurisdictions.

These and other documents were reviewed and considered, as appropriate, during the collection of data to support the planning process and plan development, including the hazard identification, vulnerability assessment, and capability assessment. Data from these sources was incorporated into the risk assessment and hazard vulnerability in Section 2 of the plan as appropriate. The data was also used in determining the capability of each jurisdiction to implement certain mitigation strategies. The Capability Assessment can be found in Section 4.

Table 1.3 – Summary of Existing Studies and Plans Reviewed

Resource Referenced	Use in this Plan
Local Comprehensive Plans (2016 Chatham County - Savannah Comprehensive Plan, 2016 City of Bloomingdale Comprehensive Plan, etc.)	The comprehensive plans for each community, where available, were referenced in the Community Data in Section 1.8 and in the community annexes. Data from comprehensive plans was referenced in the Capability Assessment in Section 4 and incorporated into Mitigation Action Plans where applicable in Section 3.
Local Ordinances (Flood Damage Prevention Ordinances, Subdivision Ordinances, Zoning Ordinances, etc.)	Local ordinances were referenced in the Capability Assessment in Section 4 and where applicable for updates or enforcement in Mitigation Action Plans in Section 6.
Chatham County and Incorporated Areas Flood Insurance Study (FIS), Revised 07/07/2014	The FIS report was referenced in the preparation of flood hazard profile in Section 2.5.6.
Chatham County Pre-Disaster Multi-Jurisdictional Hazard Mitigation Plan, 2015	The previous plan was referenced in compiling the Hazard Identification and Risk Assessment in Section 2 and in reporting on implementation status and developing the Mitigation Action Plans in Section 1 and Section 3, respectively.
Chatham County Floodplain Management Plan, 2017; City of Savannah Flood Mitigation Plan, 2015	The Chatham County and City of Savannah floodplain management plans were referenced in preparation of the flood hazard profiled in Section 2.5.6.
Chatham County Community Wildfire Protection Plan, 2014 (CWPP)	The CWPP was referenced to develop the wildfire hazard profile in Section 2.5.12 and to prepare the Capability Assessment in Section 4.
Chatham County Emergency Operations Plan	The EOP was referenced for the development of the Capability Assessment in Section 4.
Georgia Hazard Mitigation Strategy, 2019	The State Hazard Mitigation Strategy was used as a base for the hazard identification and was referenced in the development of hazard profiles in Section 2.

1.2.1.2 Phase II – Risk Assessment

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

The HMPC completed a comprehensive effort to identify, document, and profile all hazards that have, or could have, an impact on 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 made available on the plan website for the HMPC, stakeholders, and the public to review and comment. A more detailed description of the risk assessment process and the results are provided in Section 2 Hazard Identification & Risk Assessment.

The HMPC 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 HMPC could assess those activities and measures already in place that contribute to mitigating some of the risks and vulnerabilities identified. This information can be found in Section 4 Capability Assessment.

1.2.1.3 Phase III – Mitigation Strategy

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

Wood facilitated brainstorming and discussion sessions with the HMPC that described the purpose and process of setting 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 3 Mitigation Strategy.

Planning Step 8: Draft an Action Plan

A complete first draft of the plan was prepared based on input from the HMPC regarding the draft risk assessment and the goals and activities identified in Planning Steps 6 and 7. This draft was shared for HMPC, stakeholder, and public review and comment via the plan website. No public comments were received. HMPC and stakeholder comments, which were focused primarily on the hazard identification and risk assessment and the mitigation action plans, were integrated into the final draft for the Georgia Emergency Management Agency (GEMA) and FEMA Region IV to review and approve, contingent upon final adoption by the County and its participating jurisdictions.

1.2.1.4 Phase IV – Plan Maintenance

Planning Step 9: Adopt the Plan

To secure buy-in and officially implement the plan, the plan will be reviewed and adopted by all participating jurisdictions. Resolutions will be provided in Section 5.

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, the HMPC's efforts have been directed at researching data, coordinating input from participating entities, and developing appropriate mitigation actions. Section 5 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.

1.2.2 Hazard Mitigation Planning Committee

As with the previous plan, this Hazard Mitigation Plan was developed under the guidance of a Hazard Mitigation Planning Committee (HMPC). The Committee's representatives included representatives of County, City, and Town departments; local, regional and state agencies; citizens, and other stakeholders.

To reconvene the planning committee, a letter was sent via email to all County, City, and Town Hazard Mitigation Planning Committee (HMPC) contacts from the previous planning effort. Each community was asked to designate a primary and secondary contact for the HMPC. Communities were also asked to identify local stakeholder representatives to participate on the HMPC alongside the County, City, and Town officials in order to improve the integration of stakeholder input into the plan. Table 1.4 details the HMPC members and the agencies and jurisdictions they represented.

Table 1.4 – HMPC Members

Jurisdiction	Representative	Position/Agency
Chatham County	Randall Mathews	Emergency Preparedness Manager, CEMA
Chatham County	Michael Whiteaker	Emergency Management Coordinator, CEMA
Chatham County	Chuck Kearns	CEO, CES
Chatham County	Wayne Noha	Development and Engagement Chief, CES
Chatham County	Bengie Cowart	Chief of EMS, CES
Chatham County	James Vickers	Chief of Fire, CES
Chatham County	Phil Coster	COO, CES
Chatham County	Suzanne Cooler	County Engineer, Engineering
Chatham County	Anthony Stephens	Director, Facilities Maintenance
Chatham County	Nick Batey	Director, ICS
Chatham County	William Wright	Director, Public Works
Chatham County	Bob Staples	Safety, Security & Emergency Manager, St. Joseph's Hospital
Chatham County	Melanie Wilson	Executive Director, Metropolitan Planning Commission
Chatham County	Kait Morano	Advance Planning & Special Projects, Metropolitan Planning Commission
Chatham County	Kelly Nilsson	Emergency Management Director, Georgia Southern University
Chatham County	Ulyssess Bryant	Interim Chief of Police, Savannah State University
Chatham County	Justin Pratt	Emergency Management Coordinator, Savannah-Chatham County Public School System
Chatham County	Dustin Hetzel	Emergency Management Coordinator, Savannah Airport
Bloomingdale	Ferman Tyler	Fire Chief, Code Enforcement, Fire Department
Bloomingdale	Blair Jeffcoat	Chief of Police, Police Department
Garden City	Corbin Medeiros	Fire Chief, Fire Department
Garden City	Jackie Jackson	Special Projects Coordinator, City of Garden City
Garden City	Gerald Ethridge	Citizen
Pooler	Robert Byrd	City Manager, City of Pooler
Pooler	Wade Simmons	Fire Chief, Fire Department
Port Wentworth	Brian Harvey	Director, Development Services
Port Wentworth	Phillip Jones	City Administrator, City of Port Wentworth
Savannah	Dave Donnelly	Director, Emergency Management

Jurisdiction	Representative	Position/Agency
Savannah	Bryan Hollis	Risk Management Analyst, Emergency Management
Savannah	Ben Lewis	Risk Management/Loss Control Coordinator, Emergency Management
Savannah	Gloria Williams	Citizen
Thunderbolt	Andrew Bateman	Fire Chief, Fire Department
Thunderbolt	Sean Clayton	Police Chief, Police Department
Thunderbolt	Molly Sims	Town Clerk, Town of Thunderbolt
Thunderbolt	Frank Neal	Town Administrator, Town of Tunderbolt
Thunderbolt	John Henry	Citizen
Tybee Island	George Shaw	Manager, Planning & Zoning
Vernonburg	Jimmy Hungerpillar	Superintendent, Town of Vernonburg

The DMA planning regulations and guidance stress that to satisfy multi-jurisdictional participation requirements, 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 HMPC;
- 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 Chatham County HMPC, "participation" meant the following:

- Providing facilities for meetings;
- Attending and participating in the HMPC meetings;
- Collecting and providing requested data (as available);
- Providing information on local capability;
- Providing an update on previously adopted mitigation actions;
- 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 local governing bodies.

During the planning process, the HMPC members communicated through face-to-face meetings, email, and telephone conversations. This continued communication ensured that coordination was ongoing throughout the entire planning process despite the fact that not all HMPC members could be present at every meeting. Additionally, draft documents were distributed via the plan website so that the HMPC members could easily access and review them and provide comments.

The formal HMPC meetings followed the 10 CRS Planning Steps. These meetings were essential for facilitating discussion, gaining consensus, and initiating data collection efforts with local government staff, community officials, and other identified stakeholders. More importantly, the meetings and workshops prompted continuous input and feedback from relevant participants throughout the drafting stages of the Plan. The meeting dates, locations, and topics discussed are summarized in Table 1.5. More details on

each meeting, including agendas, minutes, and sign-in sheets for the HMPC meetings are included in Appendix B. All HMPC meetings were open to the public. Public meetings are summarized in Table 1.6.

In many cases, routine discussions and additional meetings were held by local staff to accomplish planning tasks specific to their department or agency. For example, completing the capability assessment, reporting on the status of existing actions, or seeking approval of specific mitigation actions for their department or agency to undertake and include in their Mitigation Action Plan. These meetings were informal and are not documented here.

Table 1.5 – Summary of HMPC Meetings

Meeting Title	Meeting Topic	Meeting Date	Meeting Location
HMPC Mtg. #1 – Project Kickoff	1) Introduction to DMA, CRS, and FMA requirements and the planning process 2) Review of HMPC responsibilities and the project schedule.	March 18, 2019	Crosswinds Gold Club 232 James B. Blackburn Drive, Savannah, GA
HMPC Mtg. #2	1) Review and update plan goals and objectives 2) Report on status of actions from the 2015 plan 3) Complete the capability self-assessment	June 18, 2019	Coastal Botanical Gardens, Main Room 2 Canebrake Road, Savannah, GA
HMPC Mtg. #3	1) Review Draft Hazard Identification & Risk Assessment (HIRA) 2) Draft Mitigation Action Plans	October 17, 2019	Coastal Botanical Gardens, Main Room 2 Canebrake Road, Savannah, GA
HMPC Mtg. #4	1) Review the Draft Hazard Mitigation Plan 2) Solicit comments and feedback	January 15, 2020	City of Savannah, City Hall 4th fl. Conference Room 2 E Bay Street Savannah, GA

1.2.3 Involving the Public

An important component of any mitigation planning process is public participation. Individual citizen and community-based input provides the entire planning team with a greater understanding of local concerns and increases the likelihood of successfully implementing mitigation actions by developing community "buy-in" from those directly affected by the decisions of public officials. As citizens become more involved in decisions that affect their safety, they are more likely to gain a greater appreciation of the hazards present in their community and take the steps necessary to reduce their impact. Public awareness is a key component of any community's overall mitigation strategy aimed at making a home, neighborhood, school, business, or entire planning area safer from the potential effects of hazards.

Public involvement in the development of the plan was sought using various methods including open public meetings, an interactive plan website, a public participation survey, and by making copies of draft plan documents available for public review online. Additionally, HMPC meetings were open to the public.

All public meetings were advertised on the plan website, which was shared on local community websites. Copies of meeting announcements are provided in Appendix B. The public meetings held during the planning process are summarized in Table 1.6.

Table 1.6 – Summary of Public Meetings

Meeting Title	Meeting Topic	Meeting Date	Meeting Location
Public Meeting #1	1) Introduction to DMA, CRS, and FMA requirements and the planning process 2) Review of HMPC responsibilities and the project schedule.	March 18, 2019	Crosswinds Golf Club 232 James B. Blackburn Drive, Savannah, GA
Public Meeting #2	1) Review "Draft" Hazard Mitigation Plan 2) Solicit comments and feedback	January 15, 2020	CEMA 124 Bull Street, Rm. 140 Savannah, GA

1.2.4 Outreach Efforts

The HMPC agreed to employ a variety of public outreach methods including established public information mechanisms and resources within the community. The table below details public outreach efforts employed during the preparation of this plan.

Table 1.7 – Public Outreach Efforts

Location	Date	Event/Message
Plan website	Ongoing	Meeting announcements, meeting materials, and description of hazards; contact information provided to request additional information and/or provide comments
Press Release	03/15/2019	Public Meeting #1 announced; plan website shared
Local community websites	Ongoing	Link to the plan website shared to expand reach
Public survey	Ongoing	Survey hosted online and made available via shareable link
Plan website - HIRA draft	01/04/2020	Draft HIRA made available for review and comment online
Plan website - Draft Plan	01/15/2020	Full draft plan made available for review and comment online

Public involvement activities for this plan update included press releases, creation of a website for the plan, a public survey, and the collection of public and stakeholder comments on the draft plan.

A public outreach survey was made available on March 8, 2019 and remained open for response until December 7, 2019. The public survey requested public input into the Hazard Mitigation Plan planning process and the identification of mitigation activities to lessen the risk and impact of future hazard events. The survey is shown in Appendix B. The survey was available in hard copy at the first public meeting and online on the plan website. In total, 70 survey responses were received.

The following is a list of high-level summary results and analysis derived from survey responses:

- 91% of responses were from the City of Savannah, 7% were from unincorporated Chatham County, and 2% were write-ins with specific neighborhoods.
- Only 5.8% of respondents say they feel not at all prepared for a hazard event; 73.9% feel somewhat prepared and 20.3% feel very prepared.
- 46.4% of respondents do not know where evacuation centers or storm shelters are located; however, 97.1% of respondents say they are able to evacuate or take shelter if necessary, which indicates that most people manage evacuating or taking shelter through their own resources. It is possible that these results skew toward those with more awareness of hazard risk and resources to respond.
- 22.9% of respondents do not know where to get more information on hazard risk and preparedness.
- Hurricane & tropical storm was by far rated the most significant hazard, followed by flood, extreme heat, storm surge, sea level rise, and severe weather. Dam/levee failure was rated the least significant hazard, followed by severe winter storm, and wildfire.

- Many respondents reported having taken steps to mitigate risk at home; these efforts include prevention, property protection, and preparedness measures.
- Respondents largely favored structural projects, natural resource protection, and preventative activities, and emergency services options for mitigation.

Detailed survey results are provided in Appendix B.

1.2.5 Involving Stakeholders

In addition to representatives of each participating jurisdiction, the Hazard Mitigation Planning Committee included a variety of stakeholders. Stakeholders on the HMPC included representatives from Savannah Airport, Savannah-Chatham County Public School System, the Metropolitan Planning Commission, Georgia Southern University, Savannah State University, St. Joseph's Hospital, and Georgia Department of Natural Resources, among others. Representatives from Georgia Emergency Management Agency (GEMA) also attended HMPC meetings. Input from additional stakeholders, including neighboring communities, was solicited through direct email invitations to the open public meetings and distribution of the public survey. However, if any additional stakeholders representing other agencies and organizations participated through the public survey, that information is unknown due to the anonymous nature of the survey. Documentation of outreach to stakeholders is provided in Appendix B.

1.3 UPDATES AND REVISIONS TO THE PLAN

1.3.1 Updates and Revisions by Section

This plan presents a complete update to the 2015 Chatham County Multi-jurisdictional Pre-Disaster Hazard Mitigation Plan. All jurisdictions that participated in the 2015 plan were also involved in this plan update. The previous plan was approved by FEMA in December 2015. For this update, the 2015 plan was used as a base for incorporation of new data and an updated planning process. Changes by section are summarized as follows:

Section 1 has been updated to reflect the 2020 planning process. Portions of this section were re-written and/or condensed for clarity. Specific documentation of the planning process was removed from this section and compiled separately in Appendix B to improve organization and readability. This section also presents data on mitigation actions from the 2015 plan that were completed or deleted as a way to report on implementation progress of the 2015 plan and separate these removed actions from those that the county and participating jurisdictions will be pursuing moving forward.

Section 2 combines Sections 2 and 3 from the 2015 plan in order to consolidate all risk and vulnerability data for each hazard in a single plan section. Updated data has been incorporated into each hazard profile. New vulnerability analysis was performed based on updated parcel data. Where still relevant, data from the 2015 was carried forward and incorporated into this section.

Section 3 presents the mitigation strategy, which was incorporated into the 2015 plan under Section 4. This section discusses the plan goals and objectives, the categories of mitigation alternatives considered, and the process used to prioritize mitigation actions. This section also presents the mitigation action plan for each jurisdiction. In keeping with the 2015 plan, all mitigation actions have been grouped based on the mitigation category they fall within. Existing mitigation actions have been updated with a current status and new mitigation actions have been identified. All existing and new actions for each jurisdiction are presented together in a single Mitigation Action Plan table.

Section 4 is a new section, which present a summary of the capability assessment conducted to gauge each jurisdiction's existing abilities and resources to implement mitigation activities. In the 2015 plan, this information was provided as an annex to the plan.

Section 5 outlines the process for adoption, implementation, monitoring, and maintenance of the plan.

A table at the beginning of each section of this plan provides a more detailed description of the updates and revisions that were made.

1.3.2 Summary of Key Updates

This hazard mitigation plan update involved a comprehensive review and update of each section of the existing plan and an assessment of the success of the County and participating municipalities in evaluating, monitoring and implementing the mitigation strategy outlined in their existing plans. Only the information and data still valid from the existing plan was carried forward as applicable into this update. The following requirements were addressed during the development of this plan update:

- 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.

Table 1.8 provides a comparison of the hazards addressed in the 2019 Georgia Mitigation Strategy and the 2015 Chatham County plan and provides the final decision made by the HMPC as to which hazards should be included in the updated 2020 Chatham County Multi-Jurisdictional Plan.

Table 1.8 – Hazard Identification Summary

Hazard	Included in 2019 State HMP?	Included in 2015 Chatham County HMP?	Included in 2020 Chatham County HMP Update?
Hurricane Wind	Yes	Yes	Yes (Hurricane)
Coastal Hazards (Storm Surge & Coastal Flooding)	Yes	Yes (Storm Surge, Sea Level Rise)	Yes (addressed under Flood and Hurricane)
Wind	Yes	Yes	Yes (addressed under Hurricane and Severe Weather)
Severe Weather (Lightning & Hail)	Yes	Yes	Yes (includes Thunderstorm Wind)
Tornados	Yes	Yes	Yes
Inland Flooding	Yes	Yes	Yes (Flood)
Severe Winter Weather	Yes	Yes	Yes
Drought	Yes	Yes	Yes
Wildfire	Yes	Yes	Yes
Earthquake	Yes	Yes	Yes
Geologic Hazards (Sinkhole & Landslide)	Yes	No	No
Dam Failures	Yes	Yes	Yes
Extreme Heat	Yes	Yes	Yes
Erosion	No	Yes	Yes
Hazardous Materials Incident	No	Yes	Yes
Terror Threat	No	Yes	Yes

In addition to the specific changes in hazard analyses in Section 2.5, the following items were also addressed in this 2020 plan update:

- GIS was used, to the extent data allowed, to analyze the priority hazards as part of the vulnerability assessment.
- Assets at risk to identified hazards were identified by property type and values of properties based on parcel data and a critical facilities inventory provided by Chatham County.
- A discussion on climate change and its projected effect on specific hazards was included in each hazard profile in the risk assessment.
- The discussion on growth and development trends was enhanced utilizing 2017 and 2018 American Community Survey data.
- Enhanced public outreach and agency coordination efforts were conducted throughout the plan update process in order to meet the more rigorous requirements of the 2017 CRS Coordinator's Manual, in addition to DMA requirements.

1.3.3 Mitigation Strategy Revisions

Progress on the mitigation strategy developed in the previous plan is also documented in this plan update. Table 1.9 details the status of mitigation actions from the previous plan. Table 1.10 on the following pages details all completed and deleted actions from the 2015 plan. More detail on the actions being carried forward is provided in Section 3: Mitigation Strategy.

Table 1.9 – Status of Previous Mitigation Actions

Jurisdiction	Completed	Deleted	Carried Forward
Chatham County	2	25	53
City of Bloomingdale	3	2	2
City of Garden City	0	11	8
City of Pooler	4	13	3
City of Port Wentworth	4	1	4
City of Savannah	8	51	9
Town of Thunderbolt	1	11	6
City of Tybee Island	0	12	8
Total	**22**	**126**	**93**

Note: The Town of Vernonburg was incorporated since the adoption of the 2015 plan and therefore was included under unincorporated Chatham County plan.

Table 1.10 – Completed and Deleted Actions from the 2015 Plan

Jurisdiction	Action #	Action Description	2020 Implementation Status	2020 Implementation Status Comments
Chatham County	P-1	Clear trees surrounding proposed storage shed at Chatham County Mosquito Control	Completed	
Chatham County	P-6	Complete a County Engineering and Public Works drainage SOP that includes post-storm recovery information.	Delete	No longer a priority.
Chatham County	P-7	Assist nursing homes and assisted living facilities with writing a County Emergency Management approved emergency plan that includes evacuation.	Delete	No funding available.
Chatham County	P-8	Develop a local directory of cultural and historical critical facilities to include interior and exterior images of structures, grounds, and collections. This will be integrated with state efforts.	Delete	No funding available.
Chatham County	P-9	Work with facility managers to develop inventory lists, including cultural and historical facilities.	Delete	No funding available.
Chatham County	P-13	Conduct a study to identify fire vulnerabilities of buildings and their contents. Implement projects identified from the study. Include information in the County outreach mailer to citizens, businesses, industries, educational, historical, and cultural institutions concerning fire protection.	Delete	No funding available.
Chatham County	P-23	Improve recurring funding for Public Works maintenance and flood management activities.	Delete	No longer a priority.
Chatham County	P-24	Provide grants information, planning tools, training, and technical assistance to increase the number of public and private sector hazard mitigation projects.	Delete	Insufficient capability
Chatham County	P-26	Conduct a study to identify fire vulnerabilities of buildings and their contents.	Delete	Duplicate action.
Chatham County	PP-18	Conduct safe rooms for public usage.	Delete	No funding available.
Chatham County	PP-25	Install hurricane shutters for the County Human Resources Building at 123 Abercorn Street.	Delete	Duplicate action
Chatham County	PP-33	Install accordion shutters to protect glass at tag building at Citizens Service Center.	Delete	Duplicate action

Jurisdiction	Action #	Action Description	2020 Implementation Status	2020 Implementation Status Comments
Chatham County	PP-38	Designate a safe room space at the Chatham County Annex.	Delete	No longer a priority.
Chatham County	PP-40	Add HVAC stands at CNT Building.	Delete	Duplicate action
Chatham County	PP-45	Large 4-inch diesel water pump to be used to remove water from the Main Electrical room and other flooded areas; (Estimated cost $12,500.00)	Delete	No funding available.
Chatham County	PP-46	Upgrade current windows to meet wind code which could eliminate movement of patients during severe weather threats; (Estimated cost $1.7 Million)	Delete	No funding available.
Chatham County	PP-47	Purchase Six 10-Watt generators to be used on non-emergency power connected critical Equipment; (Estimated cost $6,600.00)	Delete	No funding available.
Chatham County	PP-48	Provide a water proofing of the main building to provide a water-resistant base to prevent moisture seepage; (Estimated cost $1.2 Million)	Delete	No funding available.
Chatham County	PP-58	Replace patient tower roofs because current roofs cannot handle the amount of rain and winds a hurricane produces (Estimated cost 2.8 million)	Completed	
Chatham County	PP-60	Purchase 5 Heavy duty shop fans to dry walls and floors due to roof and window leaks	Delete	No funding available.
Chatham County	PP-62	Purchase and install wind screens or shutters for windows and doors at West Chatham Middle School	Delete	No funding available.
Chatham County	ES-11	Ensure that agencies responding to HAZMAT incidents have proper equipment and training.	Delete	No longer a priority.
Chatham County	ES-13	Portable Generator connections for the Pete Liakakis Building and Police Annex	Delete	Duplicate action
Chatham County	ES-14	Purchase generator for Sheriff's Office	Delete	Duplicate action
Chatham County	PEA-6	Include information in the County outreach mailer concerning transportation incident protection.	Delete	No longer a priority
Chatham County	PEA-8	Provide public education regarding contra-flow system.	Delete	No funding available.

Jurisdiction	Action #	Action Description	2020 Implementation Status	2020 Implementation Status Comments
Chatham County	PEA-9	Include information in the Chatham County outreach mailer concerning wind protection programs and wind-blown missile measures.	Delete	No longer a priority.
Bloomingdale	PP-1	Elevate Police Department generator and flood proof structure.	Completed	
Bloomingdale	PP-3	Link via conduit and cabling from City Hall to Police Department.	Completed	
Bloomingdale	PP-4	Link via conduit and cabling from Fire Department to City Hall.	Completed	
Bloomingdale	PP-5	Drainage Project to improve drainage to flood prone areas of Bloomingdale (roughly $750-$850k	Delete	No grant funding or local funding to implement the project
Bloomingdale	PP-6	Replace/Enlarge pipe under Railroad at Ottowa Farms and Harden Canal (roughly $500k)	Delete	No funding available
Garden City	P-1	Evaluate major interstates in and around Garden City for potential terrorist targets.	Deleted	No longer a priority.
Garden City	P-2	Maintain GovCollect database to maintain and track properties that have been flooded.	Deleted	Upgrading software now
Garden City	P-4	Adopt a revised Garden City Local Design Manual for higher regulatory standards.	Deleted	Part of CRS program - mtg in Feb
Garden City	P-5	Trim and prune loop at Rommel and Smith Avenues and Highway 80 at Kessler to include conveyance ditches.	Deleted	No funding available
Garden City	PP-2	Harden the Garden City Recreation Department Gymnasium.	Deleted	Will most likely demolish with a property trade agreement.
Garden City	PP-3	Add safe room to Groves High School.	Deleted	N/A
Garden City	SP-3	Area drainage basins improvement to prevent further flooding.	Deleted	No funding available
Garden City	SP-4	Culvert construction to prevent further flooding.	Deleted	Action was added after Hurricane Matthew. Could not secure funding.
Garden City	SP-5	Improve drainage systems and associated pipe crossings to prevent flooding and undermining.	Deleted	Action was added after Hurricane Matthew. Could not secure funding.
Garden City	SP-6	Improve or rehabilitate drainage systems in various collection basins city-wide.	Deleted	Action was added after Hurricane Matthew. Could not secure funding.

Jurisdiction	Action #	Action Description	2020 Implementation Status	2020 Implementation Status Comments
Garden City	SP-7	Pipe various drainage ditches to further prevent ditch erosion and undermining immediately adjacent to buildings.	Deleted	Action was added after Hurricane Matthew. Could not secure funding.
Pooler	P-1	Explore methods for adding redundancy to computer networking housed in fire station.	Delete	Deleted-Computer networking was completely removed from the fire station and will be housed in the City Hall that is under construction.
Pooler	PP-1	Provide window protection, such as shutters, for the windows at City Hall.	Delete	Covered by a new action item.
Pooler	PP-2	Increase wind load of new public works addition and new communications tower.	Completed	This was completed in 2006.
Pooler	PP-3	Install tornado safe rooms in three school facilities.	Delete	Not applicable to City of Pooler.
Pooler	PP-4	Flood-proof lift stations in repetitive loss areas at Brighton Woods Drive and North Skinner Street.	Completed	This action was completed in 2005.
Pooler	PP-6	Replace/enlarge pipe under railroad tracks at the Governor Treutlen Canal.	Delete	The railroad will not allow the municipalities to access the pipe.
Pooler	PP-8	Floodproof Pooler Police Department building.	Delete	The old Police Department was torn down.
Pooler	PP-9	Elevate generator between City Hall and Police Department.	Delete	This is not necessary because a new facility is being built to house both entities.
Pooler	PP-10	Mitigation of repetitive loss structures in the Brighton Woods Repetitive Loss area.	Delete	Covered by a new action item.
Pooler	PP-11	Mitigation of repetitive loss structures along West Whatley Street.	Delete	Covered by a new action item.
Pooler	PP-12	Replace existing well house and raise the elevation level of the well house.	Completed	
Pooler	ES-1	Install generators at all fire stations.	Completed	Generators were added to the fire stations in January 2015.
Pooler	ES-2	Install automatic switchovers for generators including lift stations.	Delete	Covered by a new action item.
Pooler	ES-3	Install generators at Rogers Street and Skinner Street water wells.	Delete	Covered by a new action item.
Pooler	ES-4	Purchase 150kw generator and automatic transfer switch (estimated cost $80,000)	Delete	Covered by a new action item. *NEW POST MATTHEW: This is a new facility that has lost power in the first two months it has been open. This is the FD HQ.

Jurisdiction	Action #	Action Description	2020 Implementation Status	2020 Implementation Status Comments
Pooler	ES-5	Purchase 50kw generator and automatic transfer switch (estimated cost $24,000)	Delete	Covered by a new action item. *NEW POST MATTHEW: The station's remote location makes it an issue getting power restored promptly.
Pooler	ES-6	Purchase 50kw generator and automatic transfer switch (estimated cost $24,000)	Delete	Covered by a new action item. *NEW POST MATTHEW: New facility that is under construction, project budget unable to include standby generator.
Port Wentworth	P-1	Update City-wide Stormwater Master Plan	Completed	
Port Wentworth	PP-1	Harden boat launch/ramp at Houlihan Landing near Houlihan Bridge	Delete	Replacing both boat ramps and adding a new section to floating dock. Engineering complete, land being donated, waiting to bid project
Port Wentworth	PP-2	Update the City's Comprehensive Plan	Completed	
Port Wentworth	ES-1	Build a water tower for the City's water reserve	Completed	
Port Wentworth	ES-2	Update the service delivery strategy City-wide	Completed	
Savannah	P-2	Complete a study to evaluate the effectiveness of a stormwater utility based on impervious area and its impact on the typical homeowner.	Completed	Study complete
Savannah	P-3	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-Disaster 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.	Delete	Partial Adoption – Mitigation
Savannah	P-4	Support the Chatham County-Savannah MPC Greenway Plan and coordinate with the MPC on the Plan as needed.	Delete	This action is too vague and no background info available
Savannah	P-5	2014: Create a Natural Floodplain Functions Plan and a Repetitive Loss Area Analysis	Completed	Completed Natural Floodplain Functions Plan, July 2015 (http://www.savannahga.gov/DocumentCenter/View/7330). Completed Repetitive Loss Area Analysis, July 2015 (http://www.savannahga.gov/DocumentCenter/View/6859).

Jurisdiction	Action #	Action Description	2020 Implementation Status	2020 Implementation Status Comments
Savannah	P-6	Work with GDOT and County Zoning Board to ensure that future development including road construction is regulated to the 100-year floodplain standard	Completed	Federal Agency directs GADOT how to build roads.
Savannah	P-8	Remove records and documents from lower levels of buildings that may be flooded following a storm surge	Delete	Steps for completing: secure and review flood/surge maps; identify vulnerable City facilities; notify departments in vulnerable City facilities to remove records from lower levels; Municipal Archives provide outreach, records management, and support to those departments for use of City-wide records management program, including City Records Center and annual dispositions program
Savannah	P-9	Mapping of electrical wiring and comparison of current conditions to current code at Savannah-Chatham Metropolitan Police Department Barracks.	Delete	City electrician is helping with building evaluation. Ongoing activity. 2019: No information available
Savannah	P-10	Research potential impacts from materials transported on tracks at I&D Water Plant	Delete	No capacity to complete
Savannah	P-12	Enclose/replace structure housing chlorine tanks at I&D Water Plant to prevent ease of access to chemical by potential terrorists as noted in DHS CI/KR Courtesy Security Inspection	Delete	No longer a priority
Savannah	P-13	Conduct engineering study to determine airflow and shutter needs for vents at Keyton Pump Station	Delete	Delete per: David Donnelly; No longer a priority
Savannah	PP-1	Chatham County Emergency Management (CEMA) will provide a prioritized list of critical facilities.	Delete	No capacity to complete
Savannah	PP-4	Harden pump stations to increase wind resistance, including roof bracing and shuttering	Delete	No funding available
Savannah	PP-5	Relocate the Southside radio site	Delete	Structure was hardened to the point relocation is not needed.
Savannah	PP-6	Harden roofs, windows, doors, and anchorage of all historical and cultural buildings	Delete	This action is too general, it should be reworded to be more specific. Is it only for City-owned buildings? Delete, no information available
Savannah	PP-9	Replace walkway between chemical storage building and main building at I&D Water Plant with a hurricane resistant covered walkway	Delete	No longer a priority.

Jurisdiction	Action #	Action Description	2020 Implementation Status	2020 Implementation Status Comments
Savannah	PP-10	Harden new storage building at I&D Water Plant through the use of additional cross members and fasteners.	Delete	No longer a priority.
Savannah	PP-11	Harden all metal buildings at I&D Water Plant through the use of additional cross members and fasteners	Delete	No longer a priority.
Savannah	PP-12	Replace doors and roll up doors with hurricane rated doors at all buildings at I&D water plant.	Delete	No longer a priority.
Savannah	PP-13	Replace existing fuel building with a hurricane rated metal shed at I&D Water Plant that provides enough storage to fuel City Critical Response Vehicles for 72 hours without resupply.	Delete	No longer a priority.
Savannah	PP-14	Replace roll up doors at centrifuge building at I&D Water Plant with hurricane rated doors	Delete	No longer a priority.
Savannah	PP-15	Replace roll up door at generator building at I&D Water Plant with a hurricane rated door	Delete	No longer a priority.
Savannah	PP-16	Replace doors to electrical building at I&D Water Plant with hurricane rated doors	Delete	No longer a priority.
Savannah	PP-17	Harden building, including windows, doors, and shutter vents, at Kayton Pump Station	Delete	No longer a priority.
Savannah	PP-18	Harden main doors and windows at Savannah Civic Center to compliment wind resistance upgrades to the fly loft structure on the North Side	Delete	This should not be addressed until the City decides what the fate of the Civic Center is. Low priority.
Savannah	PP-21	Replace back bay doors at Savannah Civic Center with hurricane rated doors	Delete	This should not be addressed until the City decides what the fate of the Civic Center is. Low priority.
Savannah	PP-22	Install wind screen protection system at front door and all openings of Police Department Barracks with a hurricane rated door	Delete	No longer a priority.
Savannah	PP-25	Improve attachment of flat roof at I&D Water Plant through the use of metal flatteners	Delete	No longer a priority.
Savannah	PP-26	Provide weather safe access to the generator building at I&D Water Plant	Delete	No longer a priority.
Savannah	PP-27	Increase wind load of roof for chemical storage building at I&D Water Plant	Delete	No longer a priority.

Jurisdiction	Action #	Action Description	2020 Implementation Status	2020 Implementation Status Comments
Savannah	PP-34	Secure window A/C units at Police Department Barracks	Delete	No longer have window A/C units at this location
Savannah	PP-36	Bracing on garage doors at Savannah Fire Department	Completed	Wind screens were ordered for Fire Headquarters / Station 3, however additional wind screens should be ordered for those stations outside of CAT 3 Flooding. Stations 13, 14, 8, 5, 2. (These are past comments. Action reported as complete per Chief Goolsby 6/7/19)
Savannah	PP-38	Debris protection for clarifiers/filters at I&D Water Plant	Delete	No longer a priority.
Savannah	PP-42	Replace downtown Savannah power poles with spun concrete poles	Delete	Private Property - Poles owned by GA Power.
Savannah	PP-44	Funding for three fire stations to harden or replace temporary stations that are currently in use	Completed	Partially complete - Stations 5 12, 15 have been completed and the City is working to complete station 14 in 2020. (These are past comments. Action reported as complete per Chief Goolsby 6/7/19)
Savannah	PP-45	Remove motorcycle dome covering Police Department Barracks	Delete	No longer a priority.
Savannah	PP-46	Elevate external HVAC at ground level at I&D Water Plant	Delete	No longer a priority.
Savannah	PP-47	HVAC stands at I&D Water Plant	Delete	No longer a priority.
Savannah	PP-48	HVAC stands on roof of chemical storage building at I&D Water Plant	Delete	No longer a priority.
Savannah	PP-49	Mechanism to prevent water from entering building via basement entrance at Savannah Civic Center	Delete	Basement is well below City Drain Lines so all water is pumped out via sump pumps. Low priority.
Savannah	PP-50	Place all mechanical equipment on pedestals at Savannah Civic Center	Delete	This should not be addressed until the City decides what the fate of the Civic Center is. Low priority.
Savannah	PP-51	Replace basement sump pumps at Savannah Civic Center	Completed	
Savannah	PP-52	Backflow protection for arena at Savannah Civic Center	Completed	
Savannah	PP-53	HVAC stands at Police Department Barracks	Delete	No longer a priority.
Savannah	PP-54	Seal/replace basement windows to prevent rain entry at Police Department Barracks	Delete	No longer a priority.
Savannah	PP-57	Apply wet flood-proofing to pump stations	Delete	No longer a priority.

Jurisdiction	Action #	Action Description	2020 Implementation Status	2020 Implementation Status Comments
Savannah	PP-58	Improve generator housing at Police Department Barracks	Delete	No longer a priority.
Savannah	PP-59	Add signage regarding potential storm surge depths.	Delete	This action is included in PEA-3 FEMA High water Mark
Savannah	PP-60	Evaluate critical facilities and recommend appropriate storm surge retrofit protection measures.	Delete	Need personnel to complete the study and funds
Savannah	PP-61	Research protection for wells around the city.	Delete	No longer a priority.
Savannah	PP-62	Fire suppression system at Police Department Barracks	Delete	No longer a priority.
Savannah	PP-63	Replace Kayton Pump Station building with monolithic dome on a concrete ring foundation to house the motor and electrical components	Delete	Deletion suggested by Director Roger Raines. No longer a priority.
Savannah	PP-64	Establish resiliency of operations at identified facilities by providing generator capabilities for backup power in the event of prolonged outages (estimated cost $540,000 - $1.26 million)	Delete	New, post-Matthew: During Hurricane Matthew, critical facilities (911 Center, Southside Precinct) were not able to maintain network connectivity because sites "upstream" were without power. (2019 - awaiting status update from IT). No capacity to complete.
Savannah	PP-65	Establish resiliency of operations at Sanitation Bureau facilities by providing generator capabilities for backup power in the event of prolonged outages. Install permanent generator to be in-line to provide power when needed. Also, enhance network connectivity to these locations by extending fiber to these sites (currently dependent on leased-line for communications). This will further allow for continuity of operations at these sites (estimated cost $930,000).	Delete	New post-Matthew: Sanitation facilities had intermittent network connectivity outages due to outages from leased-line providers. No capacity to complete.
Savannah	PP-66	Establish resiliency of operations at critical Police Department facilities by providing generator capabilities for backup power in the event of prolonged outages. Final action for each facility is to be determined. Install permanent generator to be in-line to provide power when needed. These locations are also key facilities on the City's fiber network. Maintaining power at these locations allows for	Delete	New, post-Matthew: During Hurricane Matthew, critical facilities (911 Center, Southside Precinct) were not able to maintain network connectivity because sites "upstream" were without power. (2019 - awaiting status update from IT). No capacity to complete.

Jurisdiction	Action #	Action Description	2020 Implementation Status	2020 Implementation Status Comments
		network connectivity to transverse locations (estimated cost $560,000).		
Savannah	PP-67	Funding for two fire stations to harden or replace temporary stations that are currently in use	Delete	New Hampstead Area Station, Station 10. No funding to complete.
Savannah	NRP-1	Consider expanding riparian impervious surface setbacks including a 25' setback on coastal marshland and wetlands	Completed	Included in City's 2015 Flood Mitigation Plan.
Savannah	ES-1	Relocate Emergency Coordination Center, Backup 911 Center, City Server Room, Traffic Engineering and Law Enforcement / Fire / HAZMAT / SAR / Special Operations to co-located hardened facility outside of storm surge zone that can maintain 24-hour operations in all-weather events.	Delete	No funding to complete.
Savannah	ES-3	Generator for Police Training Center	Delete	NEW POST-MATTHEW: Purchase and install generator at Police Training Center. No funding to complete.
Savannah	PEA-2	Outreach to the community through newspaper publication. Information that covers: floodplain management topics. Flooding in an out of the SFHA, flood sources not identified on the FIRM, DFIRMs, Flood Insurance, ICC, FEMA grants, LOMA, flood zones, retrofitting, elevation certificates, how to pick a contractor	Delete	CRS Annual outreach publication. Section of a newspaper outreach to the community concerning information about the new FIRM. Sent out over 86,000 copies during the week of 10/9/2016.
Thunderbolt	P-5	Acquire and Install portable bypass pumps for lift stations at Robertson, Mechanics, and Downing Ave (130,000)	Delete	Included in a new action step. *Replaces ES-2; The town has one portable bypass pump that is normally dedicated to Robertson Lift Station. There are two other lift stations that may be subject to a malfunction where additional bypass pumps may assist.
Thunderbolt	PP-1	Harden Town Hall and the fire station.	Delete	Included in a new action step. Deferred-Due to the lack of funding, the Town was unable to update the facility but plans to do so once they apply for funding as needed.
Thunderbolt	PP-2	Utilize flood controls to mitigate street flooding at Bonaventure and Downing and Gragg and Vernon Streets.	Delete	Delete – It was determined that in regard to stormwater issues, this area is no longer a priority because it only isolated a few areas that needed attention and the priority became lower for the Town.

Jurisdiction	Action #	Action Description	2020 Implementation Status	2020 Implementation Status Comments
Thunderbolt	PP-3	Infrastructure Retrofit (estimated cost $283,000)	Delete	Included in a new action step. *NEW POST MATTHEW: Throughout the Town Thunderbolt stormwater structures were identified as needing repair or replacement.
Thunderbolt	PP-4	Purchase Generator for Senior Center Facility and Equip Building for Evacuation Staging Purposes (estimated cost ($40,000)	Delete	Included in a new action step. *NEW POST MATTHEW: Equip the Senior Center to become a staging area for the residents of thunderbolt.
Thunderbolt	PP-6	Harden Community Center	Delete	Included in a new action step. *New After Irma
Thunderbolt	PP-8	Harden Public Works Facility	Delete	Included in a new action step. *New After Irma - Add Storm shutters and replace garage doors.
Thunderbolt	PP-9	Harden Museum Facility	Delete	Included in a new action step. *New After Irma - The Town needs to add protective measures and processes to safeguard Town historical information and items.
Thunderbolt	PP-10	Replace Force Main Line on Robertson Avenue	Completed	*New After Irma - Force main was damaged due to flooding during Hurricane Irma
Thunderbolt	ES-1	Acquire portable generator for water well.	Delete	Included in a new action step. Deferred-There has been a lack of funding for the project, but the Town intends to apply for funding in the future.
Thunderbolt	ES-3	Purchase generator for Public Works Critical Facility	Delete	Included in a new action step. *NEW POST MATTHEW: The public works building is used as an EOC during disaster and needs generator power
Thunderbolt	ES-4	Upgrade generators for Critical Facilities	Delete	Included in a new action step. *New After Irma
Tybee Island	PP-8	Purchase and Install Storm Shutters for City Hall	Delete	No longer a priority.
Tybee Island	PP-9	Purchase and Install Storm Shutters for Fire Dept.	Delete	No longer a priority.
Tybee Island	PP-10	Purchase and Install Storm Shutters for YMCA (Tybee Island EOC is housed at this location)	Delete	No longer a priority.
Tybee Island	PP-11	Purchase and Install storm shutters for Police Department	Delete	No longer a priority.
Tybee Island	PP-14	Purchase and Install Storm Shutters for the department of public works.	Delete	No longer a priority.
Tybee Island	PP-15	Purchase and install storms shutters at River's End RV Park Manager's Residence and Office	Delete	No longer a priority.
Tybee Island	PP-16	Purchase and Install Storm Shutters for the North Beach Restrooms	Delete	No longer a priority.

Jurisdiction	Action #	Action Description	2020 Implementation Status	2020 Implementation Status Comments
Tybee Island	NRP-3	Regulate dock construction to reduce damage to native marsh grass.	Delete	No capacity to complete.
Tybee Island	ES-3	Add redundancy to utility lines into Tybee Island.	Delete	No funding to complete.
Tybee Island	ES-5	Conduct additional hazard mitigation training for the fire department.	Delete	No longer a priority.
Tybee Island	ES-6	Purchase generator for fire station to provide power to station due to power outage.	Delete	No funding to complete.
Tybee Island	PEA-1	Conduct workshops related to FEMA hazard mitigation grant programs as needed.	Delete	On-going - New Implementation Date

1.4 PLAN ORGANIZATION

The Chatham County Multi-Jurisdictional Pre-Disaster Hazard Mitigation Plan is organized into the following sections:

- Section 1: Planning Process
- Section 2: Hazard Identification & Risk Assessment
- Section 3: Mitigation Strategy
- Section 4: Capability Assessment
- Section 5: Plan Implementation and Maintenance
- Jurisdictional Annexes
- Appendix A: Local Mitigation Plan Review Tool
- Appendix B: Planning Process Documentation
- Appendix C: Mitigation Alternatives
- Appendix D: References
- Appendix E: Risk Assessment Supplemental Documentation

1.5 HAZARD, RISK, AND VULNERABILITY SUMMARY

The hazards addressed in this plan were chosen by the HMPC based on the previous plan, the current Georgia State Mitigation Strategy, and consideration of hazard frequency and potential severity of damage. Wherever possible, probability of future occurrences was based on historical occurrence data.

The conclusions drawn from each individual hazard profile and vulnerability assessment were used to prioritize all potential hazards to Chatham County using the Priority Risk Index (PRI). This method provides a standardized numeric value to each hazard for comparability. A higher PRI value indicates a hazard poses a higher risk to the community. The PRI is a weighted sum of values assigned across five categories: probability, impact, spatial extent, warning time, and duration. Each hazard is assigned a value between 1 and 4 for each category based on a defined set of criteria. Details on these values can be found in Section 2.3. Table 1.11 below summarizes the PRI results for the hazards addressed in this plan.

Table 1.11 – Summary of PRI Results

Hazard	Probability	Impact	Spatial Extent	Warning Time	Duration	PRI Score
Dam Failure	Unlikely	Limited	Negligible	Less than 6 hrs	Less than 1 week	1.8
Drought	Likely	Minor	Large	More than 24 hrs	More than 1 week	2.5
Earthquake	Possible	Limited	Moderate	Less than 6 hrs	Less than 6 hrs	2.3
Erosion	Likely	Limited	Small	More than 24 hrs	Less than 1 week	2.3
Extreme Heat	Highly Likely	Critical	Large	More than 24 hrs	Less than 1 week	3.3
Flood	Highly Likely	Critical	Moderate	6 to 12 hours	Less than 1 week	3.3
Hurricane	Likely	Catastrophic	Large	More than 24 hrs	Less than 1 week	3.3
Sea Level Rise	Likely	Critical	Moderate	More than 24 hrs	More than 1 week	2.9
Severe Weather (Hail)[1]	Highly Likely	Minor	Small	Less than 6 hrs	Less than 6 hrs	2.4
Severe Weather (Lightning)[1]	Highly Likely	Minor	Negligible	Less than 6 hrs	Less than 6 hrs	2.2
Severe Weather (Winds)[1]	Highly Likely	Limited	Large	Less than 6 hrs	Less than 6 hrs	3.1
Severe Winter Weather	Likely	Limited	Large	More than 24 hrs	Less than 1 week	2.7
Tornado	Likely	Critical	Small	Less than 6 hrs	Less than 6 hrs	2.7
Wildfire	Likely	Limited	Moderate	Less than 6 hrs	Less than 1 week	2.8
Hazardous Materials	Likely	Critical	Moderate	Less than 6 hrs	Less than 24 hrs	3.0
Terror Threat	Unlikely	Catastrophic	Negligible	Less than 6 hrs	More than 1 week	2.2

1.6 MULTI-JURISDICTIONAL PARTICIPATION AND SPECIAL CONSIDERATIONS

This plan update includes unincorporated Chatham County as well as eight incorporated municipalities. To satisfy multi-jurisdictional participation requirements, each participating jurisdiction was required to perform the following tasks:

- Designate representatives for the HMPC to participate in mitigation planning meetings;
- Report on the status of existing mitigation projects; and
- Develop their local Mitigation Action Plan.

For this plan update, the Town of Vernonburg joined as a participant in the plan. However, due to Vernonburg's small size and limited capacity, they have participated in this plan update in a joint effort with the County. Therefore, the Mitigation Action Plan for Chatham County reflects actions for both the unincorporated areas and the Town of Vernonburg.

In developing the Chatham County Mitigation Action Plan, the County invited representatives of special needs groups to incorporate mitigation actions that will reduce the effects of hazards on vulnerable segments of the County's population. Foreseeable factors include early warning specifically directed to those groups to facilitate preparations for evacuation, identification of transportation system elements adapted to their needs, and preparation of shelters/reception areas for special needs. Stakeholders were also invited to participate in this process and have developed their own mitigation actions, such as protection and backup power generation for non-County-owned critical facilities.

To support each jurisdiction's evaluation of mitigation alternatives, Appendix C reviews a selection of actions considered within each mitigation category.

As a basis for each jurisdiction creating their own Mitigation Action Plan, jurisdiction-specific information was developed on current conditions, assets and exposure, risk and vulnerability, and capability. Current conditions information is provided in Section 1.8 Community Data, which has a countywide summary of geographic and demographic data. More specific data is presented in each jurisdictional annex. Asset and exposure data is detailed by jurisdiction in Section 2.4, with more details provided in the jurisdictional annexes. The risk assessment also provides jurisdictional specific vulnerability data, such as repetitive loss counts for flood. At the end of each hazard profile for natural hazards, a hazard summary table provides a Priority Risk Index (PRI) rating by jurisdiction to note any variations in risk across the planning area. Where applicable, annexes also include more detailed hazard mapping and data.

The following jurisdictional specific considerations were identified in the 2015 plan and remain relevant to this planning effort:

- The City of Savannah has the highest concentration of families living below the poverty level as well as almost all of the historic properties within the County. It is therefore necessary to consider the financial ability of individuals to mitigate, evacuate or recover from an event. It is also necessary to limit mitigation of structures to activities that will not impact their historic designation. Additional details on vulnerability of historic structures to flood can be found in the City of Savannah's Flood Mitigation Plan.
- Garden City has several mobile home communities as well as a significant Hispanic population. Some hazard information and preparedness materials are available in Spanish, but there is a need to consider this special needs group when planning.
- Chatham County attracts more than six million tourists annually which can present challenges with regard to informing the public, including visitors, about hazards and mitigation and preparedness measures.

- The Savannah State University campus straddles the Savannah-Chatham County boundary near the Wilmington River and includes more than 40 structures, several of which are in a Category 3 Storm Surge zone or lie near the 100-year flood plain. All three of the Georgia Institute of Technology Savannah buildings fall within the Category 4 storm surge risk zone and can be considered to be at risk from tornadoes or coastal storm winds. The Georgia Southern University (GSU) campus can be considered at risk from tornadoes or coastal storm winds. There are a total of 64 buildings on the GSU campus. The Savannah College of Art and Design has approximately 60 structures throughout the Savannah Historic District and other locations; SCAD facilities can be considered to face risks similar to the City of Savannah overall.

1.7 ADOPTION, IMPLEMENTATION, MONITORING, AND EVALUATION

Upon FEMA approval, this plan will be adopted by Chatham County and all participating jurisdictions by passing a resolution. The purpose of formally adopting this plan is to secure buy-in from all participating jurisdictions, raise awareness of the plan, and formalize the plan's implementation.

Implementation and maintenance of the plan is critical to the overall success of hazard mitigation planning. Each jurisdiction participating in this plan (Chatham County, Bloomingdale, Garden City, Pooler, Port Wentworth, Savannah, Thunderbolt, Tybee Island, and Vernonburg) is responsible for plan implementation within their jurisdiction. Elected officials, officials appointed to head County, City, and Town departments, and community staff are charged with leading implementation of various activities in the plan. Each participating jurisdiction will need to decide which action(s) to undertake first based on the priority assigned to the actions in the planning process and the availability of funding and administrative support. Low or no-cost actions are often the easiest way to demonstrate progress toward successful plan implementation.

CEMA will be responsible for establishing an annual schedule to monitor, evaluate, and update this plan with the continued support of the HMPC. The HMPC's primary duty moving forward is to see the plan successfully carried out and report to each local governing body, CEMA, GEMA, and the public on the status of plan implementation and mitigation opportunities. Other duties include reviewing and promoting mitigation proposals, considering stakeholder concerns about mitigation, passing concerns on to appropriate entities, and posting relevant information on local websites (and others as appropriate).

More details on the procedures for plan adoption, implementation, monitoring, and evaluation are provided in Section 5.

1.8 COMMUNITY DATA

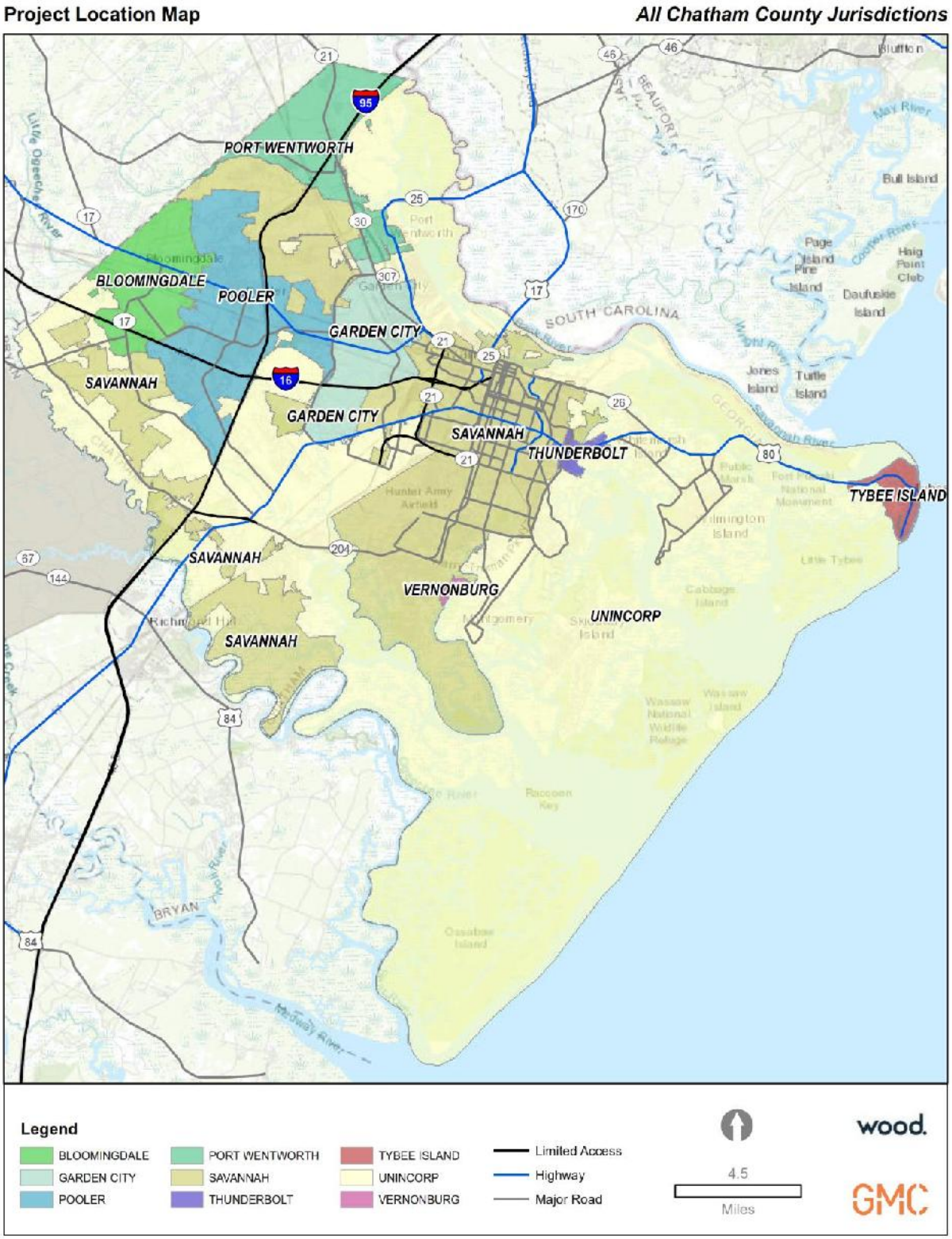
1.8.1 Overview of the Community

Chatham County is a county in the U.S. state of Georgia and is located on the state's Atlantic coast. The county seat and largest city is Savannah. One of the original counties of Georgia, Chatham County was created February 5, 1777, and is named after William Pitt, 1st Earl of Chatham. Chatham County is the northernmost of Georgia's coastal counties and is bounded by the Savannah River to the north and the Ogeechee River to the south.

Chatham County has a total area of 522 square miles. According to the U.S. Census Bureau, the total population of Chatham County was 287,049 in 2017. Therefore, the County's average population density is approximately 550 people per square mile. Note that 2017 Census data was the most recent available at the time of this plan development.

The Location Map in Figure 1.1 reflects the boundaries of the County as well as the jurisdictions within the County.

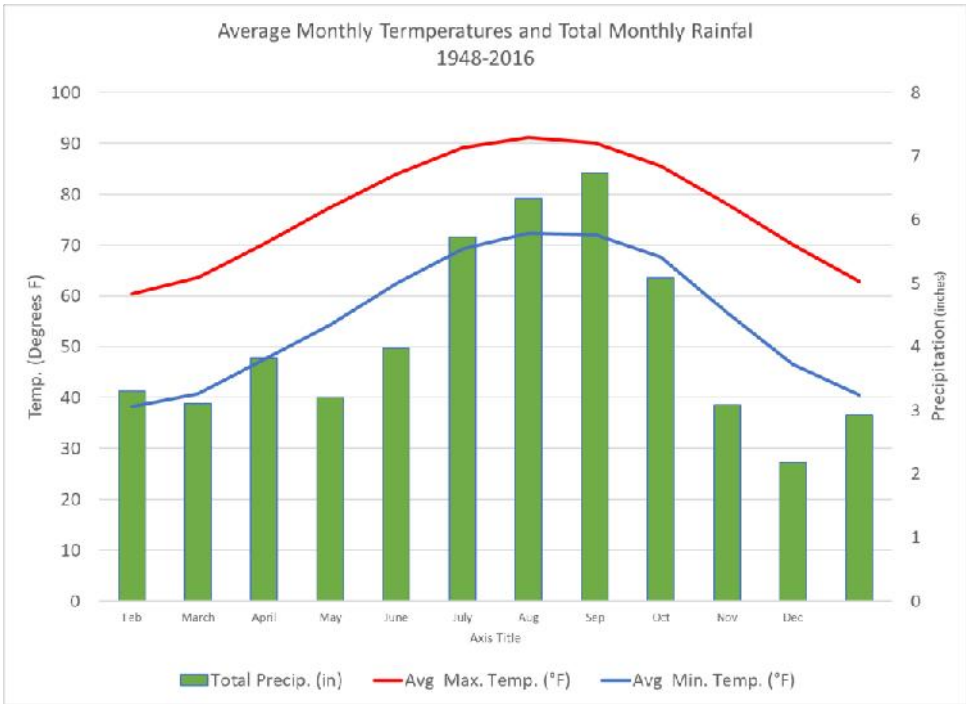
Figure 1.1 – Location Map



1.8.2 Geography and Climate

According to the Köppen climate classification system, Chatham County is classified as subtype Cfa (Humid Subtropical Climate) characterized by relatively high temperatures and evenly distributed precipitation throughout the year. The average temperature for the year is 66.8 °F. Figure 1.2 shows the average monthly precipitation totals based and average monthly temperature maximums and minimums from a weather station in Savannah, GA.

Figure 1.2 – Average Monthly Precipitation



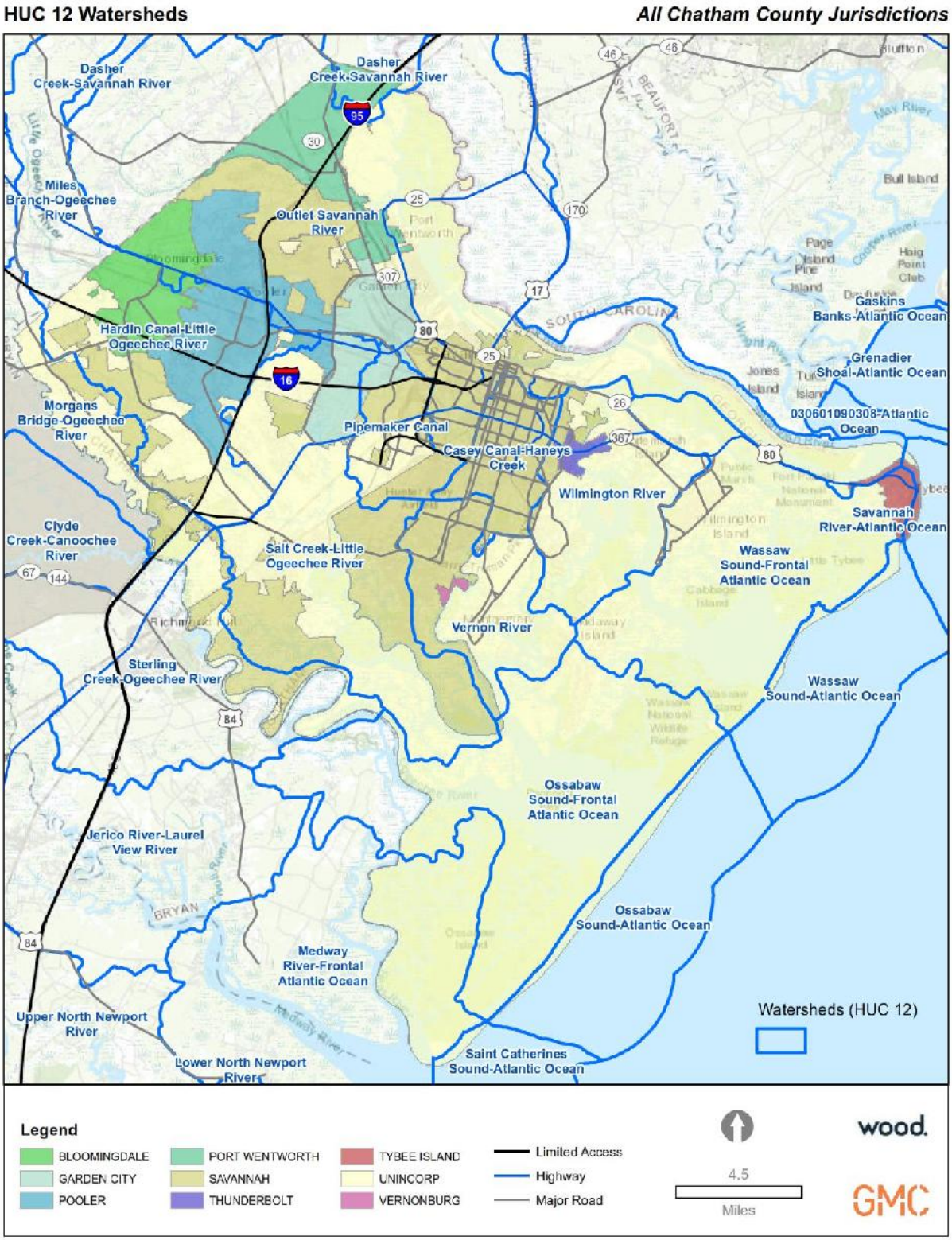
Source: University of Georgia Weather Network, Coastal Georgia Botanical Gardens, Savannah, GA

Portions of Chatham County lie within ten different HUC-12 watersheds as summarized in the table below. The HUC-12 Drainage Basin Map illustrates the HUC-12 drainage basins and drainage features in and around Chatham County.

Table 1.12 – HUC-12 Watersheds

HUC 12 Watershed Name	HUC 12 #
Sterling Creek - Ogeechee River	030602040301
Salt Creek – Little Ogeechee River	030602040203
Vernon River	030602040303
Hardin Canal – Little Ogeechee River	030602040201
Ossabaw Sound – Frontal Atlantic Ocean	030602040304
Wilmington River	030602040101
Casey Canal – Haneys Creek	030602040302
Morgans Bridge – Ogeechee River	030602020605
Outlet Savannah River	030601090307
Pipemakers Canal	030302040202
Ossabow Sound – Atlantic Ocean	030602040305
Wassaw Sound – Atlantic Ocean	030602040103
Wassaw Sound-Frontal Atlantic Ocean	030602040102

Figure 1.3 – HUC-12 Drainage Basins



1.8.3 Cultural, Historic and Natural Resources

1.8.3.1 Cultural and Historic Resources

Cultural and historic resources are summarized in the community annexes for each of the jurisdictions within the County.

1.8.3.2 Parks, Preserves, and Conservation

Parks, preserves, and conservation are summarized in the community annexes for each of the jurisdictions within the County.

1.8.3.3 Natural Resources

Floodplains and Flood Zones

FEMA flood zone designations within Chatham County are identified in the figure below. The flood hazard areas shown are designated by the Federal Emergency Management Agency (FEMA) and include: Zone A (subject to inundation by the 1% annual-chance flood event with no base flood elevation (BFE) determined), Zone AE (subject to inundation by the 1% annual-chance flood event with BFE determined), Zone VE (subject to inundation by the 1% annual-chance flood event with additional hazards due to storm waves with BFE determined), and Zone X (Moderate Risk areas outside the 1% and inside the 0.2% annual-chance floodplains with no BFE or base flood depths determined and Minimal Risk areas outside the 0.2% annual chance floodplain).

Table 1.13 – Flood Zones

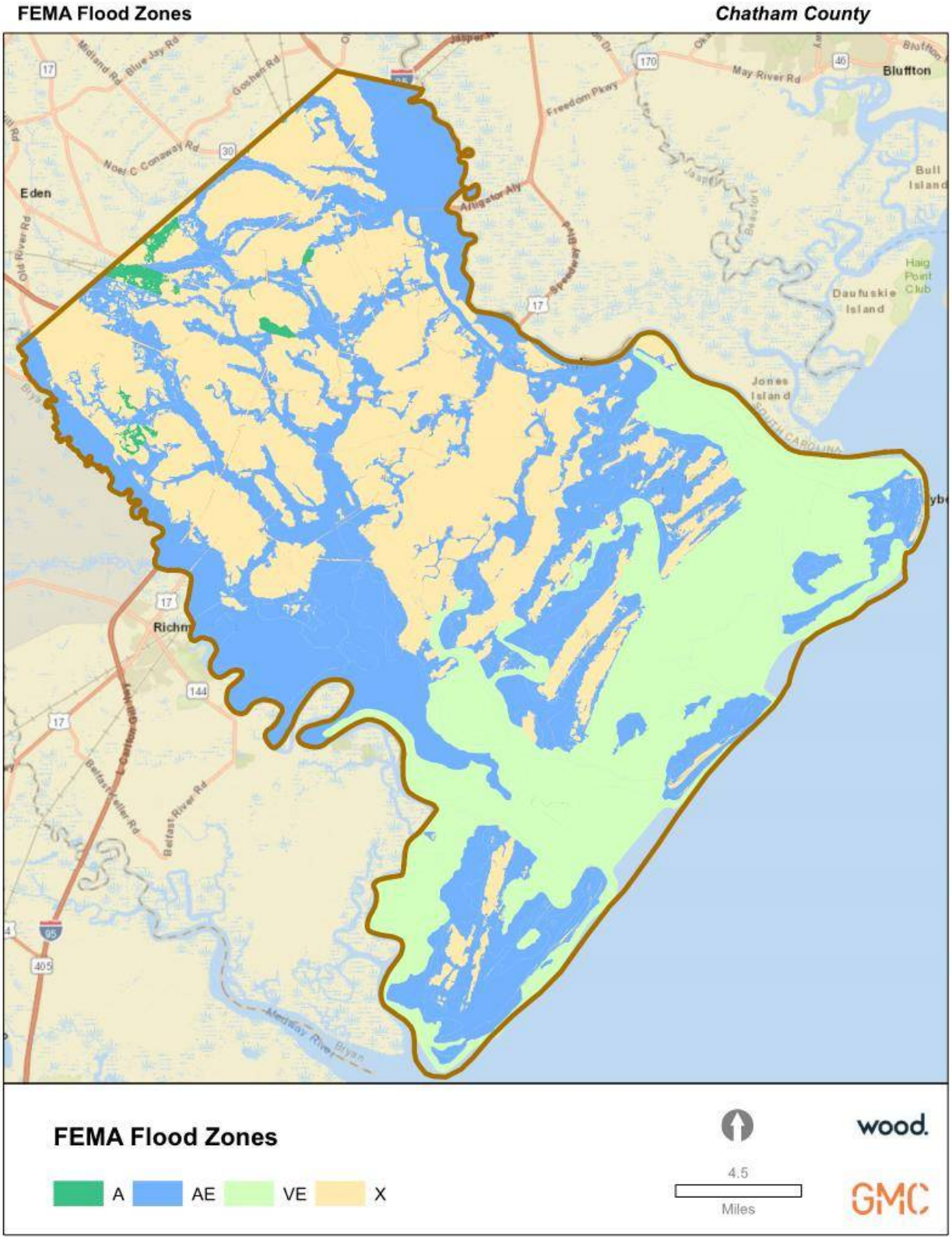
Flood Zone	Area (Acres)	Area (Square Miles)	Percent of County (%)
Outside of Flood Zones / Ocean	3,520	5.5	1.1
AE	128,205	200.3	38.4
A	2,392	3.7	0.7
VE	86,881	135.8	26.0
X	113,100	176.7	33.9
TOTAL	**334,098**	**522.0**	**100.0**

Source: FEMA, 2018

According to the 2018 FEMA data, 339.9 square miles of the County is located within a 100-year floodplain (Zone AE, A, and VE) which equals about 65 percent of the County. An additional 177 square miles are located within moderate or minimal flood hazard areas (34 percent).

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, and the vegetation stabilizes soils during flooding. Natural floodplains in the County include wetland areas and low-lying land along the major rivers in and around the unincorporated County including the Ogeechee River, Little Ogeechee River, Vernon River, Wilmington River, South Channel of the Savannah River, and the Atlantic Ocean. Natural floodplains reduce damage by allowing flood waters to spread out over large areas, aiding infiltration into the ground, reducing flow rates and acting as a flood storage area to reduce downstream peaks.

Figure 1.4 – FEMA Flood Zones by Type in Chatham County



Wetlands

Wetlands benefit the ecosystem by storing, changing, and transmitting surface water and groundwater. Through these processes pollution is removed, nutrients are recycled, groundwater is recharged, and biodiversity is enhanced. Wetland composition varies extensively, with five distinct categories for classification: Estuarine, Lacustrine, Marine, Palustrine, and Riverine systems Based on data from the National Wetland Inventory (NWI) wetlands throughout the County are summarized in Table 1.14 and Figure 1.5.

Table 1.14 – Wetland Type

Wetland Type	Area (Acres)	Area (Sq. Miles)	Percent of City
Estuarine	118,905	185.8	35.6
Palustrine	47,134	73.6	14.1
Lacustrine	830	1.3	0.2
Marine	220	0.3	0.1
Riverine	2,196	3.4	0.7
TOTAL	**169,285**	**264.4**	**50.7**

Source: National Wetland Inventory

The Palustrine System

The Palustrine (freshwater) system includes all non-tidal wetlands dominated by trees, shrubs, persistent emergent plants, emergent mosses or lichens, and all such wetlands that occur in areas where salinity due to ocean-derived salts is below 0.5%. The Palustrine system is bounded by upland.

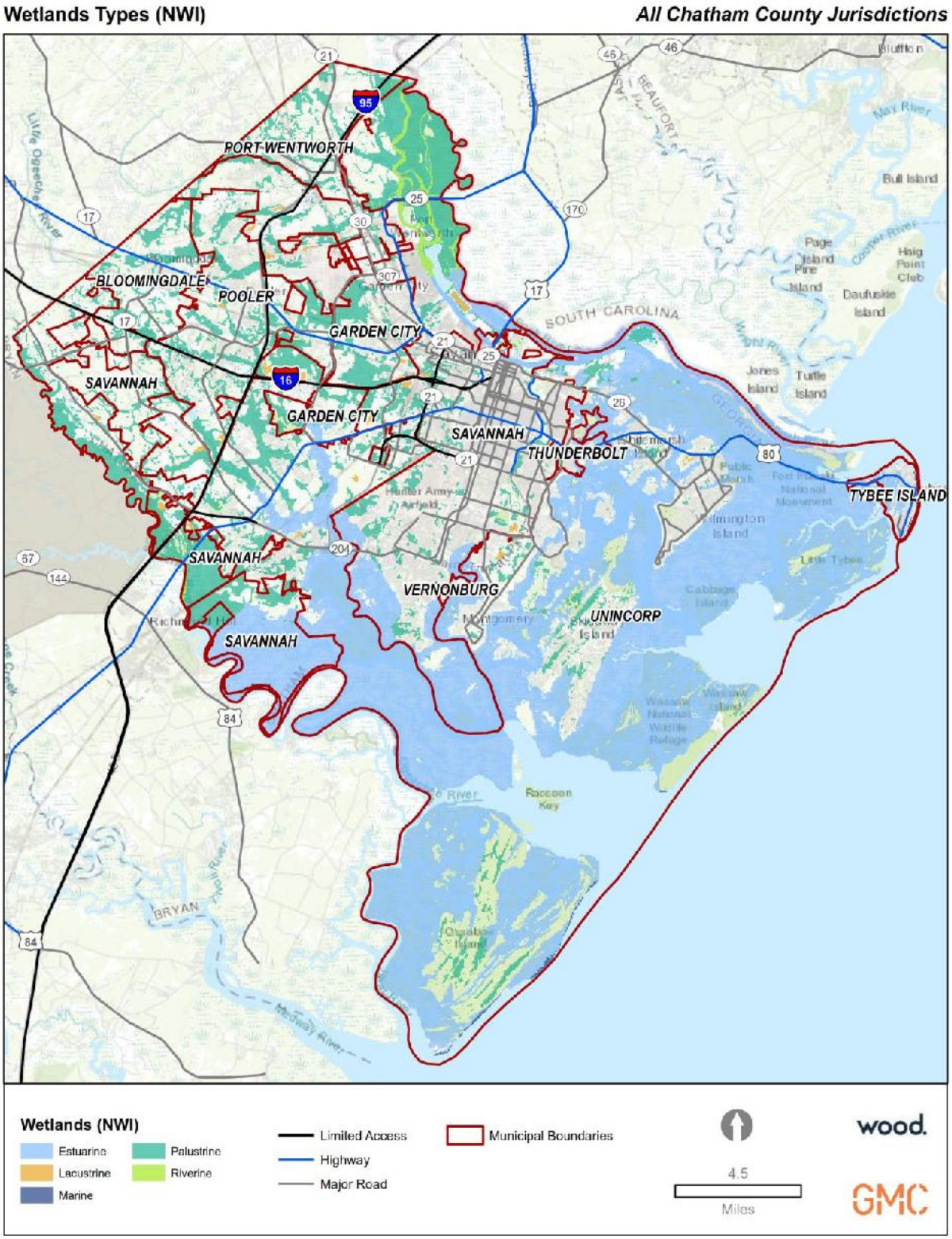
The Estuarine System

The Estuarine system consists of deep-water tidal habitat and adjacent tidal wetlands that are usually semi-enclosed by land but have open, partly obstructed, or sporadic access to the open ocean, and in which ocean water is at least occasionally diluted by freshwater runoff from the land. The Estuarine system extends (1) upstream and landward to where ocean-derived salts measure less than 0.5% during the period of average annual low flow; (2) to an imaginary line closing the mouth of a river, bay, or sound; and (3) to the seaward limit of emergent wetlands, shrubs, or trees where they are not included in (2). It also includes offshore areas of continuously diluted sea water. It contains two sub-systems: subtidal (where the substrate is continuously submerged) and intertidal (where the substrate is exposed and flooded by tides including the associated splash zone).

The Riverine System

The Riverine system includes all wetlands and deep-water habitats contained within a channel with two exceptions: (1) wetlands dominated by trees, shrubs, emergent vegetation, emergent mosses, or lichens, and (2) habitats with water containing ocean-derived salts in excess of 0.5%. The Riverine system is bounded on the landward side by upland, by the channel bank (including natural and man-made levees), or by wetlands dominated by trees, shrubs, emergent vegetation, emergent mosses, or lichens. In braided streams, the system is bounded by the banks forming the outer limits of the depression within which the braiding occurs.

Figure 1.5 – Wetland Types



Lacustrine Wetlands

Lacustrine wetlands are large, open, water-dominated systems (e.g. lakes). This definition also applies to modified systems which possess characteristics similar to lacustrine systems (e.g. deep standing or slow-moving waters).

Marine Wetlands

Marine Wetlands are areas exposed to the open ocean. The Marine System consists of the open ocean overlying the continental shelf and the coastline.

Threatened and Endangered Species

The U.S. Fish and Wildlife Service maintains a regular listing of threatened species, endangered species, species of concern, and candidate species for counties across the United States. Chatham County has thirteen species that are listed with the U.S. Fish and Wildlife Services. The table below shows the species identified as threatened, endangered, or other classification for Chatham County.

Table 1.15 – Threatened and Endangered Species

Group	Common Name	Scientific Name	Federal Status
Mammals	West Indian Manatee	*Trichechus manatus*	Threatened
Birds	Piping Plover	*Charadrius melodus*	Endangered/Threatened
Birds	Red Knot	*Calidris canutus rufa*	Threatened
Birds	Red-cockaded Woodpecker	*Picoides borealis*	Endangered
Birds	Wood Stork	*Myteria americana*	Threatened
Reptiles	Eastern Indigo Snake	*Dymarchon corais couperi*	Threatened
Reptiles	Gopher Tortoise	*Gopherus polypheus*	Candidate
Reptiles	Green Sea Turtle	*Chelonia mydas*	Threatened
Reptiles	Kemp's Ridley Sea Turtle	*Lepidochelys kempii*	Endangered
Reptiles	Leatherback Sea Turtle	*Dermochelys coriacea*	Endangered
Reptiles	Loggerhead Sea Turtle	*Caretta caretta*	Threatened
Amphibians	Frosted Flatwoods Salamander	*Ambystoma cingulatum*	Threatened
Flowering Plants	Pondberry	*Lindera melissifolia*	Endangered

Source: U.S. Fish & Wildlife Service (https://ecos.fws.gov/ecp0/reports/species-by-current-range-county?fips=40109)

1.8.4 History

Permanent European settlement came to the Chatham County – Savannah region in 1733 when the British settled the Colony of Georgia to buffer their northern colonies from the Spanish in Florida. James Edward Oglethorpe founded Savannah as the seat of the thirteenth English colony near a Creek Indian village called Yamacraw. Oglethorpe forged friendly relations with the Indians which enabled him to establish a successful town 18 miles inland from the Atlantic Ocean. Oglethorpe devised a colonial settlement plan that set it apart from other cities in the New World.

The nucleus of the plan was the ward. Each ward had a name and was a part of a larger integrated regional land system that included town commons, gardens, farms, estates, agricultural villages and fortified outposts. The plan informed the architecture, resulting in a dense urban pattern of townhouses and carriage houses in the old town and a more and more suburban pattern as development advanced into the former farm lots. Modern-day street patterns closely follow the old land divisions between farm lots.

Savannah's regional plan with its town lots and squares, garden lots, and farm lots formed a blueprint for growth that is evident in the street patterns even today. Major boulevards such as 37th Street, Victory Drive, Bull Street and Waters Avenue follow the former divisions between the farm lots.

Beyond the farms were agricultural villages such as Hampstead and Highgate (now occupied by Hunter Army Airfield) and private estates on the water such as Wormsloe and Beaulieu. The plan was completed by fortified farming villages such as those at Thunderbolt and Modena on Skidaway Island.

The outlying settlements were connected to the City of Savannah by waterways and colonial road systems. These colonial roads followed the high ground (usually the ridges of old barrier island dune structures). Early development naturally occurred along these routes including the Western Road (Louisville Road), the White Bluff Road (an extension of Bull Street), the Great Ogeechee Road (Southern Road), Wheaton Street (to Thunderbolt and the ferry to Skidaway Island), and the Augusta or River Road. Plantations were established along the Savannah and Ogeechee Rivers and on the islands such as Ossabaw, Skidaway and Wassaw.

After the Civil War, street railroads, also known as streetcars, encouraged suburban and river resort development. With the arrival of the automobile, many of these summer resorts became year-round residential suburbs and palm-lined causeways connected these communities to the mainland. Street railroads enabled urban expansion into the former farm lots where larger lots and deeper setbacks were the norm and are today desirable residential neighborhoods.

Industrial development replaced the Savannah River plantations in the Twentieth Century. Like the Nineteenth Century canals and railroads, industries spurred the development of industrial worker communities like Woodville and West Savannah. Prior to World War II, the Savannah urban area was bounded roughly by DeRenne Avenue on the South, Pennsylvania Avenue on the East, and Lathrop Avenue and Laurel Grove Cemetery on the West. Outside of several smaller municipalities, the remaining areas were rural in character, dominated by dairy farms, timber and truck farming.

Since World War II, automobile-related mobility enabled urban expansion and suburbanization, which spread to all quadrants of the County. With the exception of the estates of Wormsloe, Beaulieu, Grove Point, Oakland, Lebanon and the islands of Wassaw and Ossabaw, there is little rural landscape left in modern day Chatham County.

1.8.5 Economy

1.8.5.1 Wages and Employment

Per the 2013-2017 American Community Survey 5-Year Estimates, the median household income for Chatham County is $52,215, which is over 4.07 percent higher than the state's median household income $52,977 (there is no income data for the unincorporated County).

An estimated 17.3 percent of the population is considered to be living below the poverty level. Moreover, 25.9 percent of people under 18 years of age and 7.9 of people 65 years and over are living below the poverty level.

The table below shows employment and unemployment rates along with industry employment by major classification for the entire County.

Table 1.16 – Employment and Occupation Statistics for Unincorporated Chatham County, GA

Employment Status	Count	Percentage (%)
In labor force	148,205	64.7
Employed	132,386	57.8
Unemployed	12,654	5.5
Armed Forces	3,165	1.4
Not in labor force	80,756	35.3
Occupation		
Management, business, science and arts	47,870	36.2
Service	27,917	21.1
Sales and office	29,973	22.6
Natural resources, construction and maintenance	10,679	8.1
Production, transportation and material moving	15,947	12.0

Source: U.S. Census Bureau, American Community Survey 2013-2017 5-Year Estimates

Major industry sectors in Chatham County include management, business, science, and arts (36.2%); service (21.1%); and sales and office (22.6%); natural resources, construction, and maintenance (8.1%); and production, transportation, and material moving (12.0%).

Major employers having greater than 100 employees within Chatham County are listed in the tables below along with an estimate of the number of employees. These tables summarize the major employers located throughout Chatham County divided into Manufacturing, Distribution, Non-Manufacturing, and Government, Military, and Education. For the purposes of this report, major employers are defined as employing 100 or more persons. Major employer data was obtained from the Savannah Economic Development Authority (SEDA) for 2019.

Table 1.17 – Major (100+) Manufacturing Employers Chatham County

Company	Product/Service	Number of Employees
Gulfstream Aerospace Corporation	Jet aircraft, aerospace equipment	12,000
International Paper	Paper products, chemicals, corrugated containers	603
JCB Americas, Inc.	Construction equipment	600
Brasseler USA	Dental and medical instrumentation	400
Imperial Sugar	Refined sugar	380
Strength of Nature Global, LLC	Ethnic hair care products	300
IP Mill - Port Wentworth	Bleached pulp	300
Kerry Ingredients and Flavours	Formulation, manufacturing and containerization of technology-based ingredients, flavours and integrated solutions	260
Diamond Crystal Brands	Salt, pepper and sugar packaging	250
Derst Baking Company	Bread, rolls, cakes	246
Mitsubishi Hitachi Power Systems Americas, Inc.	Gas and steam turbines	221
Nine Line Apparel	Commercial screen printing	191
Roger Wood Foods Inc.	Smoked sausage, meats	190
Kraton	Specialty resins, pine-based chemicals	188

Company	Product/Service	Number of Employees
Johnson Matthey Process Technologies Inc.	Catalyst production	180
Byrd Cookie Company	Gourmet cookies	155
Lummus Corporation	Cotton ginning equipment manufacturer	148
EMD Chemical	Industrial pigments	140
The Industrial Company (TIC) Southeast	Steel fabrication/machine shop and industrial maintenance	136
G-Force Manufacturing	Aerospace supplier	133
Coastal Concrete SE, LLC	Ready mix concrete	125
Interfor	Sawmill	125
DIRTT	Modular interior construction solutions	110
Thunderbolt Marine	Yacht repair and refit	109
Fuji Vegetable Oil, Inc.	Cooking oils	106
River Street Sweets	Candy	100

Source: SEDA, 2019

Table 1.18 – Major (100+) Non-Manufacturing Employers Chatham County

Company	Product/Service	Number of Employees
Dollar Tree	Distribution of various products	538
OA Logistics	Home bedding and pet beds	357
Port City Logistics	Warehouse space and transportation services logistics company	300
ARGO Merchants Group/ Nordic Logistics and Warehousing LLC	Cold storage	295
Colonial Group Inc.	Storage and distribution of petroleum product and petrochemicals	275
Shaw Industries Group Inc.	Carpeting, wood flooring and tile	271
Chatham Steel Corporation	Steel service center	265
Target	Import center for various products	247
The Home Depot	Home improvement supplies distribution center	243
Coca-Cola Bottling Company United	Soft drink/water bottling warehouse	211
Pier 1 Imports	Household goods distribution	160
United Distributors Inc.	Beverage distribution	150
IKEA Wholesale, Inc.	Furniture distribution	150
Walmart - Savannah IDC 7086	Distribution of various products	147
Floor and Decor	Flooring	145
California Cartage Company	Warehousing for K-Mart	140
DSI, LLC	Distribution of various products	131
Noble House Home Furnishings	Home furnishings	129
Schneider Logistics	Warehousing, distribution and export packaging	120
Safavieh	Home furnishings	112

Source: SEDA, 2019

Table 1.19 – Major (100+) Non-Manufacturing Employers Chatham County

Company	Product/Service	Number of Employees
Memorial Health University Medical Center	Hospital	4,775
St. Joseph's/Candler Health System	Hospital	3,400
Parker's Corporation	Headquarters and convenience stores	870
SouthCoast Medical Group	Medical Care	658
Goodwill Industries of the Coastal Empire	Adult vocational rehabilitation	500
The Landings Club	Private club	480
Georgia Power Company - Coastal Region	Electric utility	455
OnBrand24	Call center	350
TMX Finance	Financial	302
CSX (Savannah)	Railroad line	259
Concentrix	Call center	213
Great Dane Trailers	Transportation trailers	213
FlightSafety International	Flight school	205
Hunter Maclean	Attorneys	120

Source: SEDA, 2019

Table 1.20 – Major (100+) Government, Military, and Education Employers Chatham County

Company	Product/Service	Number of Employees
Ft. Stewart/Hunter Army Airfield	Civilian personnel	5,773
Savannah-Chatham County Board of Education	Public schools	5,654
City of Savannah	Government	2,468
Savannah College of Art & Design	Education	1,886
Chatham County	Government	1,600
Georgia Ports Authority	Ship terminal operation	1,080
Georgia Southern University - Armstrong Campus	Education	886
Savannah State University	Education	729
US Army Corps of Engineers	Civil engineering	680

Source: SEDA, 2016

1.8.6 Housing

According to the 2014-2018 ACS 5-Year Estimates, there are 124,300 housing units in Chatham County, of which 87 percent (108,151) are occupied. Approximately 54.1% (58,545) of occupied units are owner-occupied (45.9% / 49,606 occupied by renters). A high percentage of renters is an indicator of higher pre- and post-disaster vulnerability because, according to Cutter, et al. (2003), renters often do not have the financial resources of homeowners, are more transient, are less likely to have information about or access to recovery aid following a disaster and are more likely to require temporary shelter following a disaster. Therefore, higher rates of home rentals in the County may indicate that residents are not able to implement certain types of mitigation in their homes.

Of the unincorporated County's owner-occupied housing units, 66.7 percent (39,042) have a mortgage. Most householders (62.8 percent / 85,439) moved into their current homes since the year 2000; 22.5 percent (24,353) moved in between 2000 and 2009, and 32.1 percent (34,707) moved in between 2010 and 2014. 8.3 percent (8,968) of occupied housing units have no vehicle available to them, which suggests these residents may have difficulty in the event of an evacuation.

The majority (79.4% / 78,105) of housing units in the County are detached single family homes. However, 4.2 percent (5,266) of units are mobile homes which can be more vulnerable to certain hazards, such as tornadoes and wind storms, especially if they aren't secured with tie downs.

The County's housing stock is aging, with the majority (93.7% / 116,445) of occupied housing built before 2000. Table 1.21 details housing age in the County.

Table 1.21 – Housing Age

Year Structure Built	Percent of Occupied Housing	Number of Structures
2014 or later	1.9	2,358
2010 to 2013	4.4	5,497
2000 to 2009	19.5	24,198
1980 to 1999	27.1	33,628
1960 to 1979	22.0	27,429
1940 to 1959	15.3	19,132
1939 or earlier	9.7	12,058

Source: U.S. Census Bureau, American Community Survey 2014-2018 5-Year Estimates

Age can indicate the potential vulnerability of a structure to certain hazards. For example, Chatham County first entered the National Flood Insurance Program in 1980. Therefore, based on housing age estimates at least 47.0 percent of housing in the County was built before any floodplain development restrictions were required.

1.8.7 Population

According to the U.S. Census Bureau, the County had an estimated population of 287,049 residents in 2018. Table 1.22 provides demographic data from the 2018 ACS 5-Year Estimates.

Table 1.22 – Chatham County Demographic Profile Data, 2018

Demographic	Unincorporated County
Gender/Age	
Male	138,403
Female	148,646
Under 5 Years	18,665
65 Years and Over	41,403
Race/Ethnicity (One Race)	
White	151,228
Black or African American	114,130
American Indian/Alaska Native	778
Asian	7,391
Two or More Races	8,657
Hispanic or Latino[1]	18,007
Education	
High School Graduate or Higher	172,146
Bachelor's Degree or Higher	63,823

Source: U.S. Census Bureau, 2014-2018 American Community Survey 5-Year Estimates
[1]Hispanics may be of any race, so also are included in applicable race categories.

1.8.8 Land Use

Land use data was obtained from the 2016 Update to the Chatham County – Savannah Comprehensive Plan (Comp Plan). The intent of the Comp Plan is to serve as a comprehensive planning document that guides Chatham County's and Savannah's collective growth and development decisions over the next 20 years. The Comp Plan serves both participating communities as a general statement of intent to promote local goals related to economic development, land use, transportation, housing, quality of life and other related topics.

1.8.8.1 Existing Land Use

The County includes a total area of 334,080 acres (522 square miles) as calculated from GIS and obtained from the U.S. Census. Existing land use according to the Chatham County – Savannah Comp Plan, is summarized in Table 1.23.

Table 1.23 – Existing Land Use

Land Use	County-Wide Area (Acres)	Percent of County (%)
Residential – Single Family	45,420	9.6%
Residential – Multi Family	1,811	0.4%
Public / Institutional	10,197	2.2%
Commercial – Office	23,551	5.0%
Commercial – Retail	4,615	1.0%
Trans / Com / Utilities	2,245	0.5%
Agriculture / Forestry	24,987	5.3%
Industry / Light	18,236	3.9%
Industry / Heavy	1,229	0.3%
Recreation - Active	898	0.2%
Greenspace	758	0.2%
Right-of-Way	15,838	3.3%
Tidal Marsh	92,706	19.6%
Open Water	50,448	10.7%
Undeveloped Land / Other	180,548	38.1%
TOTAL	**473,487** [(1)]	**100.0%**

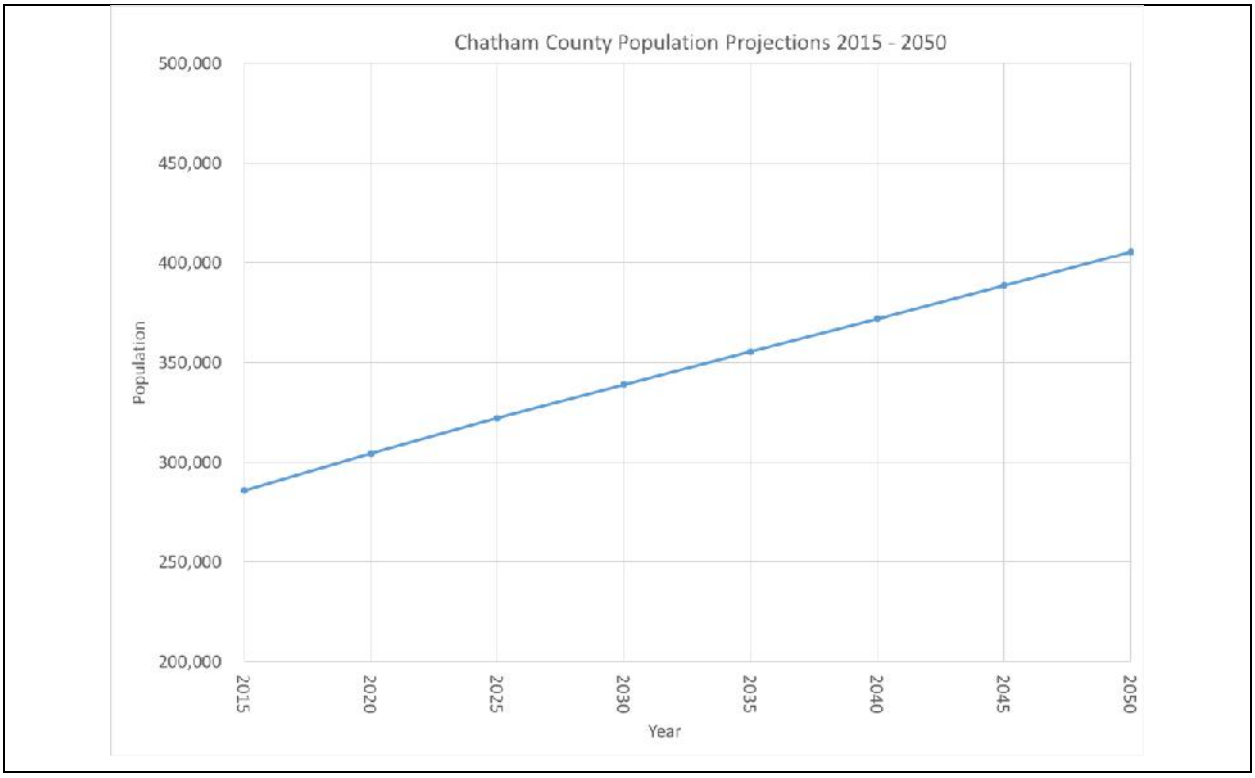
(1) 740 square miles

The Chatham County – Savannah Comprehensive Plan shows the total area for Chatham County to be 740 square miles which is higher than the 3522 square miles used for this report. The difference is likely due to the Comp Plan using an alternate County boundary that extends further east into the ocean and included in the land use categories for Tidal Marsh, Open Water, and/or Undeveloped Land/Other.

1.8.9 Growth and Development Trends

According to the Georgia Governor's Office of Planning and Budget (GOPB), Chatham County is projected to reach a population of 405,573 by 2050, which represents a 38% increase from the 2017 population. The population projections from the GOPB estimate the annual growth for the County to be about 1.1% through 2050.

Figure 1.6 – Population Projections for Chatham County 2013 - 2050



Source: Georgia Governor's Office of Planning and Budget

2 Hazard Identification & 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.
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.

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.

44 CFR Subsection D §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.

This section describes the Hazard Identification and Risk Assessment process for the development of the Chatham County Multi-Jurisdictional Pre-Disaster Hazard Mitigation Plan. It describes how the County met Step 4: Assess the Hazard, and Step 5: Assess the Problem from the 10-step planning process.

Table 2.1 – Section 2 Summary of Updates

2015 Plan Section Number	2020 Plan Section and Description of Changes
Section 2 – Local Hazard Identification and Risk	**Section 2 – Hazard Identification & Risk Assessment**
I. Hazard Identification	2.1 Overview – This section describes the risk assessment process and subsections.
	2.2 Hazard Identification – This section was updated to reflect the 2019 State HMP, updated disaster declaration information and historical occurrence records, and new decisions made by the HMPC during this plan update. Hazards not included in the State plan and not relevant to the planning area were removed from discussion.
II. Hazard Profiles	2.3 Risk Assessment Methodology and Assumptions – This section summarizes of the overall risk assessment methodology. Information on hazard-specific risk assessment methodology and data sources was incorporated into the applicable hazard profiles.
Section 3 – Local Hazard Vulnerability	
I. Overview	
II. Methodology	
III. Explanation of Data Sources	
IV. Asset Inventory	2.4 Asset Inventory – The asset inventory was updated based on 2018 Chatham County parcel data and critical facility lists provided by CEMA.

2015 Plan Section Number	2020 Plan Section and Description of Changes
V. Vulnerability Assessment Results	2.5 Hazard Profiles, Analysis, and Vulnerability – This section integrates updated information on hazard risk and vulnerability, which was presented in the 2015 plan under Chapter 2 and Chapter 3.
VI. Conclusions on Hazard Vulnerability	2.5 Conclusions on Hazard Vulnerability – This section was updated to present risk assessment findings using the Priority Risk Index in order to classify each hazard as either High, Moderate, or Low Risk so that it may be prioritized for mitigation.

2.1 OVERVIEW

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 hazard risk assessment covers all of Chatham County, including the unincorporated County and all incorporated jurisdictions participating in this plan.

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 the potential risk to natural hazards in the county 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:

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

- **Section 2.2**: **Hazard Identification** identifies the natural and human-caused hazards that threaten the planning area.
- **Section 2.3: Risk Assessment Methodology and Assumptions**
- **Section 2.4: Asset Inventory** details the population, buildings, and critical facilities at risk within the planning area.
- **Section 2.5**: **Hazard Profiles, Analysis, and Vulnerability** discusses the threat to the planning area, describes previous occurrences of hazard events and the likelihood of future occurrences, and assesses the planning area's exposure to each hazard profiled; considering assets at risk, critical facilities, and future development trends.
- **Section 2.6: Conclusions on Hazard Risk** summarizes the results of the Priority Risk Index and defines each hazard as a Low, Moderate, or High Risk hazard.

2.2 HAZARD IDENTIFICATION

To identify hazards relevant to the planning area, the HMPC began with a review of the list of hazards identified in the 2019 State Hazard Mitigation Plan and the 2015 Chatham County Multi-Jurisdictional Pre-Disaster Hazard Mitigation Plan as summarized in Table 2.2. The HMPC used these lists to identify a full range of hazards for potential inclusion in this plan update and to ensure consistency across these planning efforts. All hazards on the below list were evaluated for inclusion in this plan update.

Table 2.2 – Full Range of Hazards Evaluated

Hazard	Included in 2019 State HMP?	Included in 2015 Chatham County HMP?
Hurricane Wind	Yes	Yes
Coastal Hazards (Storm Surge & Coastal Flooding)	Yes	Yes (Storm Surge, Sea Level Rise)
Wind	Yes	Yes
Severe Weather (Lightning & Hail)	Yes	Yes
Tornadoes	Yes	Yes
Inland Flooding	Yes	Yes
Severe Winter Weather	Yes	Yes
Drought	Yes	Yes
Wildfire	Yes	Yes
Earthquake	Yes	Yes
Geologic Hazards (Sinkhole & Landslide)	Yes	No
Dam Failures	Yes	Yes
Extreme Heat	Yes	Yes
Erosion	No	Yes
Hazardous Materials Incident	No	Yes
Terror Threat	No	Yes

The HMPC evaluated the above list of hazards using existing hazard data, past disaster declarations, local knowledge, and information from the 2019 State Plan and the 2015 Chatham County Plan to determine 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.

One key resource in this effort was the National Oceanic and Atmospheric Administration's National Center for Environmental Information (NCEI), which has been tracking various types of weather events since 1950. Their Storm Events Database contains an archive by county of destructive storm or weather data and information which includes local, intense and damaging events. NCEI receives storm data from the National Weather Service (NWS), which compiles their information from a variety of sources, including but not limited to: county, state and federal emergency management officials; local law enforcement officials; SkyWarn spotters; NWS damage surveys; newspaper clipping services; the insurance industry and the general public, among others. Reports can include multiple events within one episode. Records for Chatham County are listed by zone: Coastal Chatham County and Inland Chatham County. For the purpose of summarizing storm impacts in this plan, records have been combined if listed for both zones, and events on the same date have been combined. The NCEI database contains 419 records of severe weather events that occurred in Chatham County in the 20-year period from 1999 through 2018. Table 2.3 summarizes these events.

Table 2.3 – NCEI & Committee Member Severe Weather Data for Chatham County, 1999 – 2018

Type	# of Events	Property Damage	Crop Damage	Deaths	Injuries
Coastal Flood	19	$40,000	$0	0	0
Drought	22	$0	$0	0	0
Excessive Heat	7	$0	$0	0	0
Flash Flood	32	$7,355,000	$0	0	0

Type	# of Events	Property Damage	Crop Damage	Deaths	Injuries
Flood	1	$2,000	$0	0	0
Frost/Freeze	1	$0	$0	0	0
Funnel Cloud	5	$0	$0	0	0
Hail	61	$10,500	$0	0	0
Heat	5	$0	$0	0	0
Heavy Rain	2	$0	$0	0	0
Heavy Snow	2	$0	$0	0	0
High Surf	6	$17,500	$0	0	0
High Wind	6	$31,000	$0	0	0
Hurricane	3[1]	$5,000,000	$0	1[2]	0
Ice Storm	1	$0	$0	0	0
Lightning	24	$2,360,500	$0	1	13
Rip Current	25	$1,000	$0	5	12
Storm Surge/Tide	3	$5,000,000	$0	0	0
Strong Wind	11	$55,500	$0	0	0
Thunderstorm Wind	158	$686,200	$1,000	1	5
Tornado	12	$3,600,000	$0	0	5
Tropical Storm	12[1]	$14,000	$0	0	0
Waterspout	1	$0	$0	0	0
Total:	**419**	**$24,173,200**	**$1,000**	**8**	**35**

Source: National Center for Environmental Information Events Database, July 2019 edited by Chatham County HMPC
Note: Losses reflect totals for all impacted areas for each event.
[1]Hurricane Matthew and Hurricane Irma are reported as Tropical Storms by NCEI but were reclassified by the HMPC to account for their having impacted the planning area as hurricanes.
[2]CEMA reported one death as a result of Hurricane Matthew, which was not included in NCEI records.

Due to delays in the review of this plan, additional data that has since become available was requested by GEMA in order to document more current hazard events. Table 2.4 summarizes all storm events reported by NCEI between January 2019 and July 2020.

Table 2.4 – NCEI Severe Weather Data for Chatham County, January 2019 – July 2020

Type	# of Events	Property Damage	Crop Damage	Deaths	Injuries
Coastal Flood	3	$0	$0	0	0
Hail	1	$0	$0	0	0
Lightning	5	$2,095,000	$0	0	0
Rip Current	3	$0	$0	0	0
Strong Wind	7	$9,750	$0	0	0
Thunderstorm Wind	44	$13,350	$0	0	0
Tornado	1	$0	$0	0	1
Tropical Depression	1	$0	$0	0	0
Tropical Storm	1	$0	$0	0	0
Total:	**66**	**$2,118,100**	**$0**	**0**	**1**

Source: National Center for Environmental Information Events Database

The HMPC also researched past events that resulted in a federal and/or state emergency or disaster declaration for Chatham County in order to identify significant 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. If the disaster is 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.

Records of designated counties for FEMA major disaster declarations start in 1964. Since then, Chatham County has been designated in five major disaster declarations, as detailed in Table 2.5, and eight emergency declarations, as detailed in Table 2.6.

Table 2.5 – FEMA Major Disaster Declarations, Chatham County

Disaster #	Dec. Date	Incident Type	Event Title	Individual Assistance Applications Approved	Total Individual and Households Program Dollars Approved	Total Public Assistance Grant Dollars Obligated
4338	9/15/2017	Hurricane	Hurricane Irma	9,371	$13,643,351.67	$119,793,063.20
4284	10/8/2016	Hurricane	Hurricane Matthew	2,093	$6,611,177.87	$95,732,065.50
1209	3/11/1998	Severe Storm(S)	Severe Storms and Flooding	--	--	--
1042	10/19/1994	Severe Storm(S)	Heavy Rains, Tornados, Flooding, High Winds	--	--	--
536	6/2/1977	Freezing	Shrimp Loss Due to Cold Weather	--	--	--

Source: FEMA Disaster Declarations Summary, October18, 2019
Note: Number of applications approved, and all dollar values represent totals for all counties included in disaster declaration.

Table 2.6 – FEMA Emergency Declarations, Chatham County

Disaster #	Dec. Date	Incident Type	Event Title/Description
3422	9/1/2019	Hurricane	Hurricane Dorian
3406	10/10/2018	Hurricane	Hurricane Michael
3387	9/8/2017	Hurricane	Hurricane Irma
3379	10/6/2016	Hurricane	Hurricane Matthew
3218	9/5/2005	Hurricane	Hurricane Katrina Evacuation
3144	9/14/1999	Hurricane	Hurricane Floyd
3097	3/15/1993	Snow	Severe Snowfall, Winter Storm
3044	7/20/1977	Drought	Drought

Using the above information and additional discussion, the HMPC evaluated each hazard's significance to the planning area in order to decide which hazards to include in this plan update. Some hazard titles have been updated either to better encompass the full scope of a hazard or to assess closely related hazards together. Table 2.7 summaries the determination made for each hazard.

Table 2.7 – Hazard Evaluation Results

Hazard	Included in this plan update?	Explanation for Decision
Natural Hazards		
Hurricane	Yes	The 2015 Chatham County plan and 2019 State plan addressed this hazard. The county has received two disaster declarations for hurricanes. The hazard profile will also assess storm surge impacts of tropical cyclones.
Sea Level Rise	Yes	NOAA's Sea Level Rise Viewer shows potential inundation in Chatham County due to sea level rise. The 2015 Chatham County plan profiled this hazard and found it a moderate risk hazard with a possibility for 4-5 feet of sea level rise over the next 100 years.
Severe Weather (Wind, Lightning, Hail)	Yes	The 2015 Chatham County plan profiled these hazards individually and found them to be high and moderate risk hazards. NCEI records 522 related events in the past 20 years.
Tornado	Yes	The 2015 Chatham County plan found tornado a high risk hazard. NCEI records 12 tornados causing $3.6m in damages in the past 20 years.

Hazard	Included in this plan update?	Explanation for Decision
Flood (Inland Flooding and Coastal Flood)	Yes	The 2015 Chatham County plan rated flood the highest risk hazard for the planning area. Over $7.3m in reported damages over the last 20 years are attributable to flood.
Severe Winter Weather	Yes	The 2015 Chatham County plan found Winter Storm and Freeze to be a moderate risk hazard causing an estimated $90,223 in annualized losses.
Drought	Yes	The 2015 Chatham County plan found drought to be a moderate risk hazard.
Wildfire	Yes	Wildfire was address in the 2015 Chatham County plan and the State plan. The 2014 Community Wildfire Protection Plan indicates the county experiences an average of 73 fires annually.
Earthquake*	Yes	The 2015 Chatham County plan found earthquake to be a low priority hazard, however due to the county's proximity to the Charleston Fault Zone, earthquake warrants continued assessment.
Geologic Hazards (Sinkhole & Landslide)	No	The 2015 Chatham County plan did not address this hazard due to low incidence, low vulnerability, and no known recorded past events.
Dam Failure	Yes	The 2015 Chatham County plan found dam failure to be a low priority hazard, however it will be carried forward in this risk assessment due to the presence of dams in the planning area.
Extreme Heat	Yes	The 2015 Chatham County plan found extreme heat to be a low priority hazard, however it will be carried forward in this risk assessment due to potential for increased probability.
Erosion	Yes	The 2015 Chatham County plan found erosion to be a low priority hazard, however it will be carried forward in this risk assessment given frequency and potential for long-term consequences on the planning area's risk to coastal hazards.
Technological and Human-Caused Hazards & Threats		
Hazardous Materials Incident	Yes	There are many fixed facility sites and transportation routes with hazardous materials in the planning area. The 2015 Chatham County plan addressed this hazard and found it highly likely in the planning area.
Terror Threat	Yes	The 2015 Chatham County plan addressed this hazard and the HMPC determined it should continue to be addressed due to the presence of several high profile / significant sites that could be targeted.

*These hazards were found to be low-risk hazards through the risk assessment process; therefore, they are not prioritized for mitigation actions.

2.3 RISK ASSESSMENT METHODOLOGY AND ASSUMPTIONS

The Disaster Mitigation Act of 2000 requires that the HMPC evaluate the risks associated with each of the hazards identified in the planning process. Each hazard was evaluated to determine its probability of future occurrence and potential impact. A vulnerability assessment was conducted for each hazard using either quantitative or qualitative methods depending on the available data, to determine its potential to cause significant human and/or monetary losses. A consequence analysis was also completed for each hazard.

Each hazard is profiled in the following format:

Hazard Description

This section provides a description of the hazard, including discussion of its speed of onset and duration, as well as any secondary effects followed by details specific to the Chatham County planning area.

Location

This section includes information on the hazard's physical extent, with mapped boundaries where applicable.

Extent

This section includes information on the hazard extent in terms of magnitude, describe how the severity of the hazard can be measured. Where available, the most severe event on record used as a frame of reference.

Past Occurrences

This section contains information on historical events, including the location and consequences of all past events on record within or near the Chatham County planning area. Where possible, this plan uses a consistent 20-year period.

Probability 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 according to historical occurrence (e.g. 10 winter storm events over a 30-year period equates to a 33 percent chance of experiencing a severe winter storm in any given year). The likelihood of future occurrences is categorized into one of the classifications as follows:

- ***Highly Likely*** – Near or more than 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)
- ***Possible*** – 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)

Climate Change

Where applicable, this section discusses how climate change may or may not influence the risk posed by the hazard on the planning area in the future.

Vulnerability Assessment

This section quantifies, to the extent feasible using best available data, assets at risk to natural hazards and potential loss estimates. People, properties and critical facilities, and environmental assets that are vulnerable to the hazard are identified. Future development is also discussed in this section, including how exposure to the hazard may change in the future or how development may affect hazard risk.

The vulnerability assessments followed the methodology described in the FEMA publication Understanding Your Risks—Identifying Hazards and Estimating Losses (August 2001). The vulnerability assessment first describes the total vulnerability and values at risk and then discusses vulnerability by hazard. Data used to support this assessment included the following:

- Geographic Information System (GIS) datasets, including building footprints, topography, aerial photography, and transportation layers;
- Hazard layer GIS datasets from state and federal agencies;

- Written descriptions of inventory and risks provided by the 2019 Georgia Hazard Mitigation Strategy;
- Written descriptions of inventory and risks provided by the 2015 Chatham County Multi-Jurisdictional Pre-Disaster Hazard Mitigation Plan;
- Exposure and vulnerability estimates derived using local parcel and building data; and
- Crop insurance claims by cause from USDA's Risk Management Agency.

Two distinct risk assessment methodologies were used in the formation of the vulnerability assessment. The first consists of a quantitative analysis that relies upon best available data and technology, while the second approach consists of a qualitative analysis that relies on local knowledge and rational decision making. The quantitative analysis involved the use of FEMA's Hazus-MH, a nationally applicable standardized set of models for estimating potential losses from earthquakes, floods, and hurricanes. Hazus uses a statistical approach and mathematical modeling of risk to predict a hazard's frequency of occurrence and estimated impacts based on recorded or historic damage information. The Hazus risk assessment methodology is parametric, in that distinct hazard and inventory parameters—such as wind speed and building type—were modeled using the Hazus software to determine the impact on the built environment. Chatham County's GIS-based risk assessment was completed using data collected from local, regional and national sources that included Chatham County, GEMA, and FEMA.

In addition to this risk assessment, GEMA's Hazus report for Chatham County, provided in Appendix E, includes information on hurricanes, flooding, and tornadoes.

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 facilities, historic structures, and valued natural resources (e.g., an identified wetland or endangered species habitat). Together, this information conveys the vulnerability of that area to that hazard.

Priority Risk Index

The conclusions drawn from the hazard profiling and vulnerability assessment process can be used to prioritize all potential hazards to the Chatham County planning area. The Priority Risk Index (PRI) was applied for this purpose because it provides a standardized numerical value so that hazards can be compared against one another (the higher the PRI value, the greater the hazard risk). PRI values are obtained by assigning varying degrees of risk to five categories for each hazard (probability, impact, spatial extent, warning time, and duration). Each degree of risk was assigned a value (1 to 4) and a weighting factor as summarized in Table 2.8.

Table 2.8 – Priority Risk Index

RISK ASSESSMENT CATEGORY	LEVEL	DEGREE OF RISK CRITERIA	INDEX	WEIGHT
PROBABILITY What is the likelihood of a hazard event occurring in a given year?	**UNLIKELY**	LESS THAN 1% ANNUAL PROBABILITY	**1**	**30%**
	POSSIBLE	BETWEEN 1 & 10% ANNUAL PROBABILITY	**2**	
	LIKELY	BETWEEN 10 &100% ANNUAL PROBABILITY	**3**	
	HIGHLY LIKELY	100% ANNUAL PROBABILTY	**4**	
IMPACT In terms of injuries, damage, or death, would you anticipate impacts to be minor, limited, critical, or catastrophic when a significant hazard event occurs?	**MINOR**	VERY FEW INJURIES, IF ANY. ONLY MINOR PROPERTY DAMAGE & MINIMAL DISRUPTION ON QUALITY OF LIFE. TEMPORARY SHUTDOWN OF CRITICAL FACILITIES.	**1**	**30%**
	LIMITED	MINOR INJURIES ONLY. MORE THAN 10% OF PROPERTY IN AFFECTED AREA DAMAGED OR DESTROYED. COMPLETE SHUTDOWN OF CRITICAL FACILITIES FOR > 1 DAY	**2**	
	CRITICAL	MULTIPLE DEATHS/INJURIES POSSIBLE. MORE THAN 25% OF PROPERTY IN AFFECTED AREA DAMAGED OR DESTROYED. COMPLETE SHUTDOWN OF CRITICAL FACILITIES FOR > 1 WEEK.	**3**	
	CATASTROPHIC	HIGH NUMBER OF DEATHS/INJURIES POSSIBLE. MORE THAN 50% OF PROPERTY IN AFFECTED AREA DAMAGED OR DESTROYED. COMPLETE SHUTDOWN OF CRITICAL FACILITIES > 30 DAYS.	**4**	
SPATIAL EXTENT How large of an area could be impacted by a hazard event? Are impacts localized or regional?	**NEGLIGIBLE**	LESS THAN 1% OF AREA AFFECTED	**1**	**20%**
	SMALL	BETWEEN 1 & 10% OF AREA AFFECTED	**2**	
	MODERATE	BETWEEN 10 & 50% OF AREA AFFECTED	**3**	
	LARGE	BETWEEN 50 & 100% OF AREA AFFECTED	**4**	
WARNING TIME Is there usually some lead time associated with the hazard event? Have warning measures been implemented?	**MORE THAN 24 HRS**	SELF DEFINED	**1**	**10%**
	12 TO 24 HRS	SELF DEFINED	**2**	
	6 TO 12 HRS	SELF DEFINED	**3**	
	LESS THAN 6 HRS	SELF DEFINED	**4**	
DURATION How long does the hazard event usually last?	**LESS THAN 6 HRS**	SELF DEFINED	**1**	**10%**
	LESS THAN 24 HRS	SELF DEFINED	**2**	
	LESS THAN 1 WEEK	SELF DEFINED	**3**	
	MORE THAN 1 WEEK	SELF DEFINED	**4**	

The sum of all five risk assessment categories equals the final PRI value, demonstrated in the equation below (the highest possible PRI value is 4.0).

PRI = [(PROBABILITY x .30) + (IMPACT x .30) + (SPATIAL EXTENT x .20) + (WARNING TIME x .10) + (DURATION x .10)]

The purpose of the PRI is to categorize and prioritize all potential hazards for the Chatham County planning area as high, moderate, or low risk. The summary hazard classifications generated through the use of the PRI allows for the prioritization of those high and moderate hazard risks for mitigation planning purposes. Mitigation actions are not developed for hazards identified as low risk through this process.

PRI ratings by category for the planning area as a whole are provided throughout each hazard profile. Ratings specific to each jurisdiction are provided at the end of each hazard profile. The results of the risk assessment and overall PRI scoring are provided in Section 2.6 Conclusions on Hazard Risk.

2.4 ASSET INVENTORY

An inventory of assets within Chatham County was compiled to identify those structures potentially at risk to the identified hazards and assess the level of vulnerability. Assets include elements such as buildings, property, business/industry goods, and civil infrastructure. Parcel, building footprint, foundation type, and building value data were provided by Chatham County. By identifying the type and number of assets that exist and where they are in relation to known hazard areas, the relative risk and vulnerability for such assets can be assessed.

2.4.1 Building Exposure

The properties identified to be at risk include all improved properties in Chatham County and its incorporated jurisdictions according to parcel and building footprint data provided by Chatham County. The information is provided in Table 2.9. This risk information is detailed by flood zone in in Section 2.5.6. For non-spatially defined hazards, the estimates below represent the total building exposure to the hazard.

Table 2.9 – Chatham County Building Exposure by Jurisdiction and Occupancy

Occupancy	Estimated Building Count	Building Value	Estimated Content Value	Total Value
Bloomingdale	**1,542**	**$129,229,569.30**	**$99,039,804.30**	**$228,269,373.60**
Commercial	147	$28,996,443.30	$28,996,443.30	$57,992,886.60
Industrial	20	$19,926,798.00	$29,890,197.00	$49,816,995.00
Residential	1,375	$80,306,328.00	$40,153,164.00	$120,459,492.00
Garden City	**4,933**	**$522,878,298.30**	**$549,883,394.45**	**$1,072,761,692.75**
Commercial	1,888	$196,834,162.00	$196,834,162.00	$393,668,324.00
Industrial	390	$190,027,164.30	$285,040,746.45	$475,067,910.75
Residential	2,655	$136,016,972.00	$68,008,486.00	$204,025,458.00
Pooler	**8,495**	**$2,200,450,863.50**	**$1,836,598,260.15**	**$4,037,049,123.65**
Commercial	1,071	$669,256,503.60	$669,256,503.60	$1,338,513,007.20
Industrial	210	$401,744,576.60	$602,616,864.90	$1,004,361,441.50
Residential	7,214	$1,129,449,783.30	$564,724,891.65	$1,694,174,674.95
Port Wentworth	**3,925**	**$639,281,788.30**	**$547,881,113.95**	**$1,187,162,902.25**
Agricultural	1	$104,500.00	$104,500.00	$209,000.00
Commercial	265	$175,545,873.00	$175,545,873.00	$351,091,746.00
Industrial	76	$140,415,033.30	$210,622,549.95	$351,037,583.25
Residential	3,583	$323,216,382.00	$161,608,191.00	$484,824,573.00
Savannah	**50,686**	**$10,608,744,248.40**	**$9,249,853,644.05**	**$19,858,597,892.45**
Agricultural	4	$3,600.00	$3,600.00	$7,200.00
Commercial	7,618	$5,038,642,795.90	$5,038,642,795.90	$10,077,285,591.80
Industrial	1,248	$1,426,158,321.90	$2,139,237,482.85	$3,565,395,804.75
Residential	41,816	$4,143,939,530.60	$2,071,969,765.30	$6,215,909,295.90

Occupancy	Estimated Building Count	Building Value	Estimated Content Value	Total Value
Thunderbolt	**1,135**	**$140,553,861.00**	**$102,391,283.00**	**$242,945,144.00**
Commercial	281	$56,094,105.00	$56,094,105.00	$112,188,210.00
Industrial	33	$4,067,300.00	$6,100,950.00	$10,168,250.00
Residential	821	$80,392,456.00	$40,196,228.00	$120,588,684.00
Tybee Island	**2,498**	**$572,811,201.30**	**$312,897,504.30**	**$885,708,705.60**
Commercial	226	$52,369,025.30	$52,369,025.30	$104,738,050.60
Industrial	4	$307,391.00	$461,086.50	$768,477.50
Residential	2,268	$520,134,785.00	$260,067,392.50	$780,202,177.50
Unincorporated Chatham County	**37,102**	**$7,708,255,010.60**	**$5,441,361,952.95**	**$13,149,616,963.55**
Commercial	3,240	$1,075,268,425.30	$1,075,268,425.30	$2,150,536,850.60
Industrial	1,519	$1,049,600,235.00	$1,574,400,352.50	$2,624,000,587.50
Residential	32,343	$5,583,386,350.30	$2,791,693,175.15	$8,375,079,525.45
Vernonburg	**107**	**$17,037,567.00**	**$8,518,783.50**	**$25,556,350.50**
Residential	107	$17,037,567.00	$8,518,783.50	$25,556,350.50
Countywide Total	**110,423**	**$22,539,242,407.70**	**$18,148,425,740.65**	**$40,687,668,148.35**
Agricultural	5	$108,100.00	$108,100.00	$216,200.00
Commercial	14,736	$7,293,007,333.40	$7,293,007,333.40	$14,586,014,666.80
Industrial	3,500	$3,232,246,820.10	$4,848,370,230.15	$8,080,617,050.25
Residential	92,182	$12,013,880,154.20	$6,006,940,077.10	$18,020,820,231.30

Source: Chatham County parcel and building footprint data, 2019

Note: Content value estimations are generally based on the FEMA Hazus methodology of estimating value as a percent of improved structure values by property type. The residential property type assumes a content replacement value equal to 50% of the building value. Agricultural and commercial property types assume a content replacement value equal to 100% of the building value. The industrial property type assumes a content replacement value equal to 150% of the building value.

2.4.2 Critical Facilities and Infrastructure Exposure

Of significant concern with respect to any disaster event is the location of critical facilities and infrastructure in the planning area. Critical facilities are often defined as those essential services and lifelines that, if damaged during an emergency event, would result in severe consequences to public health, safety, and welfare. Critical facilities and infrastructure assessed in this risk assessment were identified by Chatham County Emergency Management and verified by the HMPC. These facilities and infrastructure are listed in each community's annex. Additional data on critical facilities is compiled and managed by the Georgia Mitigation Information System (GMIS). A sample GMIS report on critical facility risk is provided in Appendix E.

2.5 HAZARD PROFILES, ANALYSIS, AND VULNERABILITY

2.5.1 Dam Failure

Hazard Background

A dam is a barrier constructed across a watercourse that stores, controls, or diverts water. Dams are usually constructed of earth, rock, concrete, or mine tailings. 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, manmade events, or a combination. Due to the lack of advance warning, failures resulting from natural events, such as earthquakes or landslides, may be particularly severe. Prolonged rainfall and subsequent flooding are 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 causes 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 also 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; or
- 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. Dam failures are generally catastrophic if the structure is breached or significantly damaged. 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.

Dam failure can occur with little warning. Intense storms may produce a flood in a few hours or even minutes for upstream locations. Flash floods occur within six hours of the beginning of heavy rainfall, and dam failure may occur within hours of the first signs of breaching. Other failures and breaches can take much longer to occur, from days to weeks, as a result of debris jams or the accumulation of melting snow.

Dam failures are of particular concern because the failure of a large dam has the potential to cause more death and destruction than the failure of any other manmade structure. This is because of the destructive power of the flood wave that would be released by the sudden collapse of a large dam. Dams are innately hazardous structures. Failure or poor operation can result in the release of the reservoir contents—this can include water, mine wastes, or agricultural refuse–causing negative impacts upstream or downstream or at locations far from the dam. Negative impacts of primary concern are loss of human life, property damage, lifeline disruption, and environmental damage.

Warning Time: 4 – Less than 6 hours

Duration: 3 – Less than 1 week

Location

The Georgia Safe Dams Program, an entity of the Georgia Department of Natura Resources' Environmental Protection Division, provides an inventory of all the dams in the state. Table 2.10 provides details for three dams listed in the inventory as of April 2019 that are located within Chatham County as well as one dam reported by the HMPC that was recently taken over by City of Savannah from the U.S. Army Corps of Engineers. Figure 2.1 on the following page reflects the location of these dams within the County. None of these dams are considered a high hazard. Note that the Ottowa Farms Lake Dam is currently only proposed. In addition to these dams, the Army Corps of Engineers' National Inventory of Dams (NID) database identified two federally owned and operated dams located off stream and operated for fish and wildlife ponds, detailed in Table 2.11 and shown in Figure 2.2.

Table 2.10 – Georgia Dam Inventory Listings for Chatham County, GA

Dam Name	NIDID	Owner	Height (Ft.)	NID Storage (acre-feet)	Primary Purpose	Hazard Category
Lake Mayer Dam	GA00927	Local Government	9	382	Recreation	II
Forest City Gun Club Lake Dam	GA00928	Private	10	273	Recreation	II
Proposed Ottowa Farms Lake Dam	GA04907	Private	8.5	144	Fire Protection, Stock, or Small Fish Pond	II
Raw Water Storage Impoundment	n/a	City of Savannah	32	298	Fresh Water Storage	II

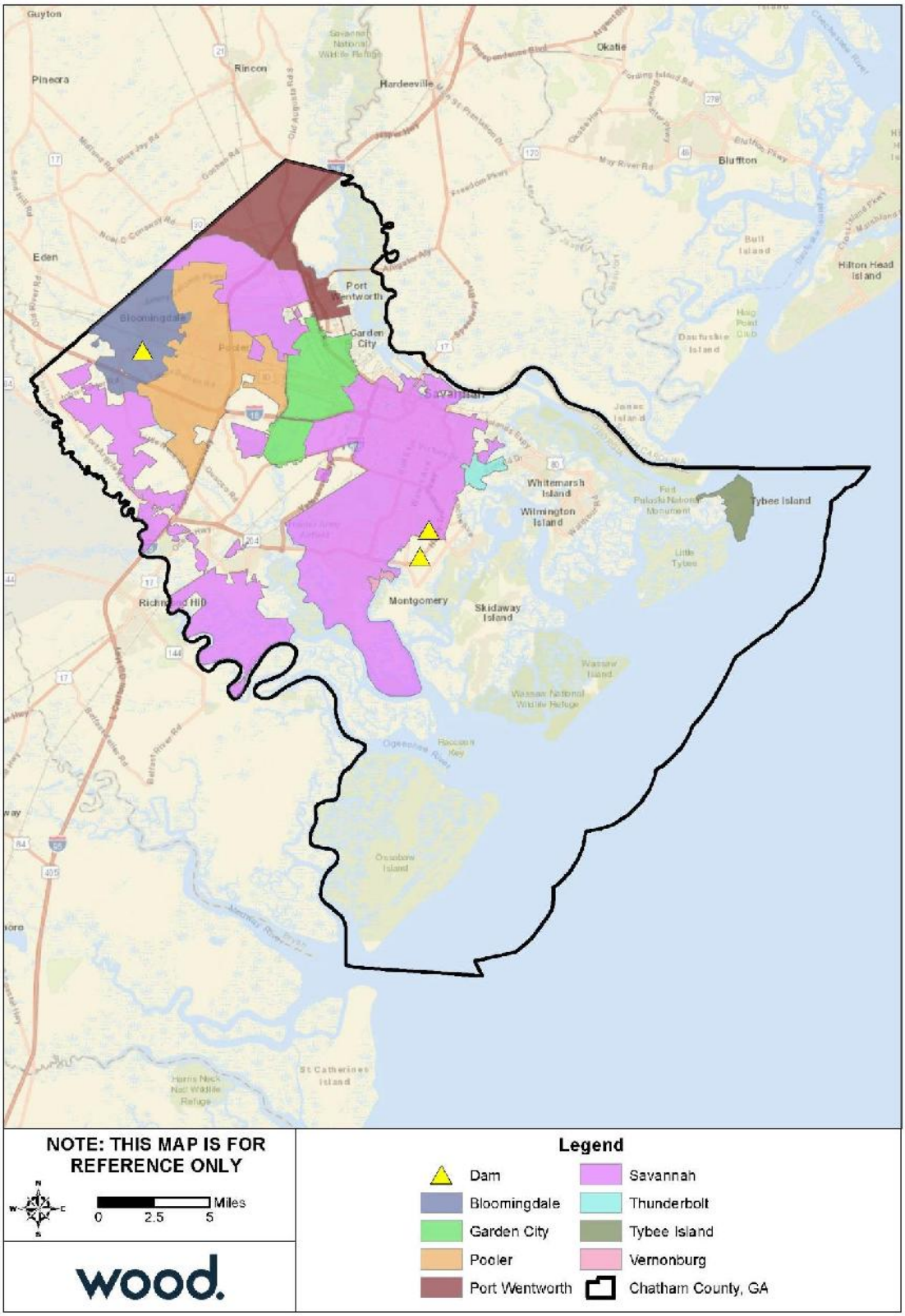
Source: Georgia Dam Inventory, 2019; HMPC input

Table 2.11 – National Inventory of Dams Additional Listings for Chatham County, GA

Dam Name	NIDID	Owner	Height (Ft.)	NID Storage (acre-feet)	Primary Purpose	Hazard Category
Pond 29	GA82309	Federal	19	71	Recreation, Fish & Wildlife Pond	Low
Pond 24	GA82208	Federal	26	45	Recreation, Fish & Wildlife Pond	Low

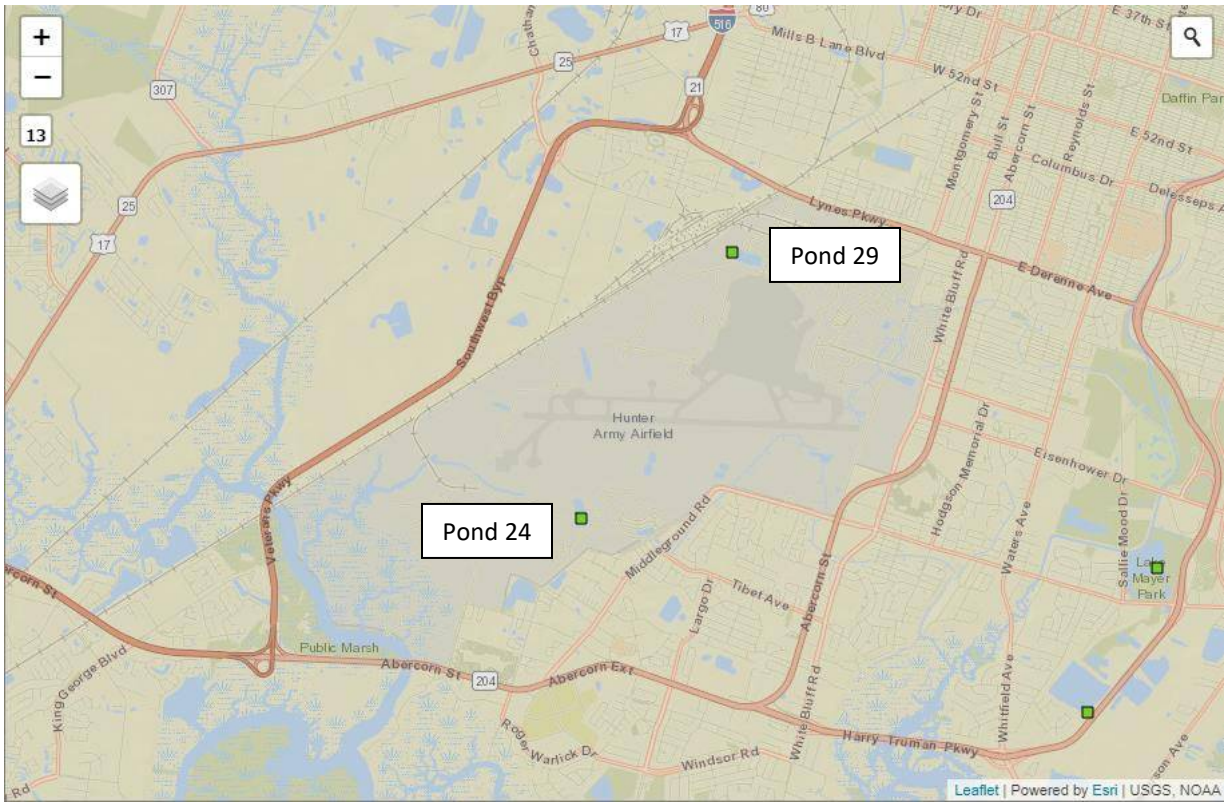
Source: National Inventory of Dams, July 2017

Figure 2.1 – Dam Locations in Chatham County



Source: Georgia Safe Dams Program, April 2019

Figure 2.2 – Off-Stream Federal Dams Identified by National Inventory of Dams



Source: National Inventory of Dams

Extent

Each state has definitions and methods to determine the Hazard Potential of a dam. In Georgia, dams are recognized by the state if they are 25 feet or more in height or impound 100 acre-feet or more. The height of a dam is from the highest point on the crest of the dam to the lowest point on the downstream toe, and the storage capacity is the volume impounded at the elevation of the highest point on the crest of the dam. A dam is regulated only if it is deemed that its failure would result in loss of human life.

Georgia Safe Dams Program engineers determine the "hazard potential" of a dam based on the consequences of failure, meaning the probable damage in terms of loss of human life that would occur if the structure failed. Dams are assigned one of two categories based on their hazard potential:

1. Category II (Low Hazard) includes dams located where failure will not cause loss of human life. Situations constituting probably loss of life are situations that involve frequently occupied structures or facilities, including, but not limited to, residences, commercial and manufacturing facilities, schools, and churches.
2. Category I (High Hazard) includes dams located where failure will likely cause loss of human life.

Category I dams are then further classified by their size with corresponding minimum spillway design requirements expressed in terms of probable maximum precipitation (PMP), as follows:

- Small: 25% PMP
- Medium: 33.3% PMP
- Large: 50% PMP
- Very Large: 100% PMP

Category I dams are assessed bi-annually by Georgia Environmental Protection Division staff and quarterly by their owners to ensure safety and compliance with regulations. Category II dams are reevaluated every 5 years for any hazard potential. The Safe Dams Program notes that there is a significant backlog in work which means many Category II and proposed dams throughout the state need further study. Given the lack of high hazard dams in the planning area, potential impact is considered limited. It is possible that dams in the planning area present greater risk since they were last evaluated due to downstream development and increased exposure, but without a reevaluation of these dams it is difficult to draw any conclusions.

Impact: 2 – Limited

Spatial Extent: 1 – Negligible

Historical Occurrences

There are no records of historical dam failures occurrences in or affecting the planning area.

Probability of Future Occurrence

There are three low hazard dams within Chatham County that could impact the County, but a flooding hazard from future dam failure is unlikely. However, regular monitoring is still necessary to prevent these events from occurring. With heavy rain events becoming more frequent and intense, conditions conducive to dam failure may occur more frequently as well.

Probability: 1 – Unlikely

Climate Change

Studies have been conducted to investigate the impact of climate change scenarios on dam safety. Climate change impacts on dam failure will most likely be those related to changes in precipitation and flood likelihood. Climate change projections suggest that precipitation may increase and occur in more extreme events, which may increase risk of flooding, putting stress on dams and increasing likelihood of dam failure. The safety of dams for the future climate can be based on an evaluation of changes in design floods and the freeboard available to accommodate an increase in flood levels. The results from the studies indicate that the design floods with the corresponding outflow floods and flood water levels will increase in the future, and this increase will affect the safety of the dams in the future. Studies concluded that the total hydrological failure probability of a dam will increase in the future climate and that the extent and depth of flood waters will increase by the future dam break scenario.

Vulnerability Assessment

Methodologies and Assumptions

No data was available on dam inundation areas in order to estimate potential losses that could result from dam failure. Therefore, this vulnerability assessment provides a qualitative assessment of the potential impacts of dam failure.

People

A person's immediate vulnerability to a dam failure is directly associated with the person's distance downstream of the dam as well as proximity to the stream carrying the floodwater from the failure. For dams that have an Emergency Action Plan (EAP), the vulnerability of loss of life for persons in their homes or on their property may be mitigated by following the EAP evacuation procedures; however, the displaced persons may still incur sheltering costs. For persons located on the river (e.g. for recreation) the vulnerability of loss of life is significant.

People are also vulnerable to the loss of the uses of the lake upstream of a dam following failure. Several uses are minor, such as aesthetics or recreational use. However, some lakes serve as drinking water supplies and their loss could disrupt the drinking water supply and present a public health problem.

There are no high hazard dams in or immediately upstream of the planning area, therefore loss of life would not be expected even in the unlikely event of a failure.

Property

Given the current dam inventory and historic data, a dam breach is unlikely in the future. However, regular monitoring can help mitigate or prevent failures if appropriate actions are taken when it is determined a failure may be likely.

Vulnerability of the built environment includes damage to the dam itself and any man-made feature located within the inundation area caused by the dam failure. A detailed assessment of exposure to dam failure could not be completed because no data was available on dam inundation areas.

Downstream of the dam, vulnerability includes potential damage to homes, personal property, commercial buildings and property, and government owned buildings and property; destruction of bridge or culvert crossings; weakening of bridge supports through scour; and damage or destruction of public or private infrastructure that cross the stream such as water and sewer lines, gas lines and power lines. Water dependent structures on the lake upstream of the dam, such as docks/piers, floating structures or water intake structures, may be damaged by the rapid reduction in water level during the failure.

As development occurs downstream of a Category II dam, the overall exposure to dam failure may result in a need to increase the rating of that dam to a Category I, which would require more stringent maintenance and reporting criteria. However, given that Category II dams are only inspected every 5 years and that there is a delay between development occurring and a Category change being made, it is possible that some Category I dams are currently unrecognized as such and that actual exposure to high hazard dam failure has increased. Future development could continue this trend. In both cases, risk is greater during the period where exposure has increased but additional reporting and maintenance criteria have not been enacted.

Environment

Aquatic species within the lake will either be displaced or destroyed. The velocity of the flood wave will likely destroy riparian and instream vegetation and destroy wetland function. The flood wave will like cause erosion within and adjacent to the stream. Deposition of eroded deposits may choke instream habitat or disrupt riparian areas. Sediments within the lake bottom and any low oxygen water from within the lake will be dispersed, potentially causing fish kills or releasing heavy metals found in the lake sediment layers.

Consequence Analysis

Table 2.12 summarizes the potential negative consequences of dam failure.

Table 2.12 – Consequence Analysis – Dam Failure

Category	Consequences
Public	Localized impact expected to be severe for inundation area and moderate to light for other adversely affected areas.
Responders	Localized impact expected to limit damage to personnel in the inundation area at the time of the incident.

Category	Consequences
Continuity of Operations (including Continued Delivery of Services)	Damage to facilities/personnel in the area of the incident may require temporary relocation of some operations. Localized disruption of roads and/or utilities may postpone delivery of some services. Regulatory waivers may be needed locally. Fulfillment of some contracts may be difficult. Impact may reduce deliveries.
Property, Facilities and Infrastructure	Localized impact to facilities and infrastructure in the inundation area of the incident. Some severe damage possible.
Environment	Localized impact expected to be severe for inundation area and moderate to light for other adversely affected areas. Consequences include erosion, water quality degradation, wildlife displacement or destruction, and habitat destruction.
Economic Condition of the Jurisdiction	Local economy and finances adversely affected, possibly for an extended period of time, depending on damage and length of investigation.
Public Confidence in the Jurisdiction's Governance	Localized impact expected to primarily adversely affect only the dam owner and local entities.

Hazard Summary by Jurisdiction

The following table summarizes dam failure hazard risk by jurisdiction. Warning time and duration are inherent to the hazard and remain constant across jurisdictions. Spatial extent of any dam failure will be negligible relative to the planning area. Jurisdictions with dams within their boundaries were assigned a probability rating of possible and an impact score of limited. Jurisdictions with no high hazard dams were assigned a probability rating of unlikely and an impact rating of minor.

Jurisdiction	Probability	Impact	Spatial Extent	Warning Time	Duration	Score	Priority
Chatham County	2	2	1	4	3	2.1	M
Bloomingdale	1	1	1	4	3	1.5	L
Garden City	1	1	1	4	3	1.5	L
Pooler	1	1	1	4	3	1.5	L
Port Wentworth	1	1	1	4	3	1.5	L
Savannah	2	2	1	4	3	2.1	M
Thunderbolt	1	1	1	4	3	1.5	L
Tybee Island	1	1	1	4	3	1.5	L
Vernonburg	1	1	1	4	3	1.5	L

2.5.2 Drought

Hazard Background

Drought is a deficiency in precipitation over an extended period. It is a normal, recurrent feature of climate that occurs in virtually all climate zones. The duration of a drought varies widely. There are cases when drought develops relatively quickly and lasts a very short period of time, exacerbated by extreme heat and/or wind, and there are other cases when drought spans multiple years, or even decades. Studying the paleoclimate record is often helpful in identifying when long-lasting droughts have occurred. Common types of drought are detailed below in Table 2.13.

Table 2.13 – Types of Drought

Type	Details
Meteorological Drought	Meteorological Drought is based on the degree of dryness (rainfall deficit) and the length of the dry period.
Agricultural Drought	Agricultural Drought is based on the impacts to agriculture by factors such as rainfall deficits, soil water deficits, reduced ground water, or reservoir levels needed for irrigation.
Hydrological Drought	Hydrological Drought is based on the impact of rainfall deficits on the water supply such as stream flow, reservoir and lake levels, and ground water table decline.
Socioeconomic Drought	Socioeconomic drought is based on the impact of drought conditions (meteorological, agricultural, or hydrological drought) on supply and demand of some economic goods. Socioeconomic drought occurs when the demand for an economic good exceeds supply as a result of a weather-related deficit in water supply.

The wide variety of disciplines affected by drought, its diverse geographical and temporal distribution, and the many scales drought operates on make it difficult to develop both a definition to describe drought and an index to measure it. Many quantitative measures of drought have been developed in the United States, depending on the discipline affected, the region being considered, and the particular application. Several indices developed by Wayne Palmer, as well as the Standardized Precipitation Index, are useful for describing the many scales of drought.

The U.S. Drought Monitor provides a summary of drought conditions across the United States and Puerto Rico. Often described as a blend of art and science, the Drought Monitor map is updated weekly by combining a variety of data-based drought indices and indicators and local expert input into a single composite drought indicator.

The **Palmer Drought Severity Index** (PDSI) devised in 1965, was the first drought indicator to assess moisture status comprehensively. It uses temperature and precipitation data to calculate water supply and demand, incorporates soil moisture, and is considered most effective for unirrigated cropland. It primarily reflects long-term drought and has been used extensively to initiate drought relief. It is more complex than the Standardized Precipitation Index (SPI) and the Drought Monitor.

The **Standardized Precipitation Index** (SPI) is a way of measuring drought that is different from the Palmer Drought Severity Index (PDSI). Like the PDSI, this index is negative for drought, and positive for wet conditions. But the SPI is a probability index that considers only precipitation, while Palmer's indices are water balance indices that consider water supply (precipitation), demand (evapotranspiration) and loss (runoff).

The State of Georgia adopted Drought Management Rules in 2015 that specify response strategies to varying levels of declared drought. These rules provide the framework to coordinate statewide response to drought.

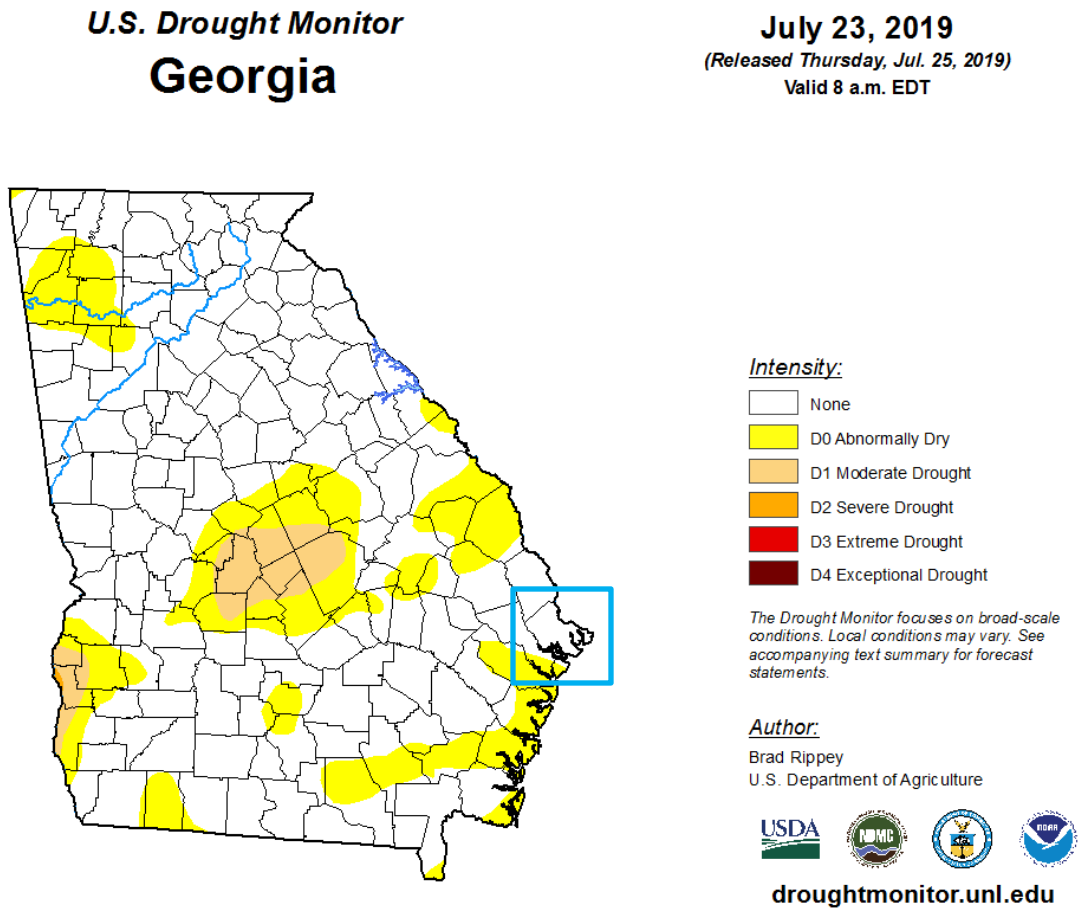
Warning Time: 1 – More than 24 hours

Duration: 4 – More than one week

Location

Drought is a regional hazard that can cover an entire the entire planning area, and in some cases the entire state. According to the PDSI, Eastern Georgia has a low-moderate risk for drought compared to the rest of the United States. Figure 2.3 notes the U.S. Drought Monitor's drought ratings for Georgia as of July 23, 2019; as of that date, Chatham County was experiencing no impacts of drought. However, the figure does nonetheless illustrate the large-scale, regional nature of drought.

Figure 2.3 – US Drought Monitor for Week of July 23, 2019



Source: U.S. Drought Monitor
Note: Blue square indicates location of Chatham County.

Extent

Drought extent can be defined in terms of intensity, using the U.S. Drought Monitor scale. The Drought Monitor Scale measures drought episodes with input from the Palmer Drought Severity Index, the Standardized Precipitation Index, the Keetch-Byram Drought Index, soil moisture indicators, and other inputs as well as information on how drought is affecting people. Figure 2.4 details the classifications used by the U.S. Drought Monitor. A category of D2 (severe) or higher on the U.S. Drought Monitor Scale can typically result in crop or pasture losses, water shortages, and the need to institute water restrictions.

Figure 2.4 – U.S. Drought Monitor Classifications

			Ranges				
Category	Description	Possible Impacts	Palmer Drought Severity Index (PDSI)	CPC Soil Moisture Model (Percentiles)	USGS Weekly Streamflow (Percentiles)	Standardized Precipitation Index (SPI)	Objective Drought Indicator Blends (Percentiles)
D0	Abnormally Dry	Going into drought: ▪ short term dryness slowing planting, growth of crops or pastures Coming out of drought: ▪ some lingering water deficits ▪ pastures or crops not fully recovered	-1.0 to -1.9	21 to 30	21 to 30	-0.5 to -0.7	21 to 30
D1	Moderate Drought	▪ Some damage to crops, pastures ▪ Streams, reservoirs, or wells low, some water shortages developing or imminent ▪ Voluntary water-use restrictions requested	-2.0 to -2.9	11 to 20	11 to 20	-0.8 to -1.2	11 to 20
D2	Severe Drought	▪ Crop or pasture losses likely ▪ Water shortages common ▪ Water restrictions imposed	-3.0 to -3.9	6 to 10	6 to 10	-1.3 to -1.5	6 to 10
D3	Extreme Drought	▪ Major crop/pasture losses ▪ Widespread water shortages or restrictions	-4.0 to -4.9	3 to 5	3 to 5	-1.6 to -1.9	3 to 5
D4	Exceptional Drought	▪ Exceptional and widespread crop/pasture losses ▪ Shortages of water in reservoirs, streams, and wells creating water emergencies	-5.0 or less	0 to 2	0 to 2	-2.0 or less	0 to 2

Source: U.S. Drought Monitor

The most severe drought to impact Chatham County in the past 20 years occurred when the county spent 100 weeks in drought from September 2010 to August 2012. At the drought's peak from June 21, 2011 through August 9, 2011, at least 90 percent of the county was considered in D4 (exceptional) drought.

Impact: 1 – Minor

Spatial Extent: 4 – Large

Historical Occurrences

U.S. Drought Monitor records drought intensity weekly throughout the country. Table 2.14 presents the number of weeks that Chatham County spent in drought by intensity over the period from 1999 through 2018, for which the Drought Monitor has records for 991 weeks.

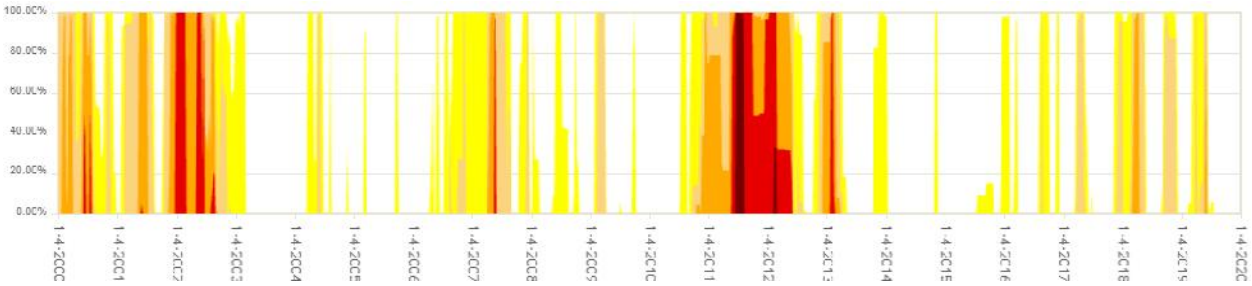
Table 2.14 – Weeks in Drought, 1999-2018

	Weeks in Drought						% of time in Severe Drought or Worse
County	Total	D0	D1	D2	D3	D4	
Chatham	469	195	122	97	47	8	15.3%

Source: U.S. Drought Monitor History

Figure 2.5 shows the historical periods where the county was considered in some level of drought condition. The color key shown in Figure 2.4 indicates the intensity of the drought. Between 2000 and 2018, Chatham County was in some level of drought 47.3% of the time.

Figure 2.5 – US Drought Monitor Historical Trends – Chatham County



Source: U.S. Drought Monitor

The Georgia Automated Environmental Monitoring Network (GAEMK) provides data on droughts, including historical records of temperature and precipitation – including departure from normal levels (1971-2000). Table 2.15 below, from Chatham County's previous plan, shows the departure from normal precipitation levels from 2006 through November 2014 in Chatham County. Per this assessment Chatham County experienced the greatest magnitude of drought between 2006 and 2008, totaling over 25 inches of precipitation deficit. Precipitation was also below normal levels from 2010-2013, which fits with the prior assessment of intense periods of drought in 2011 and 2012.

Table 2.15 – Departure from Normal Precipitation Levels

Year	Chatham County
2006	-13.15
2007	-3.99
2008	-8.60
2009	14.60
2010	-8.02
2011	-5.43
2012	-6.69
2013	5.36
2014	3.10

Source: GAEMK, 2015 Chatham County HMP

The National Drought Mitigation Center (NDMC), located at the University of Nebraska in Lincoln, provides a clearinghouse for information on the effects of drought, based on reports from media, observers, impact records, and other sources. According to the NDMC's Drought Impact Reporter, during the 10-year period from January 2009 through December 2018, 423 county level drought impacts were noted for the State of Georgia, of which 18 were reported to affect Chatham County. Table 2.16 summarizes the number of impacts reported by category and the years impacts were reported for each category. Note that the Drought Impact Reporter assigns multiple categories to each impact.

Table 2.16 – Drought Impacts Reported for Chatham County, January 2009 through December 2018

Category	Impacts	Years Reported
Agriculture	11	2011, 2012, 2013, 2016, 2017
Business & Industry	1	2012
Fire	1	2016
Plants & Wildlife	3	2017
Relief, Response & Restrictions	13	2010, 2011, 2012, 2013, 2016, 2017
Water Supply & Quality	4	2010, 2013, 2016, 2017

Source: Drought Impact Reporter, http://droughtreporter.unl.edu

NCEI reports 23 drought events between 1996-2019, detailed in Table 2.17. These events are reported monthly and generally for larger regions or even the entire state. (Note that of the 67 drought events reported in the previous plan, 21 were erroneously included in Chatham County counts but occurred in Walton County. The remaining 46 events were reported for two separate zones, "Inland Chatham" and "Coastal Chatham" but only amounted to 23 unique event reports.)

Table 2.17 – NCEI Records of Drought, 1996-2019

Location	Date	Deaths	Injuries	Property Damage	Crop Damage
Inland Chatham (Zone), Coastal Chatham (Zone)	5/1/1996	0	0	0	0
Inland Chatham (Zone), Coastal Chatham (Zone)	8/1/1999	0	0	0	0
Inland Chatham (Zone), Coastal Chatham (Zone)	9/1/1999	0	0	0	0
Inland Chatham (Zone), Coastal Chatham (Zone)	5/15/2000	0	0	0	0
Inland Chatham (Zone), Coastal Chatham (Zone)	6/1/2000	0	0	0	0
Inland Chatham (Zone), Coastal Chatham (Zone)	7/1/2000	0	0	0	0
Inland Chatham (Zone), Coastal Chatham (Zone)	8/1/2000	0	0	0	0
Inland Chatham (Zone), Coastal Chatham (Zone)	9/1/2000	0	0	0	0
Inland Chatham (Zone), Coastal Chatham (Zone)	4/1/2001	0	0	0	0
Inland Chatham (Zone), Coastal Chatham (Zone)	5/1/2001	0	0	0	0
Inland Chatham (Zone), Coastal Chatham (Zone)	6/1/2001	0	0	0	0
Inland Chatham (Zone), Coastal Chatham (Zone)	10/1/2001	0	0	0	0
Inland Chatham (Zone), Coastal Chatham (Zone)	11/1/2001	0	0	0	0
Inland Chatham (Zone), Coastal Chatham (Zone)	12/1/2001	0	0	0	0
Inland Chatham (Zone), Coastal Chatham (Zone)	1/1/2002	0	0	0	0
Inland Chatham (Zone), Coastal Chatham (Zone)	2/1/2002	0	0	0	0
Inland Chatham (Zone), Coastal Chatham (Zone)	3/1/2002	0	0	0	0
Inland Chatham (Zone), Coastal Chatham (Zone)	4/1/2002	0	0	0	0
Inland Chatham (Zone), Coastal Chatham (Zone)	5/1/2002	0	0	0	0
Inland Chatham (Zone), Coastal Chatham (Zone)	6/1/2002	0	0	0	0
Inland Chatham (Zone), Coastal Chatham (Zone)	7/1/2002	0	0	0	0
Inland Chatham (Zone), Coastal Chatham (Zone)	8/1/2002	0	0	0	0
Inland Chatham (Zone), Coastal Chatham (Zone)	9/1/2002	0	0	0	0

Source: NCEI Storm Events Database

Additionally, the County has had one FEMA Emergency Declaration for a drought in July 1977.

Probability of Future Occurrence

Probability: 3 – Likely

Over the 20-year period, for which Drought Monitor reports on 991 weeks, from 2000 through 2018, Chatham County had 469 weeks of drought conditions ranging from abnormally dry to exceptional drought. This equates to a 47 percent chance of drought in any given week. Of this time, approximately 152 weeks were categorized as a severe (D2) drought or greater; w equates to a 15 percent chance of severe drought in any given week.

Climate Change

The Fourth National Climate Assessment reports that average and extreme temperatures are increasing across the country and average annual precipitation is decreasing in the Southeast. Heavy precipitation events are becoming more frequent, meaning that there will likely be an increase in the average number of consecutive dry days. As temperature is projected to continue rising, evaporation rates are expected

to increase, resulting in decreased surface soil moisture levels. Together, these factors suggest that drought will increase in intensity and duration in the Southeast.

Vulnerability Assessment

Methodologies and Assumptions

No data is available to estimate potential losses that could result from future droughts; therefore, vulnerability to drought is assessed qualitatively.

People

Drought can affect people's physical and mental health. For those economically dependent on a reliable water supply, drought may cause anxiety or depression about economic losses, reduced incomes, and other employment impacts. Conflicts may arise over water shortages. People may be forced to pay more for water, food, and utilities affected by increased water costs. Drought may cause health problems due to poorer water quality from lower water levels. If accompanied by extreme heat, drought can also result in higher incidents of heat stroke and even loss of life.

Property

Drought is unlikely to cause damages to the built environment. However, in areas with shrinking and expansive soils, drought may lead to structural damages. Drought may cause severe property loss for the agricultural industry in terms of crop and livestock losses. The USDA's Risk Management Agency (RMA) maintains a database of all paid crop insurance claims. Between 2007-2017, crop insurance claims due to drought in Chatham County were only paid out in 2016. In total, there were 72.57 impacted acres and a total of $8,428 in claims paid out. Per the USDA's Census of Agriculture, from 2012 to 2017 the total number of farms in the County increased from 35 to 67 and the total land in farms increased from 3,835 to 4,677. However, although agricultural exposure has increased, which may indicate vulnerability has increased, agriculture still only accounts for 1.7 percent of the County's total land area. Therefore, overall agricultural exposure is still very low.

Environment

Drought can affect local wildlife by shrinking food supplies and damaging habitats. Sometimes this damage is only temporary, and other times it is irreversible. Wildlife may face increased disease rates due to limited access to food and water. Increased stress on endangered species could cause extinction.

Another concern during a drought is that contaminants such as pesticides and fertilizers may concentrate in the soil as precipitation wanes and then enter waterways during heavy rains and flooding. Given the cultural and economic importance of water access in Chatham County, any increase in contaminant load of the river could adversely affect the planning area.

Drought conditions can also provide a substantial increase in wildfire risk. As plants and trees die from a lack of precipitation, increased insect infestations, and diseases—all of which are associated with drought—they become fuel for wildfire. Long periods of drought can result in more intense wildfires, which bring additional consequences for the economy, the environment, and society. Drought may also increase likelihood of wind and water erosion of soils.

Consequence Analysis

Table 2.18 summarizes the potential negative consequences of drought.

Table 2.18 – Consequence Analysis - Drought

Category	Consequences
Public	Can cause anxiety or depression about economic losses, conflicts over water shortages, reduced incomes, fewer recreational activities, higher incidents of heat stroke, and fatality.
Responders	Impacts to responders are unlikely. Exceptional drought conditions may impact the amount of water immediately available to respond to wildfires.
Continuity of Operations (including Continued Delivery of Services)	Drought would have minimal impacts on continuity of operations due to the relatively long warning time that would allow for plans to be made to maintain continuity of operations.
Property, Facilities and Infrastructure	Drought has the potential to affect water supply for residential, commercial, institutional, industrial, and government-owned areas. Drought can reduce water supply in wells and reservoirs. Utilities may be forced to increase rates.
Environment	Environmental impacts include strain on local plant and wildlife; increased probability of erosion and wildfire.
Economic Condition of the Jurisdiction	Farmers may face crop losses or increased livestock costs. Businesses that depend on farming may experience secondary impacts. Extreme drought has the potential to impact local businesses in landscaping, recreation and tourism, and public utilities.
Public Confidence in the Jurisdiction's Governance	When drought conditions persist with no relief, local or State governments must often institute water restrictions, which may impact public confidence.

Hazard Summary by Jurisdiction

The following table summarizes drought hazard risk by jurisdiction. Drought risk is uniform across the planning area. Warning time, duration, and spatial extent are inherent to the hazard and remain constant across jurisdictions. The majority of damages that result from drought are to crops and other agriculture-related activities as well as water-dependent industries; therefore, the magnitude of the impacts is typically greater in unincorporated areas. In more heavily developed areas, the magnitude of drought is less severe, with lawns and local gardens affected and potential impacts on local water supplies during severe, prolonged drought.

Jurisdiction	Probability	Impact	Spatial Extent	Warning Time	Duration	Score	Priority
Chatham County	3	2	4	1	4	2.8	H
Bloomingdale	3	1	4	1	4	2.5	H
Garden City	3	1	4	1	4	2.5	H
Pooler	3	1	4	1	4	2.5	H
Port Wentworth	3	1	4	1	4	2.5	H
Savannah	3	1	4	1	4	2.5	H
Thunderbolt	3	1	4	1	4	2.5	H
Tybee Island	3	1	4	1	4	2.5	H
Vernonburg	3	1	4	1	4	2.5	H

2.5.3 Earthquake

Hazard Background

An earthquake is a movement or shaking of the ground. Most earthquakes are caused by the release of stresses accumulated as a result of the rupture of rocks along opposing fault planes in the Earth's outer crust. These fault planes are typically found along borders of the Earth's 10 tectonic plates. The areas of greatest tectonic instability occur at the perimeters of the slowly moving plates, as these locations are subjected to the greatest strains from plates traveling in opposite directions and at different speeds. Deformation along plate boundaries causes strain in the rock and the consequent buildup of stored energy. When the built-up stress exceeds the rocks' strength a rupture occurs. The rock on both sides of the fracture is snapped, releasing the stored energy and producing seismic waves, generating an earthquake.

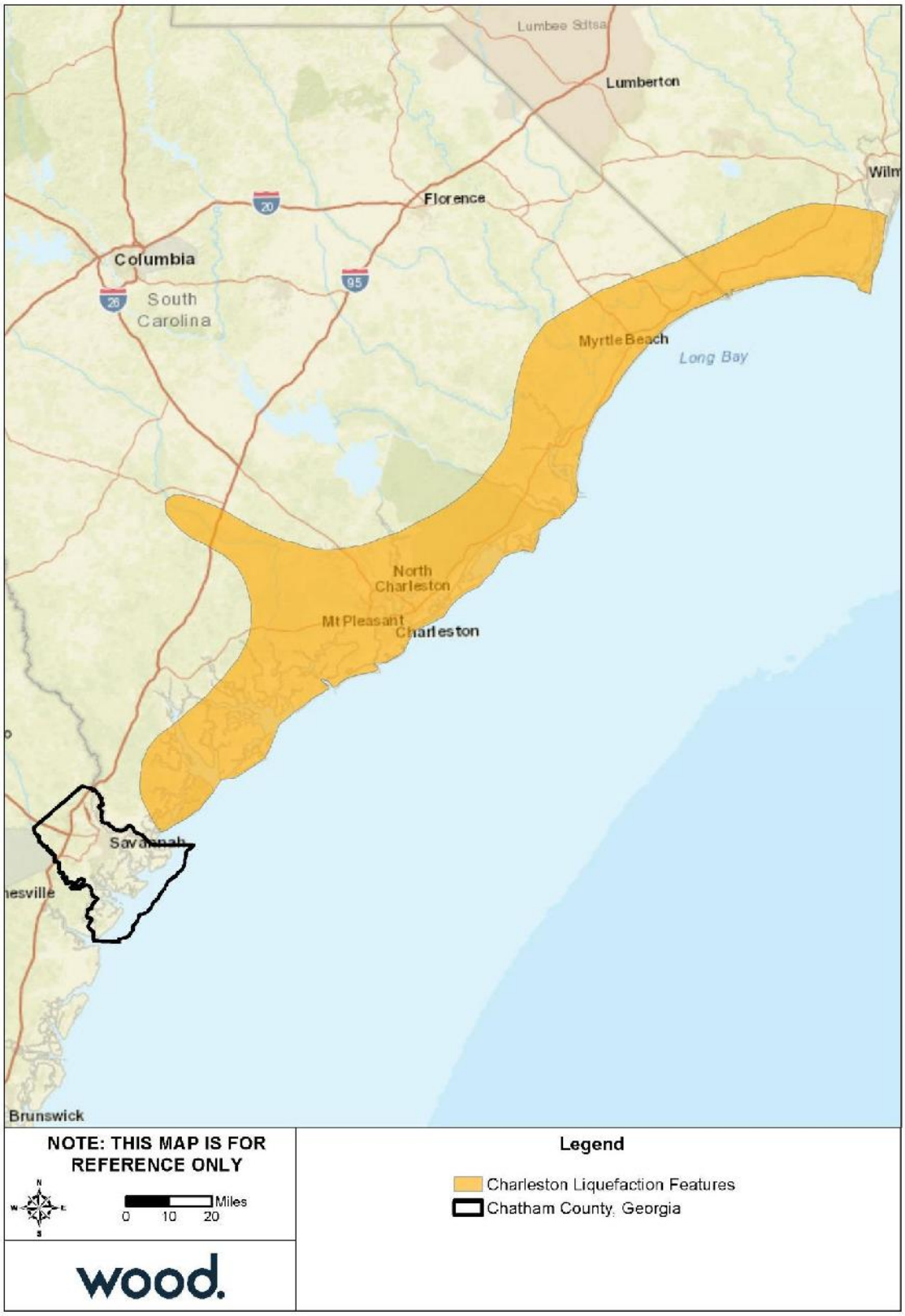
Warning Time: 4 – Less than 6 hours

Duration: 1 – Less than 6 hours

Location

The United State Geological Survey's Quaternary faults database was consulted to define the location of potential earthquakes within range of Chatham County. Quaternary faults are active faults recognized at the surface which have evidence of movement in the past 2.58 million years. The Charleston liquefaction features is the primary active fault area that could produce an earthquake affecting Chatham County. Figure 2.6 reflects the location of the Charleston liquefaction features in relation to Chatham County based on data from the USGS Earthquake Hazards Program.

Figure 2.6 – US Quaternary Faults, Charleston Liquefaction Features



Source: USGS Earthquake Hazards Program

All of Georgia is subject to earthquakes, with the western and southern region most vulnerable to a damaging earthquake. The state is affected by both the Charleston Fault in South Carolina and New Madrid Fault in Tennessee. Both faults have generated earthquakes measuring greater than 8.0 on the Richter Scale during the last 200 years. In addition, there are several smaller fault lines in eastern Tennessee and throughout North Carolina that could produce less severe shaking. Chatham County is closest to and therefore more likely to face risk from the Charleston Fault zone.

Extent

Earthquakes are measured in terms of their magnitude and intensity. Magnitude is measured using the Richter Scale, an open-ended logarithmic scale that describes the energy release of an earthquake through a measure of shock wave amplitude. A detailed description of the Richter Scale is given in Table 2.19. Although the Richter scale is usually used by the news media when reporting the intensity of earthquakes and is the scale most familiar to the public, the scale currently used by the scientific community in the United States is called the Modified Mercalli Intensity (MMI) scale. The MMI scale is an arbitrary ranking based on observed effects. Table 2.20 shows descriptions for levels of earthquake intensity on the MMI scale compared to the Richter scale. Seismic shaking is typically the greatest cause of losses to structures during earthquakes.

Table 2.19 – Richter Scale

Magnitude	Effects
Less than 3.5	Generally, not felt, but recorded.
3.5 – 5.4	Often felt, but rarely causes damage.
5.4 – 6.0	At most slight damage to well-designed buildings. Can cause major damage to poorly constructed buildings over small regions.
6.1 – 6.9	Can be destructive in areas up to 100 kilometers across where people live.
7.0 – 7.9	Major earthquake. Can cause serious damage over larger areas.
8.0 or greater	Great earthquake. Can cause serious damage in areas several hundred kilometers across.

Source: FEMA

Table 2.20 – Comparison of Richter Scale and Modified Mercalli Intensity (MMI) Scale

MMI	Richter Scale	Felt Intensity
I	0 – 1.9	Not felt. Marginal and long period effects of large earthquakes.
II	2.0 – 2.9	Felt by persons at rest, on upper floors, or favorably placed.
III	3.0 – 3.9	Felt indoors. Hanging objects swing. Vibration like passing of light trucks. Duration estimated. May not be recognized as an earthquake.
IV	4.0 – 4.3	Hanging objects swing. Vibration like passing of heavy trucks. Standing motor cars rock. Windows, dishes, doors rattle. Glasses clink the upper range of IV, wooden walls and frame creak.
V	4.4 – 4.8	Felt outdoors; direction estimated. Sleepers wakened. Liquids disturbed, some spilled. Small unstable objects displaced or upset. Doors swing, close, open. Pendulum clocks stop, start.
VI	4.9 – 5.4	Felt by all. Many frightened and run outdoors. Persons walk unsteadily. Windows, dishes, glassware broken. Books, etc., fall off shelves. Pictures fall off walls. Furniture moved. Weak plaster and masonry D cracked. Small bells ring. Trees, bushes shaken.
VII	5.5 – 6.1	Difficult to stand. Noticed by drivers of motor cars. Hanging objects quiver. Furniture broken. Damage to masonry D, including cracks. Weak chimneys broken at roof line. Fall of plaster, loose bricks, stones, tiles, cornices. Some cracks in masonry C. Waves on ponds. Small slides and caving in along sand or gravel banks. Large bells ring. Concrete irrigation ditches damaged.

MMI	Richter Scale	Felt Intensity
VIII	6.2 – 6.5	Steering of motor cars is affected. Damage to masonry C; partial collapse. Some damage to masonry B. Fall of stucco and some masonry walls. Twisting, fall of chimneys, factory stacks, monuments, towers, elevated tanks. Frame houses moved on foundations. Decayed piling broken off. Branches broken from trees. Changes in flow or temperature of springs and wells. Cracks in wet ground and on steep slopes.
IX	6.6 – 6.9	General panic. Masonry D destroyed; masonry C heavily damaged, sometimes with complete collapse; masonry B seriously damaged. (General damage to foundations.) Serious damage to reservoirs. Underground pipes broken. Conspicuous cracks in ground. In alluvial areas sand and mud ejected, earthquake fountains, sand craters.
X	7.0 – 7.3	Most masonry and frame structures destroyed with their foundations. Some well-built wooden structures and bridges destroyed. Serious damage to dams, dikes, embankments. Large landslides. Water thrown on banks of canals, rivers, lakes, etc. Sand and mud shifted horizontally on beaches and flat land. Rails bent slightly.
XI	7.4 – 8.1	Rails bent greatly. Underground pipelines completely out of service.
XII	> 8.1	Damage nearly total. Large rock masses displaced. Lines of sight and level distorted. Objects thrown in the air.

Masonry A: Good workmanship, mortar, and design; reinforced, especially laterally, and bound together by using steel, concrete, etc.; designed to resist lateral forces. Masonry B: Good workmanship and mortar; reinforced, but not designed in detail to resist lateral forces. Masonry C: Ordinary workmanship and mortar; no extreme weaknesses like failing to tie in at corners, but neither reinforced nor designed against horizontal forces. Masonry D: Weak materials, such as adobe; poor mortar; low standards of workmanship; weak horizontally.
Source: Oklahoma State Hazard Mitigation Plan.

The most severe earthquake to impact the Chatham County area measured a VIII on the Modified Mercalli Intensity Scale.

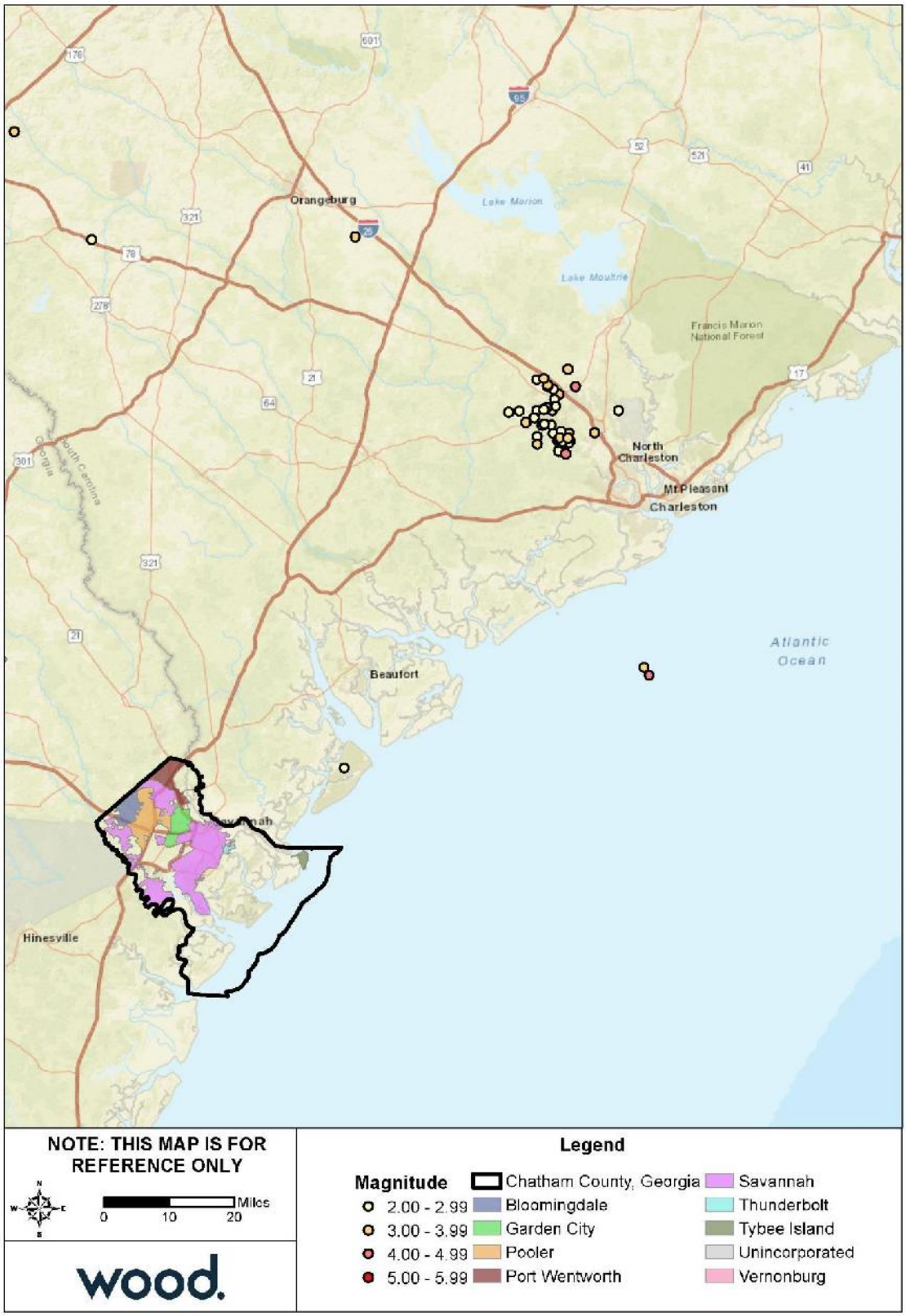
Impact: 2 – Limited

Spatial Extent: 3 – Moderate

Historical Occurrences

The USGS Earthquake Hazards Program maintains a database of historical earthquakes of a magnitude 2.5 and greater from 1973 to 2019. Earthquake events that occurred within and around the Charleston liquefaction features are shown in Figure 2.7 in relation to Chatham County.

Figure 2.7 – Historical Earthquakes by Magnitude, 1973-2019



Source: USGS Earthquakes Hazard Program

The above map documents earthquakes that have occurred within 100 miles of Chatham County in or near the Charleston liquefaction features fault zone. However, given the long distances across which earthquake impacts can be felt, these events do not encompass all earthquakes that have affected Chatham County. The National Geophysical Data Center maintains a database of all earthquakes from 1811 to 2019 including the maximum intensity for each locality that felt the earthquake. Since 1985, no major earthquake events have impacted the planning area. The largest earthquake to impact the county was the Charleston earthquake of 1886, which registered an MMI of VIII in Savannah.

Table 2.21 – Historical Earthquakes Felt in Chatham County, 1811-2019

Year	City	Magnitude	MMI	Epicentral Distance
1811	Savannah	7.2	4	927
1812	Savannah	7.4	6	927
1857	Savannah		4	
1879	Savannah		4	299
1886	Savannah		8	137
1903	Tybee Island, Savannah		6	
1905	Savannah		3	504
1905	Savannah		3	504
1907	Savannah		5	137
1912	Savannah		5	
1914	Savannah		2	132
1916	Savannah		2	401
1916	Thunderbolt		2	508
1927	Thunderbolt, Tybee Island		4	
1959	Savannah		4	181
1968	Savannah	5.3	4	941

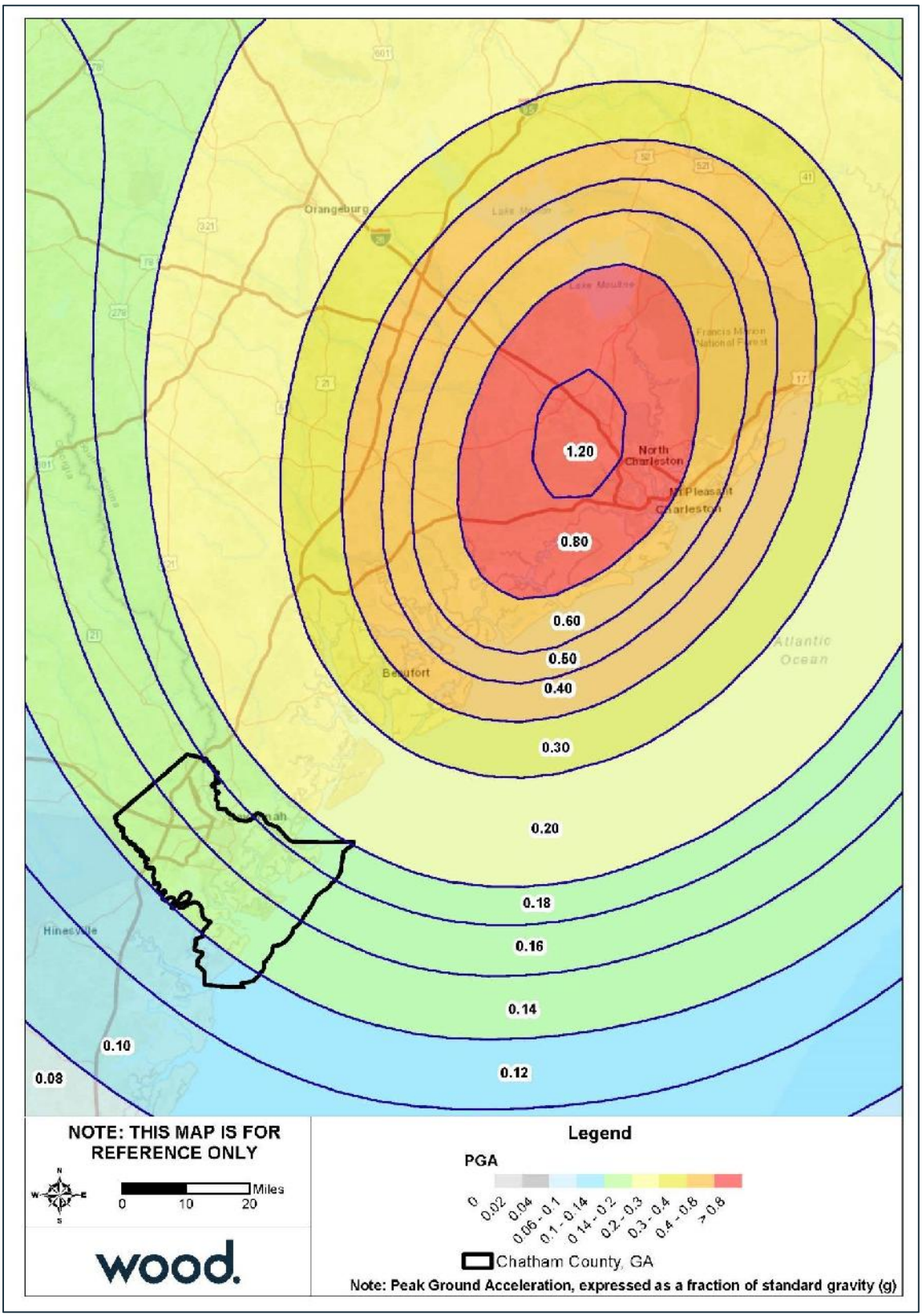
Source: National Geophysical Data Center and HMPC input

Probability of Future Occurrence

Ground motion is the movement of the earth's surface due to earthquakes or explosions. It is produced by waves generated by a sudden slip on a fault or sudden pressure at the explosive source and travels through the earth and along its surface. Ground motion is amplified when surface waves of unconsolidated materials bounce off of or are refracted by adjacent solid bedrock. The probability of ground motion is depicted in USGS earthquake hazard maps by showing, by contour values, the ground motions (of a particular frequency) that have a common given probability of being exceeded in 50 years.

Figure 2.8 reflects the seismic hazard for Chatham County based on the national USGS map of peak acceleration with two percent probability of exceedance in 50 years. To produce these estimates, the ground motions being considered at a given location are those from all future possible earthquake magnitudes at all possible distances from that location. The ground motion coming from a particular magnitude and distance is assigned an annual probability equal to the annual probability of occurrence of the causative magnitude and distance. The method assumes a reasonable future catalog of earthquakes, based upon historical earthquake locations and geological information on the recurrence rate of fault ruptures. When all the possible earthquakes and magnitudes have been considered, a ground motion value is determined such that the annual rate of its being exceeded has a certain value. Therefore, for the given probability of exceedance, two percent, the locations shaken more frequently will have larger ground motions. The majority of Chatham County is located within a zone with peak acceleration of 14-18% g. The northeastern-most portion of the county, including Tybee Island, falls within a zone with peak acceleration of 18-20% g.

Figure 2.8 – Seismic Hazard Information for Chatham County



Source: USGS Earthquake Hazards Program

In simplified terms, based on the record of past occurrences there were 16 earthquakes over a 208-year period from 1811 to 2019. Using past occurrence as an indicator of future probability, there is a 7.7 percent annual probability of an earthquake being felt in Chatham County. Of these past events, only three could have caused building damage, defined for this purpose as an MMI of 6 or greater. Therefore, there is a 1.4 percent annual chance of an earthquake causing some building damage in Chatham County.

Based on this data, it can be reasonably assumed that an earthquake event affecting Chatham County is possible.

Probability: 2 – Possible

Climate Change

Scientists are beginning to believe there may be a connection between climate change and earthquakes. Changing ice caps and sea-level redistribute weight over fault lines, which could potentially have an influence on earthquake occurrences. However, currently no studies quantify the relationship to a high level of detail, so recent earthquakes should not be linked with climate change. While not conclusive, early research suggest that more intense earthquakes and tsunamis may eventually be added to the adverse consequences that are caused by climate change.

Vulnerability Assessment

Methodologies and Assumptions

Hazus was used to evaluate potential earthquake impacts, leveraging Hazus general building stock information, which is based on 2010 Census data. Hazus limits modeled events to a minimum magnitude of 5.0; therefore, the analysis and results presented here are based on an earthquake of that strength as well as a more severe magnitude 7.0 earthquake.

People

Earthquake events in Chatham County are unlikely to produce more than moderate ground shaking; therefore, injury or death is unlikely. Objects falling from shelves generally pose the greatest threat to safety. However, given proximity to the Charleston fault area, there is potential for more serious impacts. In severe cases, an earthquake could cause fatalities due to building collapse.

Hazus estimates that the 250-year earthquake (a magnitude 5.0 event) would result in extensive damage to 3,733 residential structures and complete damage of 935 residential structures. With these estimates, potential population at risk was calculated using the American Community Survey 2013-2017 5-Year Estimates for household factor, the average number of individuals per household. The household factor for Chatham County is 2.54, therefore there are an estimated 11,857 individuals at severe risk to the 250-year earthquake event.

Property

In a severe earthquake event, buildings can be damaged by the shaking itself or by the ground beneath them settling to a different level than it was before the earthquake (subsidence). Buildings can even sink into the ground if soil liquefaction occurs. If a structure (a building, road, etc.) is built across a fault, the ground displacement during an earthquake could seriously damage that structure.

Earthquakes can also cause damages to infrastructure, resulting in secondary hazards. Damages to dams or levees could cause failures and subsequent flooding. Fires can be started by broken gas lines and power lines. Fires can be a serious problem, especially if the water lines that feed the fire hydrants have been damaged as well. Impacts of earthquakes also include debris clean-up and service disruption.

Chatham County has not been impacted by an earthquake with more than a moderate intensity, so major damage to the built environment is unlikely. However, there is potential for impacts to certain masonry buildings, as well as environmental damages with secondary impacts on structures.

Overall building exposure to earthquake has increased since the previous plan, as detailed in Section 2.4.1. However, there were no major development changes since the previous plan that would have significantly altered vulnerability to earthquake in the planning area.

Hazus was used to evaluate earthquake vulnerability. Level 1 probabilistic scenarios were run to estimate building losses from several return periods. Default Hazus earthquake damage functions and methodology were used for the 250-year return period, which assumed a magnitude 5.0 event. A magnitude 7.0 event was used for the 500-year return period.

Table 2.22 through Table 2.23 detail the estimated buildings impacted by 250-year and 500-year earthquake events, assumed to be a magnitude 5.0 and magnitude 7.0 event, respectively. Note, building value estimates are inherent to Hazus and do not necessarily reflect damages to the asset inventory provided by the County's parcel and building data.

Table 2.22 – Estimated Buildings Impacted by 250-Year Earthquake Event

Occupancy Type	Estimated Building Damage	Estimated Content Loss	Estimated Total Damage
Residential	$1,359,950,000	$394,920,000	$1,754,870,000
Commercial	$761,960,000	$285,360,000	$1,047,320,000
Industrial	$135,390,000	$80,580,000	$215,970,000
Other	$227,820,000	$78,000,000	$305,820,000
Total	**$2,485,120,000**	**$838,860,000**	**$3,323,980,000**

Source: Hazus

Table 2.23 – Estimated Buildings Impacted by 500-Year Earthquake Event

Occupancy Type	Estimated Building Damage	Estimated Content Loss	Estimated Total Damage
Residential	$1,391,860,000	$399,290,000	$1,791,150,000
Commercial	$829,250,000	$305,970,000	$1,135,220,000
Industrial	$149,580,000	$87,900,000	$237,480,000
Other	$211,370,000	$81,940,000	$293,310,000
Total	**$2,582,060,000**	**$875,100,000**	**$3,457,160,000**

Source: Hazus

All critical facilities should be considered at risk to minor damage should an earthquake event occur.

Environment

An earthquake is unlikely to cause substantial impacts to the natural environment in Chatham County. Impacts to the built environment (e.g. ruptured gas line) could damage the surrounding environment. However, this type damage is unlikely based on historical occurrences.

Consequence Analysis

Table 2.24 summarizes the potential negative consequences of earthquake.

Table 2.24 – Consequence Analysis - Earthquake

Category	Consequences
Public	Impact expected to be severe for people who are unprotected or unable to take shelter; moderate to light impacts are expected for those who are protected.

Category	Consequences
Responders	Responders may be required to enter unstable structures or compromised infrastructure. Adverse impacts are expected to be severe for unprotected personnel and moderate to light for protected personnel.
Continuity of Operations (including Continued Delivery of Services)	Damage to facilities/personnel in the area of the incident may require relocation of operations and lines of succession execution. Disruption of lines of communication and destruction of facilities may extensively postpone delivery of services.
Property, Facilities and Infrastructure	Damage to facilities and infrastructure in the area of the incident may be extensive for facilities, people, infrastructure, and HazMat.
Environment	May cause extensive damage, creating denial or delays in the use of some areas. Remediation may be needed.
Economic Condition of the Jurisdiction	Local economy and finances expected to be adversely affected, possibly for an extended period of time.
Public Confidence in the Jurisdiction's Governance	Ability to respond and recover may be questioned and challenged if planning, response, and recovery are not timely and effective.

Hazard Summary by Jurisdiction

The following table summarizes earthquake hazard risk by jurisdiction. Despite minor differences in peak acceleration probabilities, earthquake risk is uniform across the planning area.

Jurisdiction	Probability	Impact	Spatial Extent	Warning Time	Duration	Score	Priority
Chatham County	2	2	3	4	1	2.3	M
Bloomingdale	2	2	3	4	1	2.3	M
Garden City	2	2	3	4	1	2.3	M
Pooler	2	2	3	4	1	2.3	M
Port Wentworth	2	2	3	4	1	2.3	M
Savannah	2	2	3	4	1	2.3	M
Thunderbolt	2	2	3	4	1	2.3	M
Tybee Island	2	2	3	4	1	2.3	M
Vernonburg	2	2	3	4	1	2.3	M

2.5.4 Erosion

Hazard Background

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, wear 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 each 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 and accretion results naturally from the impacts of tidal longshore currents. Severe coastal erosion can occur over a short period when the state is impacted by hurricanes, tropical storms and other weather systems. 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.

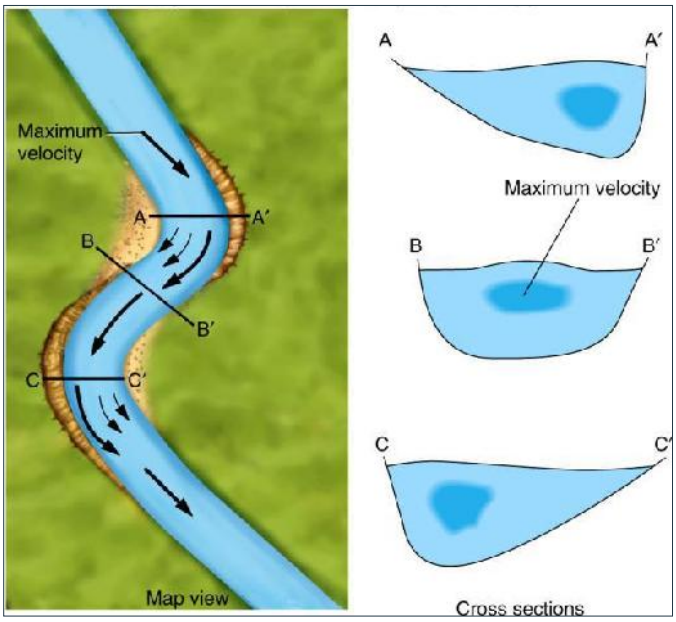
Erosion rates and potential impacts are highly localized. Severe storms can remove wide beaches, along with substantial dunes, in a single event. In undeveloped areas, these high recession rates are not likely to cause significant concern, but in some heavily populated locations, one or two feet of erosion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

Estuaries are partially enclosed, coastal water bodies where freshwater meats saltwater from the ocean. They are influenced by tides but still protected from the full force of ocean waves. Estuaries are often referred to as bays or sounds. Estuarine coastlines can experience erosion through short-term processes, such as tides, storms, wind, and boat wakes, as well as long-term processes, such as sea level rise. Many variables determine the rate of estuarine erosion including shoreline type, geographic location and size of the associated estuary, the type and abundance of vegetation, and the frequency and intensity of storms. Estuarine erosion is problematic as more development occurs along estuarine shorelines.

Stream Bank Erosion

Stream banks 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 2.9. This distribution of velocity results in erosion occurring on the outside of the bend and deposition occurring on the inside of the bend.

Figure 2.9 – 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 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.

Warning Time: 1 – More than 24 hours

Duration: 3 – Less than 1 week

Location

Erosion can occur along any shoreline in the region. Erosion is likely to be more frequent and severe along the Atlantic coast, but erosion of estuarine and streambank shorelines can also occur. In Chatham County,

erosion is typically caused by coastal tides, ocean currents, and storm events. Erosion rates are dependent on many characteristics, including soil type. According to the existing Chatham County Hazard Mitigation Plan, coastal soils, are composed of fine-grained particles such as sand while inland soils tend to have greater organic matter content. This makes coastal areas more susceptible to erosion. While much of the coast is protected, more developed areas, such as Tybee Island, are more susceptible to erosion.

Extent

The magnitude of erosion can be measured as a rate of change from a measured previous condition. The Georgia Coastal Hazards Portal maps shoreline change rates for coastal and estuarine shorelines. The program analyzed historical shorelines using AMBUR from the 1930s to the 2000s. From this analysis, the program derived erosional hot spots, based on research from the Applied Coastal Research Laboratory at Georgia Southern University. The coastal areas of Chatham County have experienced varying rates of erosion in some areas as well as accretion in others. Erosional hot spots from the Georgia Coastal Hazards Portal are shown in Figure 2.10

Erosion rates can vary significantly across the region due to several factors including fetch, shoreline orientation, and soil composition. To account for these variations, long-term erosion can also be measured by land cover changes and increases in open water. While a small fraction of the shoreline may exhibit accretion over a short period of time, cumulative impacts can still indicate an overall loss of estuarine coastline and marsh habitat. Table 2.25 provides from the NOAA Coastal Change Analysis Program (C-CAP) Land Cover Atlas showing land cover changes in the region from 1996 to 2010. This is the most recent data available on land cover changes.

Table 2.25 – Land Cover Changes, 1996-2010

Land Cover Type	Chatham Net Change
Development	24.53 sq. mi
Agriculture	-0.37 sq. mi
Forested	-22.47 sq. mi
Wetland	-6.72 sq. mi
Barren Land	1.69 sq. mi
Open Water	0.23 sq. mi

Source: https://coast.noaa.gov/digitalcoast/data/ccapregional.html

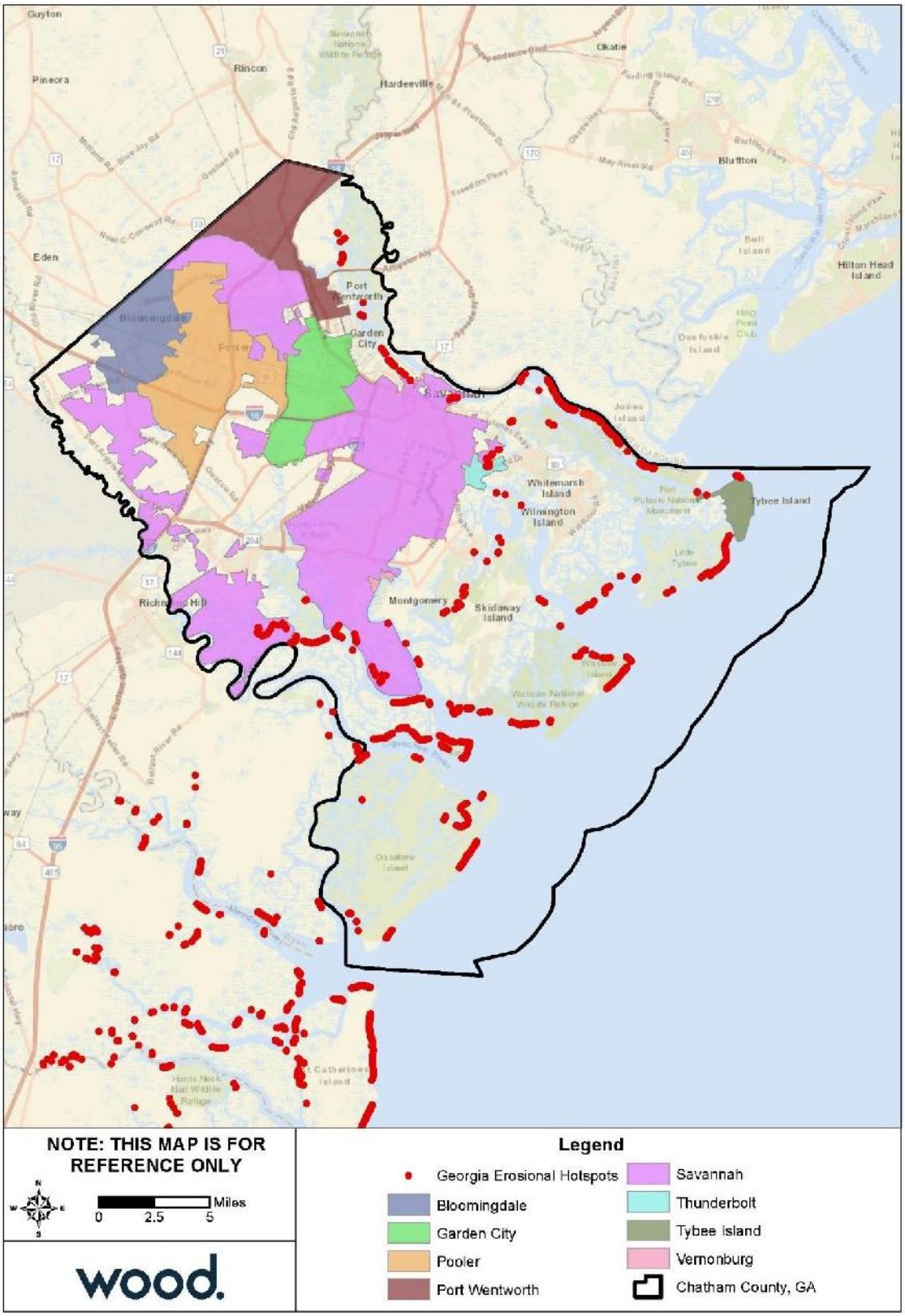
The C-CAP data indicates a small net increase in open water and larger net decreases in wetland and forested land in the County. Increases in open water and decreases in wetland area may be indicative of erosion-caused shoreline losses, and decreases in forested land and wetland may also be indicative of development changes that can exacerbate erosion. Additionally, Chatham County saw a large increase in development. Increases in developed land likely result in increased impervious surfaces, which may increase stormwater runoff, alter drainage patterns, and further exacerbate erosion and flood issues.

In terms of the magnitude of impacts, erosion may cause property damage when severe but is unlikely to cause injury or death.

Impact: 2 – Limited

Spatial Extent: 2 – Small

Figure 2.10 – Erosional Hotspots, Chatham County



Source: Georgia Coastal Hazards Portal

Historical Occurrences

As Figure 2.10 shows, shoreline erosion is occurring along ocean and estuarine coastlines throughout Chatham County. Erosion is typically an ongoing process, however it can be intensified during storm events, particularly hurricane storm tides. Per an examination of event narratives in NCEI records from 1999 to 2020 for hurricanes, tropical storms, storm surges, and coastal floods, the following instances of major erosion are noted in Chatham County:

October 5, 2005 (Tropical Storm) – Tropical Storm Tammy moved ashore in northeast Florida but the strongest effects were felt well north of the actual center. Tropical Storm force wind gusts as high as 50 mph affected the Georgia coast for many hours. Numerous trees were blown down, a few of which fell on houses and cars. Coastal flooding and high surf also occurred due to Tammy. Significant beach erosion occurred at Tybee Island.

September 30, 2007 (Coastal Flood) – Severe beach erosion was reported on Tybee Island as High Astronomical Tides combined with strong Northeast winds across the coastal waters. Lifeguard towers were undermined or destroyed, and the beach was completely washed away in several areas. Several homes were also damaged due to high surf and coastal flooding.

October 7, 2016 (Storm Surge) – Across southeast Georgia, the main impacts from Hurricane Matthew included heavy rain, wind damage, and storm surge, specifically along coastal locations, such as Tybee Island. The entire southeast Georgia coast was impacted by storm surge generally ranging from 2 to 5 feet with some locations as high as 6 to 8 feet. Damage was storm surge was most notable on the northern ends of Tybee Island. Moderate erosion was noted near the Tybee Island Pier and oceanside of Center Street.

September 11, 2017 (Storm Surge) – Storm surge associated with Tropical Storm Irma had widespread significant impacts in Chatham County where 7 homes were destroyed, 369 sustained major damage, and 445 sustained minor damage. A National Weather Service storm survey team found significant beach erosion on Tybee Island with most, if not all, of the dune line eroded away by storm surge and wave action. Furthermore, in some areas on the Tybee Island beach, approximately 6-10 feet of dune escarpment was found washed away.

Probability of Future Occurrence

Erosion and accretion are natural processes that are likely to continue to occur. The likelihood of significant instances of erosion will likely be tied to the occurrence of hurricane, tropical storm, and nor'easter events. According to NCEI, 4 events caused reported erosion in the region over the 21-year span between 1999-2019. This equates to a 19 percent chance of erosion occurring in any given year. Additionally, drawing from the likelihood of hurricanes, tropical storms, and Nor'easters, erosion is likely to occur.

Probability: 3 – Likely

Climate Change

As discussed under Climate Change in Section 2.5.6 and Section 2.5.7, climate change is expected to make heavy rain events and tropical storms and hurricanes more frequent and intense. As a result, the erosion typically caused by these storms can be expected to occur more frequently. Coastal erosion is also expected to increase as a result of rising seas. A 2018 study found that globally, between 1984 and 2015 erosion outweighed accretion. However, the study could not conclude the degree to which erosion during this period is attributed to climate changes or increased coastal development. Nonetheless, increases in erosion have been observed and are expected to continue.

Vulnerability Assessment

Methodologies and Assumptions

Vulnerability to coastal hazards was assessed based on past occurrences nationally and internationally as well as data from NOAA, USGS, the Intergovernmental Panel on Climate Change (IPCC), and other sources.

In addition to the data presented below, the forthcoming Southeast Coastal Assessment from the United States Army Corps of Engineers (USACE) South Atlantic Division will provide supplementary data and details through a comprehensive coastal shoreline risks and needs assessment. This tool will look at four hazards (hurricanes and storms, long-term erosion, flooding, and potential sea level rise) and how they will impact population, the built environment, and the natural environment.

People

Erosion is unlikely to have any direct impact on the health or safety of individuals. However, it may cause indirect harm by weakening structures and by changing landscapes in ways that increase risk of other hazard impacts. For example, erosion of dune systems causes areas protected by those dunes to face higher levels of risk.

Property

Property damage due to erosion typically only results in conjunction with large storm events which also bring wind and water damages. These events can cause scour and weaken foundations, which may undermine affected buildings' structural integrity.

Environment

Erosion can change the shape and characteristics of coastal shorelines and riverine floodplains. Eroded material may clog waterways and decrease drainage capacity. Erosion can also negatively impact water quality by increasing sediment loads in waterways.

Consequence Analysis

Table 2.26 summarizes the potential negative consequences of erosion.

Table 2.26 – Consequence Analysis – Erosion

Category	Consequences
Public	Erosion is unlikely to impact public health and safety.
Responders	Erosion is unlikely to require immediate response or rescue operations.
Continuity of Operations (including Continued Delivery of Services)	Erosion is unlikely to impact public continuity of operations.
Property, Facilities and Infrastructure	Erosion can result in property damage if it is severe enough or if scour occurs that undermines the integrity of structural foundations.
Environment	Erosion can increase sediment loads in waterbodies and change riverine and coastal topography.
Economic Condition of the Jurisdiction	Beach renourishment projects to counter erosion are extremely costly. Water dependent industries may suffer from lost shoreline and degraded water quality.
Public Confidence in the Jurisdiction's Governance	Erosion is unlikely to impact public confidence.

Hazard Summary by Jurisdiction

The following table summarizes erosion hazard risk by jurisdiction. Exposure to erosion varies across jurisdictions, therefore probability and spatial extent are dependent upon the area at risk. Jurisdictions with shoreline at risk were assigned a probability of 3 (likely), an impact of 2 (limited), and a spatial extent of 2 (small). Jurisdictions with little to no shoreline at risk were assigned a probability score of 1 (unlikely), an impact of 1 (minor), and a spatial extent of 1 (negligible). Warning time and duration are inherent to the hazard and remain constant across jurisdictions.

Jurisdiction	Probability	Impact	Spatial Extent	Warning Time	Duration	Score	Priority
Chatham County	3	2	2	1	3	2.5	H
Bloomingdale	1	1	1	1	3	1.4	L
Garden City	1	1	1	1	3	1.4	L
Pooler	1	1	1	1	3	1.4	L
Port Wentworth	1	1	1	1	3	1.4	L
Savannah	3	2	2	1	3	2.5	H
Thunderbolt	3	2	2	1	3	2.5	H
Tybee Island	3	2	2	1	3	2.5	H
Vernonburg	1	1	1	1	3	1.4	L

2.5.5 Extreme Heat

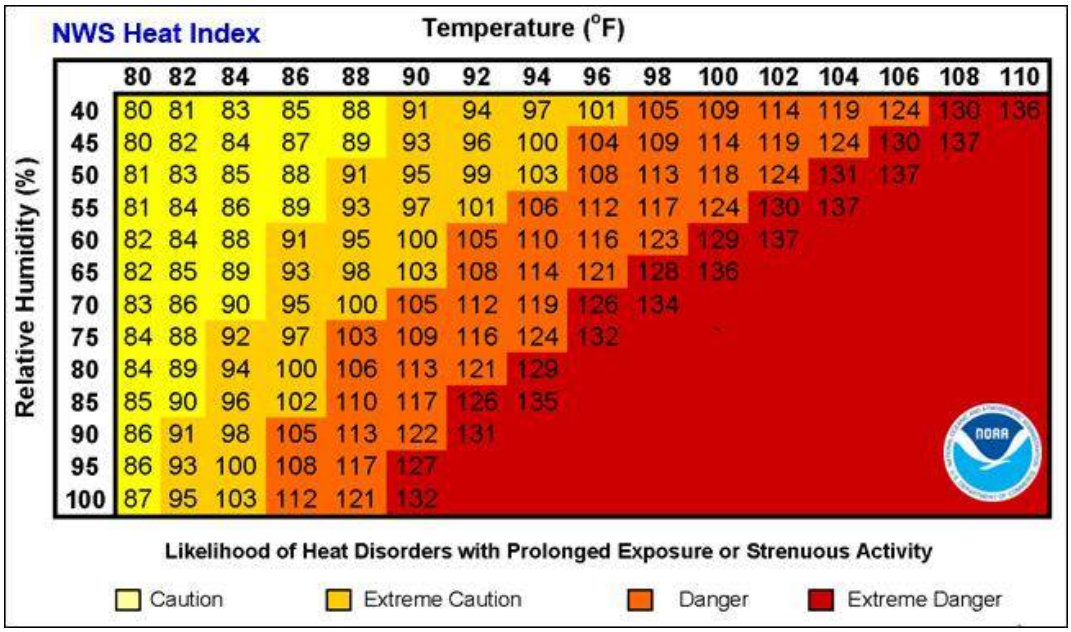
Hazard Background

Per information provided by FEMA, in most of the United States extreme heat is defined as a long period (2 to 3 days) of high heat and humidity with temperatures above 90 degrees. In extreme heat, evaporation is slowed and the body must work extra hard to maintain a normal temperature, which can lead to death by overwork of the body. Extreme heat often results in the highest annual number of deaths among all weather-related disasters. Per Ready.gov:

- Extreme heat can occur quickly and without warning
- Older adults, children, and sick or overweight individuals are at greater risk from extreme heat
- Humidity increases the feeling of heat as measured by heat index

Ambient air temperature is one component of heat conditions, with relative humidity being the other. The relationship of these factors creates what is known as the apparent temperature. The Heat Index Chart in Figure 2.11 uses both of these factors to produce a guide for the apparent temperature or relative intensity of heat conditions.

Figure 2.11 – Heat Index Chart



Source: National Weather Service (NWS) https://www.weather.gov/safety/heat-index
Note: Exposure to direct sun can increase Heat Index values by as much as 15°F. The shaded zone above 105°F corresponds to a heat index that may cause increasingly severe heat disorders with continued exposure and/or physical activity.

During these conditions, the human body has difficulties cooling through the normal method of the evaporation of perspiration. Health risks rise when a person is overexposed to heat. The most dangerous place to be during an extreme heat incident is in a permanent home, with little or no air conditioning. Those at greatest risk for heat-related illness include people 65 years of age and older, young children, people with chronic health problems such as heart disease, people who are obese, people who are socially isolated, and people who are on certain medications, such as tranquilizers, antidepressants, sleeping pills, or drugs for Parkinson's disease. However, even young and healthy individuals are susceptible if they participate in strenuous physical activities during hot weather or are not acclimated to hot weather. Table 2.27 lists typical symptoms and health impacts of heat exposure.

Table 2.27 – Typical Health Impacts of Extreme Heat

Heat Index (HI)	Disorder
80-90° F (HI)	Fatigue possible with prolonged exposure and/or physical activity
90-105° F (HI)	Sunstroke, heat cramps, and heat exhaustion possible with prolonged exposure and/or physical activity
105-130° F (HI)	Heatstroke/sunstroke highly likely with continued exposure

Source: National Weather Service Heat Index Program, www.weather.gov/os/heat/index.shtml

The National Weather Service has a system in place to initiate alert procedures (advisories or warnings) when the Heat Index is expected to have a significant impact on public safety. The expected severity of the heat determines whether advisories or warnings are issued. A common guideline for issuing excessive heat alerts is when the maximum daytime Heat Index is expected to equal or exceed 105 degrees Fahrenheit (°F) and the night time minimum Heat Index is 80°F or above for two or more consecutive days. A heat advisory is issued when temperatures reach 105 degrees and a warning is issued at 115 degrees.

Impacts of extreme heat are not only focused on human health, as prolonged heat exposure can have devastating impacts on infrastructure as well. Prolonged high heat exposure increases the risk of pavement deterioration, as well as railroad warping or buckling. High heat also puts a strain on energy systems and consumption, as air conditioners are run at a higher rate and for longer; extreme heat can also reduce transmission capacity over electric systems.

Warning Time: 1 – More than 24 hours

Duration: 3 – Less than one week

Location

The entire planning area is susceptible to high temperatures and incidents of extreme heat.

Extent

The extent of extreme heat can be defined by the maximum apparent temperature reached. Apparent temperature is a function of ambient air temperature and relative humidity and is reported as the heat index. The National Weather Service Forecast Office in Raleigh sets the following criteria for heat advisory and excessive heat warning:

- **Heat Advisory** – Heat Index of 105°F to 109°F for 3 hours or more. Can also be issued for lower values 100°F to 104°F for heat lasting several consecutive days
- **Excessive Heat Watch** – Potential for heat index values of 110°F or hotter within 24 to 48 hours. Also issued during prolonged heat waves when the heat index is near 110°F
- **Excessive Heat Warning** – Heat Index of 110°F or greater for any duration

Table 2.28 notes the highest temperature on record at three weather stations in Chatham County according to the Southeast Regional Climate Center.

Table 2.28 – Highest Temperature by Location

Temperature	Location	Date
103°F	Savannah Beach, GA	06/26/1952
105°F	Savannah Airport WSO	06/24/1944
106°F	Savannah USDA Plant	08/17/1954

Source: Southeast Regional Climate Center

Impact: 3 – Critical

Spatial Extent: 4 – Large

Historical Occurrences

According to the National Oceanic and Atmospheric Administration (NOAA), 2016 and 2017 are tied as Georgia's hottest years on record; that record stretches back 123 years to 1895.

NCEI records 14 incidents of heat or excessive heat for Chatham County between 1996-2019, detailed in Table 2.29. There were no recorded fatalities or injuries nor was any property or crop damage reported. All 14 incidents occurred between July and August and impacted the entire county.

Table 2.29 – NCEI Records of Heat, 1996-2019

Location	Date	Event Type	Deaths	Injuries	Property Damage
Inland Chatham (Zone), Coastal Chatham (Zone)	6/1/1996	Heat	0	0	0
Inland Chatham (Zone), Coastal Chatham (Zone)	6/1/1998	Heat	0	0	0
Inland Chatham (Zone), Coastal Chatham (Zone)	8/1/1999	Heat	0	0	0
Inland Chatham (Zone), Coastal Chatham (Zone)	7/27/2005	Heat	0	0	0
Inland Chatham (Zone), Coastal Chatham (Zone)	8/1/2006	Heat	0	0	0
Inland Chatham (Zone), Coastal Chatham (Zone)	8/2/2006	Heat	0	0	0
Inland Chatham (Zone), Coastal Chatham (Zone)	8/3/2006	Heat	0	0	0
Inland Chatham (Zone)	8/10/2007	Excessive Heat	0	0	0
Inland Chatham (Zone)	8/11/2007	Excessive Heat	0	0	0
Inland Chatham (Zone), Coastal Chatham (Zone)	7/25/2010	Excessive Heat	0	0	0
Inland Chatham (Zone), Coastal Chatham (Zone)	7/26/2010	Excessive Heat	0	0	0
Inland Chatham (Zone), Coastal Chatham (Zone)	7/30/2010	Excessive Heat	0	0	0
Inland Chatham (Zone)	7/31/2011	Excessive Heat	0	0	0
Inland Chatham (Zone), Coastal Chatham (Zone)	8/4/2011	Excessive Heat	0	0	0

Source: NCEI Storm Events Database

The following are a selection of narrative descriptions recorded in NCEI as well as the County's prior hazard mitigation plan for heat events:

July 27, 2005 – An upper ridge pressure settled over the region bringing extreme heat to portions of southeast Georgia. The heat, combined with high humidity, created heat indices averaging between 110°F and 120°F across inland areas and indices of 105°F to 110°F at the beaches. Temperatures cooled slighting into the next day, but heat indices still averaged 110°F

August 1-3, 2006 – Intense heat wave began on August 1st and lasted through the 5th. Heat advisories and excessive heat warnings were issued throughout this period. During the peak afternoon hours, heat indices across the region averaged between 105°F and 115°F.

July 25-26, 2010 – An expansive and deep layered ridge of high pressure extending across the southeast United States on July 25, 2010 resulted in very hot and humid conditions across southern South Carolina and southeast Georgia. Heat index values reached 118°F in inland areas of the county and 117°F on the coast. The following day, record heat across the area along with plenty of moisture produced heat index values between 115°F and 125°F triggering thunderstorm development. The heat index in Coffee Bluff measured 121°F and 117°F at Hunter Army Airfield.

August 4, 2011 – A strong mid and upper level ridge produced large thickness values over the southeast. These thickness values supported afternoon high temperatures in the upper 90s to low 100s inland and mid 90s along the coast. These temperatures in combination with low to mid 70s dewpoints pooling along an afternoon sea breeze, produced dangerous heat indices over portions of southeast Georgia. A heat

index of 118°F was measured at Bamboo Farm Coastal Gardens and of 115°F at the Windsor Forest mesonet site.

Heat index records maintained by the North Carolina Climate Office for the southeastern United States indicate that the Chatham County area regularly experiences heat index temperatures above 100°F. Table 2.30 provides counts of heat index values by threshold recorded from 1999-2019 at the Savannah Municipal Airport weather station (KSAV), used as an indicator for Chatham County overall. Counts are provided as the number of hours in a given year where the heat index reached or exceeded 100°F.

Table 2.30 – Historical Heat Index Counts, Savannah Municipal Airport (KSAV), 1999-2018

Year	Heat Index Value				Total
	100-104°F	105-109°F	110-114°F	≥115°F	
1999	152	105	26	5	288
2000	107	26	0	0	133
2001	66	9	0	0	75
2002	135	75	6	0	216
2003	148	27	0	0	175
2004	71	9	0	0	80
2005	118	33	5	0	156
2006	76	15	1	0	92
2007	125	39	13	11	188
2008	66	14	0	0	80
2009	82	15	0	0	97
2010	236	108	16	0	360
2011	171	72	8	0	251
2012	77	34	7	7	125
2013	71	4	0	0	75
2014	114	24	1	0	139
2015	146	35	1	0	182
2016	232	50	6	0	288
2017	167	58	2	0	227
2018	154	26	1	0	181
2019	237	101	11	0	349
Sum	**2,751**	**879**	**104**	**23**	**3,757**
Average	**131**	**42**	**5**	**1**	**179**

Source: North Carolina Climate Office, Heat Index Climatology Tool

According to this data, Chatham County averages approximately 179 hours per year with heat index values above 100°F. Per the Georgia Automated Environmental Monitoring Network, the recorded maximum temperature for the County was 104.4°F.

Probability of Future Occurrence

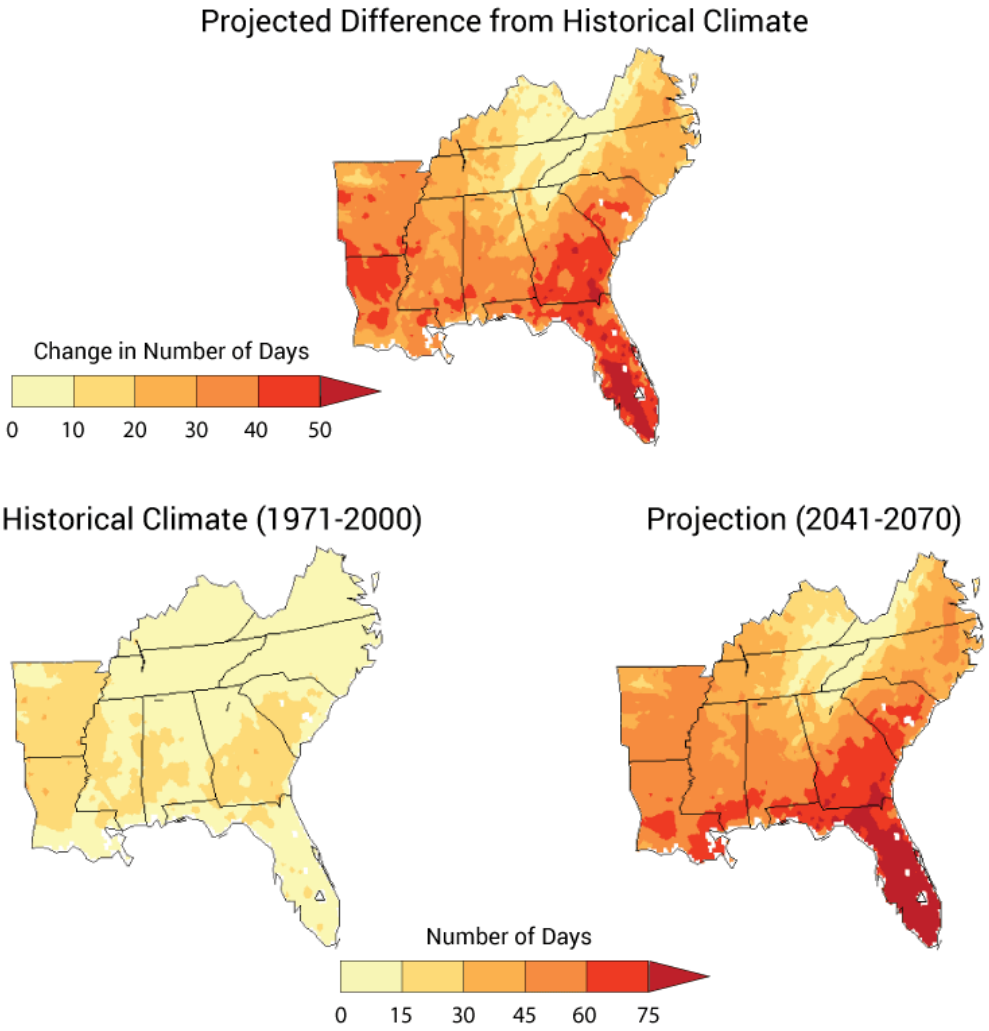
Data was gathered from the North Carolina State Climate Office's Heat Index Climatology Tool using the Savannah Municipal Airport weather station as an approximation for Chatham County. Based on 21 years of available data, the Region averages 179 hours per year with heat index temperatures above 100°F. Heat index temperatures surpassed 100°F every year, occurring for at least 75 hours per year.

Probability: 4 – Highly Likely

Climate Change

Research shows that average temperatures will continue to rise in the Southeast United States and globally, directly affecting Chatham County. Per the Fourth National Climate Assessment, "extreme temperatures are projected to increase even more than average temperatures. Cold waves are projected to become less intense and heat waves more intense." The number of days over 95°F is expected to increase by between 20 and 30 days annually, as shown in Figure 2.12.

Figure 2.12 – Projected Change in Number of Days Over 95°F



Source: NOAA NCDC from 2014 National Climate Assessment

Vulnerability Assessment

Methodologies and Assumptions

No data is available to assess the potential for deaths, injuries, property damages in the planning area that could result from extreme heat; therefore, vulnerability is assessed on a qualitative basis for this hazard.

People

Extreme heat can cause heat stroke and even loss of human life. The elderly and the very young are most at risk to the effects of heat. People who are isolated are also more vulnerable to extreme heat.

Property

Extreme heat is unlikely to cause significant damages to the built environment. However, road surfaces can be damaged as asphalt softens, and concrete sections may buckle under expansion caused by heat. Train rails may also distort or buckle under the stress of heat induced expansion. Power transmission lines may sag from expansion and if contact is made with vegetation the line may short out causing power outages. Additional power demand for cooling also increases power line temperature adding to heat impacts. Extreme heat can also cause significant agricultural losses.

Increases in impervious surface area can exacerbate heat conditions through the urban heat island effect, whereby the concentration of structures, infrastructure, and human activity, traps and stores heat resulting in localized "heat islands." Information is not available on the extent to which impervious surface coverage has changed since the adoption of the previous hazard mitigation plan, but it is possible that as greenfield development has occurred, this process has and may continue to exacerbate heat hazards in some areas of the county.

Environment

Wild animals are vulnerable to heat disorders similar to humans, including mortality. Vegetation growth will be stunted, or plants may be killed if temperatures rise above their tolerance extremes.

Consequence Analysis

Table 2.31 summarizes the potential negative consequences of extreme heat.

Table 2.31 – Consequence Analysis – Extreme Heat

Category	Consequences
Public	Extreme heat may cause illness and/or death.
Responders	Consequences may be greater for responders if their work requires exertion and/or wearing heavy protective gear.
Continuity of Operations (including Continued Delivery of Services)	Continuity of operations is not expected to be impacted by extreme heat because warning time for these events is long.
Property, Facilities and Infrastructure	Minor impacts may occur, including possible damages to road surfaces and power lines.
Environment	Environmental impacts include strain on local plant and wildlife, including potential for illness or death.
Economic Condition of the Jurisdiction	Farmers may face crop losses or increased livestock costs.
Public Confidence in the Jurisdiction's Governance	Extreme heat is unlikely to impact public confidence.

Hazard Summary by Jurisdiction

The following table summarizes extreme heat hazard risk by jurisdiction. Extreme heat risk does not vary significantly by jurisdiction.

Jurisdiction	Probability	Impact	Spatial Extent	Warning Time	Duration	Score	Priority
Chatham County	4	3	4	1	3	3.3	H

Bloomingdale	4	3	4	1	3	3.3	H
Garden City	4	3	4	1	3	3.3	H
Pooler	4	3	4	1	3	3.3	H
Port Wentworth	4	3	4	1	3	3.3	H
Savannah	4	3	4	1	3	3.3	H
Thunderbolt	4	3	4	1	3	3.3	H
Tybee Island	4	3	4	1	3	3.3	H
Vernonburg	4	3	4	1	3	3.3	H

2.5.6 Flood

Hazard Background

Flooding is defined by the rising and overflowing of water onto normally dry land. As defined by FEMA, a flood is a general and temporary condition of partial or complete inundation of two or more acres of normally dry land area or of two or more properties. Flooding can result from an overflow of inland waters or an unusual accumulation or runoff of surface waters from any source.

Flooding is the most frequent and costly of all-natural hazards in the United States and has caused more than 10,000 death(s) since 1900. Approximately 90 percent of presidentially declared disasters result from flood-related natural hazard events. Taken as a whole, more frequent, localized flooding problems that do not meet federal disaster declaration thresholds ultimately cause the majority of damages across the United States.

Sources and Types of Flooding

Flooding in Chatham County can be attributed to four main sources as noted below. Due to its low-lying coastal setting, flooding can occur anywhere in the county.

Coastal Tidal Flooding: All lands bordering the coast along the Atlantic Ocean and in low-lying coastal plains are susceptible to tidal effects and 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 because of abnormally high tides or tidal waves, storm surge and heavy rains in combination with high tides, tropical storms and hurricanes. As noted in the 2014 Flood Insurance Study (FIS) report, Chatham County is particularly susceptible to coastal flooding due to "its openness to Atlantic Ocean surges and unfavorable bathymetry extending offshore. Many of the large streams 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, and the offshore ocean depths are shallow for great distances, generating a high Atlantic Ocean surge."

Riverine Flooding: Chatham County has numerous rivers and canals running throughout its jurisdiction that are susceptible to overflowing their banks during and following excessive precipitation events. While flash flooding caused by surface water runoff is not uncommon in Chatham County, riverine flood events (such as the "100-year flood") will cause significantly more damage and economic disruption for the area. Chatham County's FIRM dated July 7, 2014 was used for this assessment. The Savannah River and the Ogeechee River, along with their many tributaries, are the primary riverine flood sources in the County. The 2014 FIS report notes that "the Savannah River (northern boundary) and the Ogeechee River (southern boundary) have drainage areas extending far beyond the limits of Chatham County. Other streams have chiefly tidal estuaries within the county 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, both of which are wide and deep. Much of the land situated in the floodplain is undeveloped marshland, with some residential, commercial, and industrial development."

Flash or Rapid Flooding: A flash flood occurs when water levels rise at an extremely fast rate as a result of intense rainfall over a brief period, possibly from slow-moving intense thunderstorms and sometimes combined with rapid snowmelt, ice jam release, frozen ground, saturated soil, or impermeable surfaces. Ice jam flooding is a form of flash flooding that occurs when ice breaks up in moving waterways, and then stacks on itself where channels narrow. This creates a natural dam, often causing flooding within minutes of the dam formation. Flash flooding can happen in Special Flood Hazard Areas (SFHAs) as delineated by

the National Flood Insurance Program (NFIP) and can also happen in areas not associated with floodplains. Flash flood hazards caused by surface water runoff are most common in urbanized areas, where greater population density generally equates to more impervious surface (e.g., pavement and buildings) which increases the amount of surface water generated.

Flash flooding is a dangerous form of flooding which can reach full peak in only a few minutes. Rapid onset allows little or no time for protective measures. Flash flood waters move at very fast speeds and can move boulders, tear out trees, scour channels, destroy buildings, and obliterate bridges. Flash flooding can result in higher loss of life, both human and animal, than slower developing river and stream flooding.

Localized/Stormwater Flooding: Localized stormwater flooding can occur throughout Chatham County. Localized stormwater flooding occurs when heavy rainfall and an accumulation of runoff overburden the stormwater drainage system. The cause of localized stormwater flooding in Chatham County can be attributed to its generally flat topography, abundance of water features, and the large amount of developed and impervious land, which limits ground absorption and increases surface water runoff.

Localized flooding may be caused by the following issues:

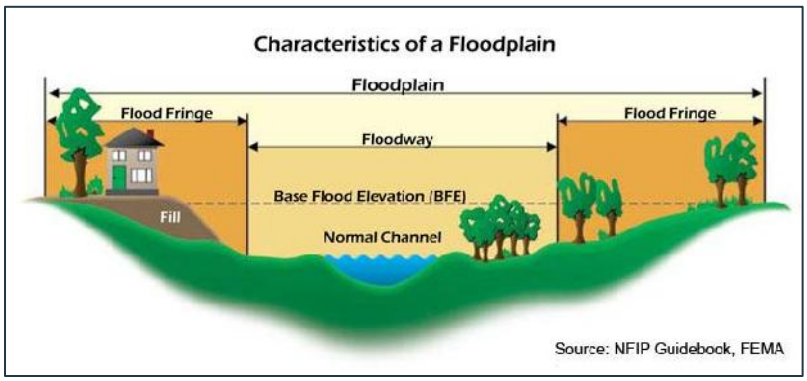
- **Inadequate Capacity –** An undersized/under capacity pipe system can cause water to back-up behind a structure which can lead to areas of ponded water and/or overtopping of banks.
- **Clogged Inlets** – Debris covering the asphalt apron and the top of grate at catch basin inlets may contribute to an inadequate flow of stormwater into the system. 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.

While localized flooding may not be as destructive as coastal flooding, it is a chronic problem. The repetitive damage caused by such flooding can add up. Sewers may back up, yards can be inundated, and homes, businesses and vehicles can be flooded. Drainage and sewer systems not design to carry the capacity currently needed to handle increased storm runoff can cause water to back into basements and damage mechanical systems. These impacts, and other localized flooding impacts, can create public health and safety concerns.

Flooding and Floodplains

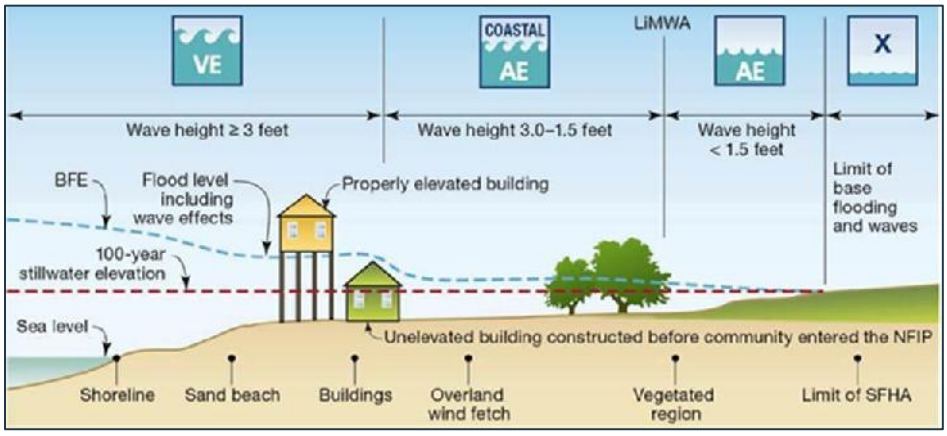
A floodplain, as shown in Figure 2.13, is flat or nearly flat land adjacent to a stream or river that experiences occasional or periodic flooding. It includes the floodway, which consists of the stream channel and adjacent areas that carry flood flows, and the flood fringe, which are areas covered by 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 2.13 – Characteristics of a Floodplain



In coastal areas, flooding occurs due to high tides, tidal waves, storm surge, or heavy rains in combination with these other sources. In these areas, flood hazards typically include the added risk of wave action delineated by the VE Zone and Coastal AE Zone. Wave height and intensity decreases as floodwaters move inland. Figure 2.14 shows the typical coastal floodplain and the breakdown of flood zones in these settings. These flood zones are discussed further in Table 2.32

Figure 2.14 – Characteristics of a Coastal Floodplain



Source: FEMA

In its common usage, the floodplain most often refers to that area that is inundated by the "100-year flood," which is the flood that has a 1% chance in any given year of being equaled or exceeded. 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 National Flood Insurance Program (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 likely occur, they are in many ways often the most predictable and manageable hazard.

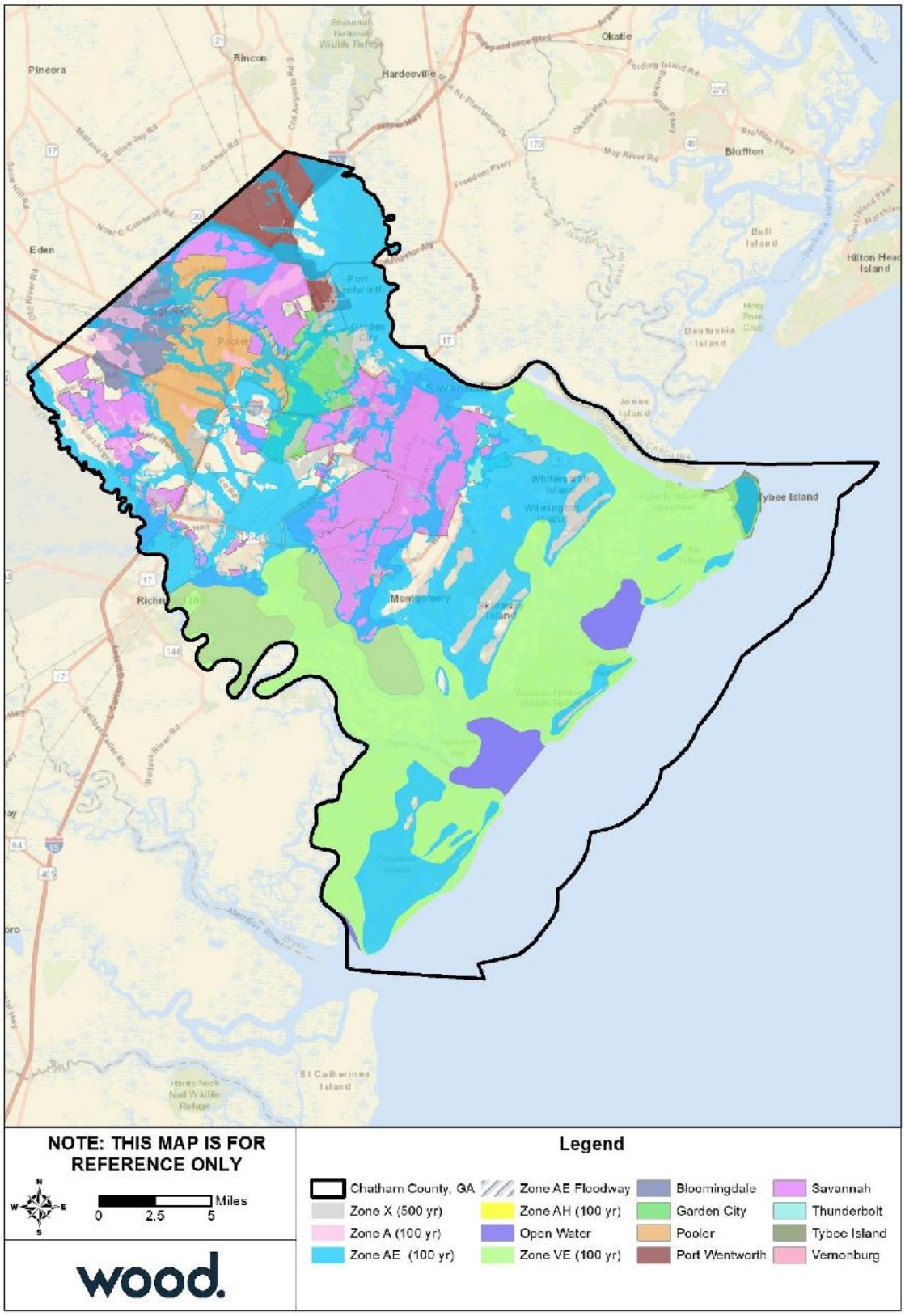
Warning Time: 3 – 6 to 12 hours

Duration: 3 – Less than 1 week

Location

Figure 2.15 reflects the 2014 mapped flood insurance zones for Chatham County. Maps for each participating jurisdiction are provided in the jurisdictional annexes.

Figure 2.15 – FEMA Flood Hazard Areas in Chatham County



Source: FEMA 2014 DFIRM

Extent

Flood extent can be defined by the amount of land in the floodplain and the potential magnitude of flooding as measured by flood height and velocity.

Regulated floodplains are illustrated on inundation maps called Flood Insurance Rate Maps (FIRMs). It is the official map for a community on which FEMA has delineated both the Special Flood Hazard Areas (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 Chatham County using the FIRM dated July 7, 2014. Table 2.32 summarizes the flood insurance zones identified by the Digital FIRM (DFIRM).

Table 2.32 – 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 hydrologic and hydraulic investigations and have no wave effects. The Coastal AE Zone is differentiated from the AE Zone by the Limit of Moderate Wave Action (LiMWA) and includes areas susceptible to wave action between 1.5 to 3 feet.
AH	Areas subject to inundation by 1% -annual-chance shallow flooding (usually areas of ponding) where average depths are between one and three feet. Base Flood Elevations (BFEs) derived from detailed hydraulic analyses are shown in this zone.
A	Areas with a 1% annual chance of flooding and a 26% chance of flooding over the life of a 30-year mortgage. Because detailed analyses are not performed for such areas, no depths or base flood elevations are shown within these zones.
A99	Areas subject to inundation by the 1-percent-annual-chance flood event, but which will ultimately be protected upon completion of an under-construction Federal flood protection system. These are areas of special flood hazard where enough progress has been made on the construction of a protection system, such as dikes, dams, and levees, to consider it complete for insurance rating purposes. Zone A99 may only be used when the flood protection system has reached specified statutory progress toward completion. No Base Flood Elevations (BFEs) or 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.

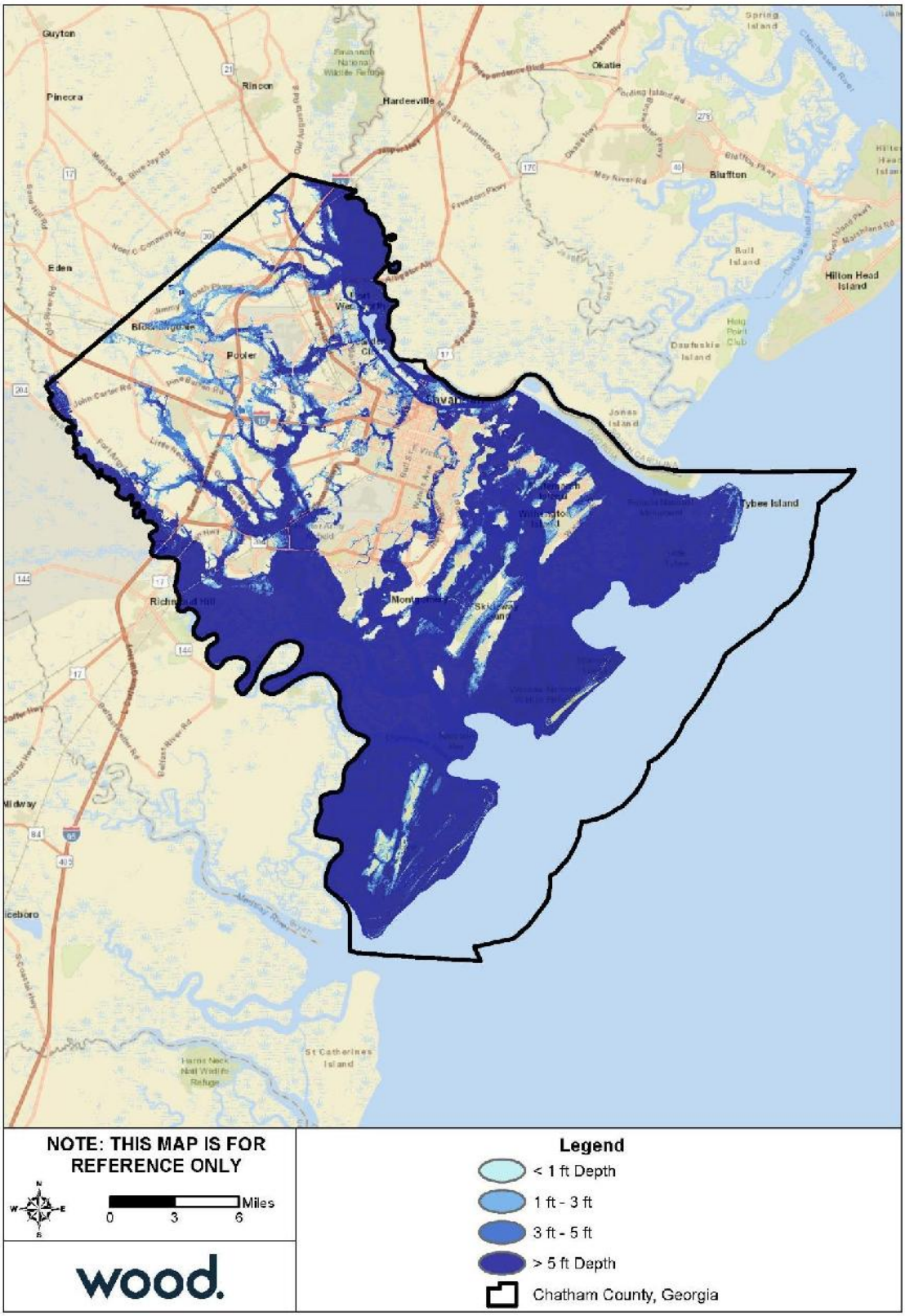
Approximately 68% of Chatham County falls within the SFHA. Table 2.33 provides a summary of the County's total area (excluding open water) by flood zone on the 2014 effective DFIRM. This is further broken down by jurisdiction in each individual annex. Figure 2.16 shows the depth of flooding predicted from a 1% annual chance flood. It was decided that the 2014 DFIRM would be used for the vulnerability assessment because at the time the risk assessment and flood analysis was started, the 2018 DIFRM was not available. However, in order to incorporate a summary of the new flood risk data into this plan, details on acreage in the newly updated 2018 FIRM are provided under Community Data in Section 1.8 and in each community's annex.

Table 2.33 – Flood Zone Acreage in Chatham County

Flood Zone	Acreage	Percent of Total (%)
A	4,896.67	1.52%
A99	3,487.11	1.08%
AE	108,467.24	33.70%
AH	2.03	0.00%
VE	101,532.14	31.54%
0.2% Annual Chance Flood Hazard	15,708.64	4.88%
X	87,791.15	27.27%
Total	**321,884.98**	**--**
SFHA Total	218,385.19	67.85%

Source: FEMA 2014 DFIRM

Figure 2.16 – Flood Depth, 100-Year Floodplain, Chatham County



Source: FEMA 2014 DFIRM

The NFIP utilizes the 100-year flood as a basis for floodplain management. The Flood Insurance Study (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). Considered another way, properties in a 100-year flood zone have a one percent probability of flooding 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 typically insured against flooding.

Impact: 3 – Critical

Spatial Extent: 3 – Moderate

Historical Occurrences

Table 2.34 details the historical occurrences of flooding identified from 1996 through 2019 by NCEI Storm Events database. Where multiple instances of flooding were reported across different locations on the same date, these events are combined so as to indicate the number of days of flooding. It should be noted that only those historical occurrences listed in the NCEI database are shown here and that other, unrecorded or unreported events may have occurred within the planning area during this timeframe.

Table 2.34 – NCEI Records of Flooding, 1996-2019

Type	Event Count	Deaths/Injuries	Reported Property Damage	Reported Crop Damage
Coastal Flood	22	0/0	$40,000	$0
Flash Flood	35	0/2	$8,430,000	$0
Flood	1	0/0	$2,000	$0
Heavy Rain	2	0/0	$0	$0
Storm Surge/Tide	3	0/0	$5,000,000	$0
Total	**63**	**0/2**	**$13,472,000**	**$0**

Source: NCEI

According to NCEI, 63 recorded flood events affected the planning area from 1996 to 2019 causing an estimated $13,472,000 in property damage and two injuries, but no fatalities or crop damage.

Table 2.35 provides a summary of this historical information by location. In some cases, multiple locations were reported as experiencing flooding within the same day. It is important to note that many of the events attributed to the county are countywide or include incorporated areas. Similarly, though some events have a starting location identified, the event may have covered a larger area including multiple jurisdictions. Still, this list provides an indication of areas that may be particularly flood prone.

Table 2.35 – Summary of Historical Flood Occurrences by Location, 1996-2019

Location	Event Count	Deaths/Injuries	Property Damage
Coastal Chatham	43	0/0	$40,000
Eastern Chatham County	3	0/0	$7,000,000
Garden City	2	0/0	$100,000
Pooler	1	0/0	$0
Port Wentworth	1	0/0	$0
Savannah	37	0/2	$1,175,000
Thunderbolt	1	0/0	$5,000
Tybee Island	2	0/0	$0
Unincorporated Chatham County	24	0/0	$5,152,000
Total	**114**	**0/2**	**$13,472,000**

Source: NCEI

The following event narratives are provided in the NCEI Storm Events Database and illustrate the impacts of flood events on the county:

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.

October 11, 2002 – Tropical Storm Kyle dumped 3 to 5 inches of rain in the Savannah area within a 12-hour period. This very heavy rainfall caused flooding of roads, low lying areas and places with poor drainage. Numerous cars stalled and roads were closed as the flooding began to endanger lives.

July 30, 2007 – A weak frontal boundary in combination with sea breeze and numerous low-level boundaries in a highly unstable environment resulted in numerous showers and thunderstorms across the region. Numerous road closures were reported in Downtown Savannah as well as high water entering some apartments. Cars were seen floating down the roadway at 65th and Abercorn Street.

September 30, 2007 – Strengthening High pressure over New England and low pressure off the Southeast U.S. coastline, resulted in a tight pressure gradient across southern South Carolina and Southeast Georgia. Strong Northeast winds and High Astronomical Tides combined to produce significant Beach Erosion across the region. Severe Beach Erosion was reported at Tybee Island. Lifeguard towers were undermined or destroyed. Several homes were damaged due to high surf and coastal flooding. The beach was completely washed away in several areas.

December 21, 2007 – Low pressure developed off the coast of South Carolina and Georgia as a potent upper level disturbance moved across the region. Moderate to heavy rains fell across the area, bringing much needed rainfall to some drought-stricken areas. The pressure gradient between the area of low pressure and a wedge of high pressure across the piedmont of South Carolina and Georgia, associated with strong cold air damming, produced strong winds along the coast. This larger event resulted in 7 reported incidents county wide. Aviation Court and Bonnie Bridge were reported flooded by the Chatham County Emergency Manager. Across the county, numerous roads were flooded, including parts of Commerce Boulevard in Garden City where the water depth was as high as 6 feet, completely submerging cars in some places. In Savannah, one house was evacuated due to flooding.

June 22-23, 2009 – An anomalously high Perigean Spring Tides resulted in significant coastal flooding along the Georgia coast. On June 22, the high tide peaked at 10.11 feet Mean Lower Low Water (MLLW) at the National Ocean Service (NOS) site on Tybee Island, Georgia. The next day, it peaked at 10.07 feet MLLW. Chatham County Emergency Management reported numerous roads flooded across the county as well as yards flooded in the Wilmington Island and Burnside areas of Chatham County. A federal employee reported roads flooded due to anomalously high tides throughout Ossabaw Island, with one dyke completely destroyed.

June 23, 2014 – The combination of the a very unstable atmosphere, the presence of a weak surface trough and the passing of a Mesoscale Convective Vortex (MCV) produced numerous showers and thunderstorms. A line of stationary thunderstorms produced between 4-10 inches of rain across Chatham County, which resulted in flash flooding. KSAV observed the wettest June day on record since observations began in 1871. Widespread flash flooding along with numerous road closures were reported in parts of Garden City, Pooler, Port Wentworth and at the Savannah Airport in Georgia. Water levels were reported being over tires, flooding was observed around some businesses and tow trucks were used to relocate

vehicles from flooded locations. Flood waters also washed out a section of the CSX rail line near Highway 307 and Gulf Stream Road. Total costs were generally estimated to be around 15.0K.

October 27, 2015 – A combination of persistent and strong east/northeast winds, the perigean spring tide and a full moon produced 2 days of elevated high tide cycles along the southeast Georgia coast. Major coastal flood stage levels were recorded at the Fort Pulaski, GA (FPKG1) tide gauge on Oct 27, 2015, which claimed 3rd place on the all-time historic crest list. Moderate coastal flood stage levels were also recorded at the Fort Pulaski, GA (FPKG1) tide gauge on Oct 28, 2015, which claimed 9th place on the all-time historic crest list.

September 2, 2016 – The National Ocean Service tide gauge at Fort Pulaski measured a peak storm surge of 1.64 feet associated with Tropical Storm Hermine.

October 7, 2016 – During Hurricane Matthew, The National Ocean Service tide gauge at Fort Pulaski peaked at 12.56 ft above Mean Lower Low Water at 248 AM on October 8th, which is the highest high tide on record. A peak surge of 7.69 ft was also recorded at the Fort Pulaski tide gauge at 242 AM on October 8th. A National Hurricane Center survey team found a high water mark of 3 feet in a home several blocks from the shoreline on the northern end of Tybee Island. The observed debris field and high water marks indicate preliminary inundation values of 5 to 6 feet MHHW close to the northern Tybee Island shoreline. In downtown Savannah, water flooded a parking lot and entered the Hyatt Ballroom building 10-18 inches deep. Water reached the doorways of many businesses on River Street but no significant salt water intrusion or damage was reported. A restaurant on the east end of River street was flooded with 3 to 6 inches of water from the Savannah River. An eyewitness reported that the hulls of boats tied up at River Street rose to the level of the railing along the Savannah River. Farther east, along U.S. Route 80, about 1 foot of water entered a restaurant on the Isle of Armstrong. On Whitemarsh Island, debris on U.S. Route 80 indicated that the road was inundated. At Fort Pulaski, a NWS/NHC survey team measured 5 feet of inundation near the Coast Guard station and around the fort on the northern end of the island.

September 11, 2017 – Storm surge associated with Tropical Storm Irma had widespread significant impacts in Chatham County. The National Ocean Service tide gauge at Fort Pulaski measured a peak tide level of 12.24 feet Mean Lower Low Water (MLLW) or 4.73 feet Mean Higher High Water (MHHW). This tide value ranks as the 2nd highest on record for the Fort Pulaski gauge and the peak surge value measured during the event was 5.63 feet. According to Chatham County Emergency Management, 7 homes were destroyed, 369 sustained major damage, and 445 sustained minor damage. The Savannah River did breach onto River Street, but water remained out of businesses. Storm surge damage was most extensive on Tybee Island, specifically on Lewis Avenue and the southwestern portion of the island. Homes on Pelican Drive were also damaged by surge. Some storm surge related damage occurred to homes on Dutch Island and Burnside Island. Highway 80 between Savannah and Tybee Island was closed due to saltwater covering and inundating the roadway. Several rescues were performed as surge trapped people in their homes. USGS high water mark analysis revealed storm surge related inundation ranging from 1.19-5.25 feet above ground level across coastal portions of the county. The peak inundation value of 5.25 feet above ground level was taken from a high water mark at Oakridge Golf Course on Skidaway Island. Another notable high water mark of 3.28 feet above ground level was analyzed on 6th Street near Lewis Avenue on Tybee Island. Extensive flooding took place at the Fort Pulaski National Monument area including the visitors center. A picture taken by National Park staff showed a water line indicative of 17 inches of water inside one of the park structures.

November 23-24, 2018 – Astronomical effects including a full moon and upcoming lunar perigee combined to produce an elevated morning high tide. The level of the high tide was driven even higher by the presence of strong northeasterly winds along the coast due to strong surface high pressure centered between the Mid-Atlantic states and New England. The high tide resulted in coastal flooding along the

southeast Georgia coast including Savannah and Tybee Island. A maximum tide level of 10.25 feet above Mean Lower Low Water (MLLW), or 2.75 feet above Mean Higher High Water (MHHW), was observed at the Fort Pulaski tide gage. Major coastal flooding typically begins along the southeast Georgia coast when tide levels reach 10.0 feet above MLLW, or 2.5 feet above MHHW, at the Fort Pulaski tide gage.

Chatham County Police closed Highway 80 near Tybee Island due to the roadway being inundated with saltwater. Also, flooding of homes, yards, and several roadways was reported around the Plantation golf course on Skidaway Island. Chatham County Police closed Highway 80 between Savannah and Tybee Island due to saltwater flooding making the road impassable.

Chatham County has had two FEMA Major Disaster Declarations for severe storms that include elements of flooding in 1994 and 1998. However, many of the Major Disaster Declarations and Emergency Declarations in the county for hurricanes likely included flooding associated with individual hurricane events as well.

Probability of Future Occurrence

By definition of the 100-year flood event, SFHAs are defined as those areas that will be inundated by the flood event having a 1-percent chance of being equaled or exceeded in any given year. Properties located in these areas have a 26 percent chance of flooding over the life of a 30-year mortgage.

The 500-year flood area is defined as those areas that will be inundated by the flood event having a 0.2-percent chance of being equaled or exceeded in any given year; it is not the flood that will occur once every 500 years.

While exposure to flood hazards vary across jurisdictions, all jurisdictions have at least some area of land in FEMA flood hazard areas. Additionally, there is risk of localized and stormwater flooding as well as severe wind-driven surge in areas outside the SFHA and at different intervals than the 1% annual chance flood. In the 24-year period between 1996-2019, there were 63 flood-related events recorded by NCEI, which equates to an average of 2.6 events annually. Therefore, the probability of flooding is considered highly likely for all jurisdictions.

Probability: 4 – Highly Likely

Climate Change

Per the Fourth National Climate Assessment, frequency and intensity of heavy precipitation events is expected to increase across the country. More specifically, it is “very likely” (90-100% probability) that most areas of the United States will exhibit an increase of at least 5% in the maximum 5-day precipitation by late 21st century. Additionally, increases in precipitation totals are expected in the Southeast. The mean change in the annual number of days with rainfall over 1 inch for the Southeastern United States is 0.5 to 1.5 days. Therefore, with more rainfall falling in more intense incidents, the region may experience more frequent flash flooding. Increased flooding may also result from more intense tropical cyclone; researchers have noted the occurrence of more intense storms bringing greater rainfall totals, a trend that is expected to continue as ocean and air temperatures rise.

Vulnerability Assessment

Methodologies and Assumptions

Wood performed a Level 2 flood loss analysis in Hazus by leveraging 2019 parcel data provided by Chatham County. Wood developed a depth raster for all portions of the SFHA where water surface elevations were available and loaded this raster as well as the parcel data into Hazus. Losses were calculated based on Hazus standard depth damage functions.

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 percentage of damage to the structure, which translates to the same percentage of the structure's replacement value. Figure 2.16 depicts the depth of flooding that can be expected within the Chatham County planning area during the 100-year flood event. Table 2.36 provides the depth damage factors that were used to calculate coastal flood losses for the planning area. These depth damage factors are based on the default depth damage curve in Hazus.

Table 2.36 – Depth Damage Percentages

	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

GEMA's Hazus report, which estimates flood loss based on the 2018 DFIRM, is available in Appendix E.

People

Certain health hazards are 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 where their wastes are stored can contribute polluted waters to the receiving streams.

Debris also poses a risk both during and after a flood. During a flood, debris carried by floodwaters can cause physical injury from impact. During the recovery process, people may often need to clear debris out

of their properties but may encounter dangers such as sharp materials or rusty nails that pose a risk of tetanus. People must be aware of these dangers prior to a flood so that they understand the risks and take necessary precautions before, during, and after a flood.

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.

Floods can also result in fatalities. Individuals face high risk when driving through flooded streets. However, NCEI does not contain any records of deaths in Chatham County caused by flood events.

An estimate of population at risk to flooding was developed based on the assessment of residential property at risk. Counts of residential buildings at risk were multiplied by a household factor for each jurisdiction, derived from a weighted average of the 2013-2017 American Community Survey's average household size for owner- and renter-occupied housing. The resulting estimates of population at risk are shown in Table 2.37. Overall, approximately 38,887 people live in high-risk flood zones.

Table 2.37 – Chatham County Population at Risk to Flood

Jurisdiction	Residential Properties at Risk	Household Factor	Population at Risk
City of Bloomingdale	179	2.46	440
City of Garden City	268	2.82	756
City of Pooler	467	2.61	1,219
City of Port Wentworth	147	2.60	382
City of Savannah	2,430	2.50	6,075
City of Tybee Island	2,182	2.33	5,084
Town of Thunderbolt	105	2.35	247
Town of Vernonburg	10	2.79	28
Unincorporated Chatham County	9,707	2.54	24,656
Total	**15,495**	**--**	**38,887**

Source: FEMA, U.S. Census Bureau 2013-2017 ACS 5-Year Estimates

Property

Residential, commercial, and public buildings, as well as critical infrastructure such as transportation, water, energy, and communication systems may be damaged or destroyed by flood waters. Table 2.38 summarizes building exposure by jurisdiction and flood zone.

Table 2.38 – Building Exposure by Jurisdiction and Flood Zone

Flood Zone	Building Count	Value ($)
Bloomingdale		
A	205	$11,035,589.00
AE	230	$16,141,054.33
X (500 yr)	25	$2,420,053.33
X	1,082	$99,632,872.60
Garden City		
AE	969	$70,010,104.40
X (500 yr)	1,840	$178,906,203.80
X	2,124	$273,961,989.90
Pooler		
A	284	$59,840,975.50
AE	975	$378,532,680.30
X (500 yr)	195	$47,137,169.50
X	7,041	$1,714,940,038.00
Port Wentworth		
AE	525	$156,432,782.60
X (500 yr)	653	$62,134,586.30
X	2,747	$420,714,419.30
Savannah		
A	79	$102,874,062.00
AE	4,380	$977,223,634.00
AH	1	$135,200.00
VE	70	$7,769,870.00
X (500 yr)	2,915	$482,755,096.50
X	43,242	$9,038,037,486.00
Thunderbolt		
AE	388	$54,503,105.60
X (500 yr)	22	$6,216,130.00
X	725	$79,834,625.30
Tybee Island		
AE	2,266	$497,183,131.60
VE	232	$75,628,069.60
Vernonburg		
AE	44	$7,207,610.00
X (500 yr)	17	$3,574,500.00
X	46	$6,255,457.00
Unincorporated Chatham County		
A	5	$1,396,600.00
AE	14,114	$3,200,375,055.00
VE	427	$98,421,308.84
X (500 yr)	8,335	$1,736,863,214.00
X	14,220	$2,671,128,432.00

Source: 2014 DFIRM; Chatham County parcel and building footprint data, 2019

Table 2.39 details the estimated losses for the 100-year flood event, calculated using Hazus methodologies for value of contents based on occupancy type. The total damage estimate value is based on damages to the total of improved building value and contents value. Land value is not included in any of the loss estimates as generally land is not subject to loss from floods.

Table 2.39 – Estimated Building Damage and Content Loss for 1% Annual Chance Flood by Jurisdiction

Occupancy Type	Total Buildings with Loss	Total Value (Building & Contents)	Estimated Building Damage	Estimated Content Loss	Estimated Total Damage	Loss Ratio
Bloomingdale						
Commercial	9	$2,092,100.00	$16,361.88	$43,168.65	$59,530.52	2.8%
Industrial	3	$2,500,062.50	$47,806.67	$100,593.54	$148,400.21	5.9%
Residential	179	$13,865,842.50	$810,577.24	$482,061.62	$1,292,638.87	9.3%
Total	191	$18,458,005.00	$874,745.79	$625,823.81	$1,500,569.60	8.1%
Garden City						
Commercial	307	$29,111,093.56	$1,294,297.72	$4,341,161.56	$5,635,459.28	19.4%
Industrial	56	$26,909,466.67	$832,334.21	$2,461,822.26	$3,294,156.47	12.2%
Residential	268	$26,182,851.50	$5,080,615.62	$2,869,663.62	$7,950,279.24	30.4%
Total	631	$82,203,411.73	$7,207,247.54	$9,672,647.44	$16,879,894.98	20.5%
Pooler						
Commercial	75	$127,324,539.78	$5,774,685.20	$18,866,310.41	$24,640,995.61	19.4%
Industrial	26	$124,988,171.87	$3,557,430.97	$10,163,880.13	$13,721,311.10	11.0%
Residential	467	$143,621,026.50	$14,773,982.32	$8,343,958.60	$23,117,940.92	16.1%
Total	568	$395,933,738.15	$24,106,098.49	$37,374,149.15	$61,480,247.64	15.5%
Port Wentworth						
Commercial	46	$13,898,190.00	$147,103.23	$450,213.15	$597,316.38	4.3%
Industrial	3	$69,100,250.00	$462,499.23	$775,910.18	$1,238,409.41	1.8%
Residential	147	$11,661,801.50	$1,676,753.18	$940,273.01	$2,617,026.19	22.4%
Total	196	$94,660,241.50	$2,286,355.64	$2,166,396.33	$4,452,751.97	4.7%
Savannah						
Commercial	390	$704,081,401.20	$24,834,865.10	$87,917,406.00	$112,752,271.10	16.0%
Industrial	154	$140,893,789.70	$5,974,541.40	$17,406,478.40	$23,381,019.80	16.6%
Residential	2430	$257,964,776.20	$38,544,070.21	$21,984,663.17	$60,528,733.38	23.5%
Total	2974	$1,102,939,967.10	$69,353,476.71	$127,308,547.57	$196,662,024.28	17.8%
Tybee Island						
Commercial	191	$69,058,700.66	$5,131,263.03	$17,215,955.11	$22,347,218.14	32.4%
Industrial	4	$768,477.50	$55,852.14	$179,751.38	$235,603.52	30.7%
Residential	2182	$741,249,077.99	$140,335,460.89	$86,132,540.04	$226,468,000.93	30.6%
Total	2377	$811,076,256.15	$145,522,576.06	$103,528,246.53	$249,050,822.59	30.7%
Thunderbolt						
Commercial	214	$52,321,843.08	$2,799,100.52	$9,091,790.48	$11,890,891.00	22.7%
Industrial	18	$4,125,500.00	$179,425.97	$528,379.87	$707,805.84	17.2%
Residential	105	$19,666,837.50	$3,506,816.97	$1,974,688.74	$5,481,505.70	27.9%
Total	337	$76,114,180.58	$6,485,343.46	$11,594,859.08	$18,080,202.54	23.8%
Vernonburg						
Residential	10	$2,673,365.00	$357,741.58	$213,928.51	$571,670.09	21.4%
Unincorporated Chatham County						
Commercial	532	$376,461,589.60	$21,881,237.18	$76,544,078.63	$98,425,315.81	26.1%
Industrial	561	$373,448,334.92	$14,717,252.91	$41,459,054.95	$56,176,307.86	15.0%

Occupancy Type	Total Buildings with Loss	Total Value (Building & Contents)	Estimated Building Damage	Estimated Content Loss	Estimated Total Damage	Loss Ratio
Residential	9707	$3,210,192,945.78	$499,642,804.62	$290,821,343.52	$790,464,148.14	24.6%
Total	10800	$3,960,102,870.30	$536,241,294.71	$408,824,477.10	$945,065,771.81	23.9%
Chatham County Total						
Commercial	1,764	$1,374,349,458	$61,878,914	$214,470,084	$276,348,998	20.1%
Industrial	825	$742,734,053	$25,827,143	$73,075,871	$98,903,014	13.3%
Residential	15,495	$4,427,078,524	$704,728,823	$413,763,121	$1,118,491,943	25.3%
Total	**18,084**	**$6,544,162,036**	**$792,434,880**	**$701,309,076**	**$1,493,743,956**	**22.8%**

Source: Hazus v. 2.0

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. Loss ratios for all occupancy types with identified structures in Chatham County are well above 10%, meaning that in the event of a flood with a magnitude of the 1%-annual-chance event or greater, the planning area would face extreme difficulty in recovery. Even smaller, more probabilistic floods may also result in the county having difficulty recovering.

Across the planning area there are 58 critical facilities located in the AE zone and 1 facility located in the VE zone which may be at risk to damages.

According to FEMA flood insurance policy records as of November 2019, there have been a total of 3,790 flood losses reported in Chatham County through the NFIP since 1978 (note, not all jurisdictions had joined the NFIP at this time) totaling over $77 million in claim payments. A summary of these figures by jurisdiction can be found in Table 2.40. Note that these figures include only losses to structured insured under the NFIP and for losses were claimed under the program and granted payouts. It is highly likely that additionally losses occurred in Chatham County that were either uninsured, denied claim payments, or simply not reported. Further detail on NFIP policies is provided in individual jurisdictional annexes.

Table 2.40 – Summary of Insured Flood Losses by Jurisdiction

Jurisdiction	Number of Policies	Number of Claims	Total Claims Payments
Bloomingdale	192	21	$293,341
Garden City	274	35	$1,421,876
Pooler	1,779	50	$770,223
Port Wentworth	228	36	$316,325
Savannah	6,848	1,764	$32,565,277
Thunderbolt	333	28	$888,072
Tybee Island	2,721	532	$14,059,650
Unincorporated Areas	16,348	1,324	$26,795,458
Chatham County Total	**28,723**	**3,790**	**$77,110,222**

Source: Federal Emergency Management Agency, National Flood Insurance Program Community Information System, Accessed November 2019

Changes in development can impact vulnerability by increasing flood risk. New development likely results in an increase in impervious surface, which can increase stormwater runoff, alter drainage patterns, and exacerbate flooding. Additionally, changes in development can increase exposure to flood risk. For example, new development can be built in areas prone to flooding, and that development can also cause changes to the floodplain and flood flows that cause existing properties to become exposed to flood.

Properly elevating new development, limiting fill, requiring compensatory storage, and other development restrictions can mitigate the impacts of new development on flood risk.

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 to examine repetitive losses within the planning area.

According to 2019 NFIP records, there are a total of 407 repetitive loss properties within the Chatham County planning area, of which 36.6 percent are insured. Data was not available on the occupancy type of these properties; however, it can be reasonably assumed that the majority are residential. The previous plan had access to 2014 repetitive loss data and reported that nearly all of the then 395 repetitive loss properties were single-family residential while the remaining few were non-residential (commercial). Table 2.41 summarizes repetitive loss properties by jurisdiction as identified by FEMA through the NFIP and reported in the Georgia Mitigation Information System (GMIS).

Table 2.41 – Repetitive Loss Properties by Jurisdiction

Jurisdiction	Total Number of Properties	Total Number of Losses	% Insured	Total Amount of Claims Payments	Average Claim Payment
Bloomingdale	1	2	0.0	$5,943.87	$2,971.94
Chatham County	44	100	68.2	$303,789.80	$9,205.75
Garden City	2	4	0.0	$197,317.86	$49,329.47
Pooler	5	12	20.0	$138,267.52	$13,826.75
Port Wentworth	8	18	37.5	$147,269.89	$14,726.99
Savannah	328	847	30.2	$12,490,128.14	$20,509.24
Thunderbolt	2	4	50.0	$10,111.77	$5,055.89
Tybee Island	17	40	88.2	$55,123.41	$6,890.43
Vernonburg	0	0	n/a	n/a	n/a
Total	**407**	**1027**	**36.6**	**$13,347,952.26**	**$19,687.25**

Source: GMIS accessed December 20, 2019

Environment

During a flood event, chemicals and other hazardous substances may end up contaminating local water bodies. Flooding kills animals and in general disrupts the ecosystem. Snakes and insects may also make their way to the flooded areas.

Floods can also cause significant erosion, which can alter streambanks and deposit sediment, changing the flow of streams and rivers and potentially reducing the drainage capacity of those waterbodies.

Consequence Analysis

Table 2.42 summarizes the potential detrimental consequences of flood.

Table 2.42 – Consequence Analysis - Flood

Category	Consequences
Public	Localized impact expected to be severe for incident areas and moderate to light for other adversely affected areas.
Responders	First responders are at risk when attempting to rescue people from their homes. They are subject to the same health hazards as the public. Flood waters may

Category	Consequences
	prevent access to areas in need of response or the flood may prevent access to the critical facilities themselves which may prolong response time. Damage to personnel will generally be localized to those in the flood areas at the time of the incident and is expected to be limited.
Continuity of Operations (including Continued Delivery of Services)	Floods can severely disrupt normal operations, especially when there is a loss of power. Damage to facilities in the affected area may require temporary relocation of some operations. Localized disruption of roads, facilities, and/or utilities caused by incident may postpone delivery of some services.
Property, Facilities and Infrastructure	Buildings and infrastructure, including transportation and utility infrastructure, may be damaged or destroyed. Impacts are expected to be localized to the area of the incident. Severe damage is possible.
Environment	Chemicals and other hazardous substances may contaminate local water bodies. Wildlife and livestock deaths possible. The localized impact is expected to be severe for incident areas and moderate to light for other areas affected by the flood or HazMat spills.
Economic Condition of the Jurisdiction	Local economy and finances will be adversely affected, possibly for an extended period of time. During floods (especially flash floods), roads, bridges, farms, houses and automobiles are destroyed. Additionally, the local government must deploy firemen, police and other emergency response personnel and equipment to help the affected area. It may take years for the affected communities to be re-built and business to return to normal.
Public Confidence in the Jurisdiction's Governance	Ability to respond and recover may be questioned and challenged if planning, response, and recovery are not timely and effective.

Hazard Summary by Jurisdiction

The following table summarizes flood hazard risk by jurisdiction. Flood risk due to storm surge, high tide flooding, flash flooding, and stormwater flooding exists across the entire county. All participating jurisdictions have at least some area in SFHA and are thus exposed to a high risk of flooding; given that other sources of flooding and other levels of flooding may occur beyond these areas, the spatial extent was considered moderate for all jurisdictions. Impact ratings were based upon Hazus loss estimates; only Bloomingdale had an overall loss estimate below 10% and was rated with an impact of limited, while remaining jurisdictions were rated with an impact of critical. All communities also face a uniform probability of flooding.

Jurisdiction	Probability	Impact	Spatial Extent	Warning Time	Duration	Score	Priority
Chatham County	4	3	3	3	3	3.3	H
Bloomingdale	4	2	3	3	3	3.0	H
Garden City	4	3	3	3	3	3.3	H
Pooler	4	3	3	3	3	3.3	H
Port Wentworth	4	3	3	3	3	3.3	H
Savannah	4	3	3	3	3	3.3	H
Thunderbolt	4	3	3	3	3	3.3	H
Tybee Island	4	3	3	3	3	3.3	H
Vernonburg	4	3	3	3	3	3.3	H

2.5.7 Hurricane

Hazard Background

Hurricanes and tropical storms are classified as cyclones and defined as any closed circulation developing around a low-pressure center in which the winds rotate counter-clockwise in the Northern Hemisphere (or clockwise in the Southern Hemisphere) and whose diameter averages 10 to 30 miles across. A tropical cyclone refers to any such circulation that develops over tropical waters. Tropical cyclones act as a "safety-valve," limiting the continued build-up of heat and energy in tropical regions by maintaining the atmospheric heat and moisture balance between the tropics and the pole-ward latitudes. The primary damaging forces associated with these storms are high-level sustained winds, heavy precipitation, and tornadoes.

The key energy source for a tropical cyclone is the release of latent heat from the condensation of warm water. Their formation requires a low-pressure disturbance, warm sea surface temperature, rotational force from the spinning of the earth, and the absence of wind shear in the lowest 50,000 feet of the atmosphere. The majority of hurricanes and tropical storms form in the Atlantic Ocean, Caribbean Sea, and Gulf of Mexico during the official Atlantic hurricane season, which encompasses the months of June through November. The peak of the Atlantic hurricane season is in early to mid-September and the average number of storms that reach hurricane intensity per year in the Atlantic basin is about six.

While hurricanes pose the greatest threat to life and property, tropical storms and depressions also can be devastating. 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.

- **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.

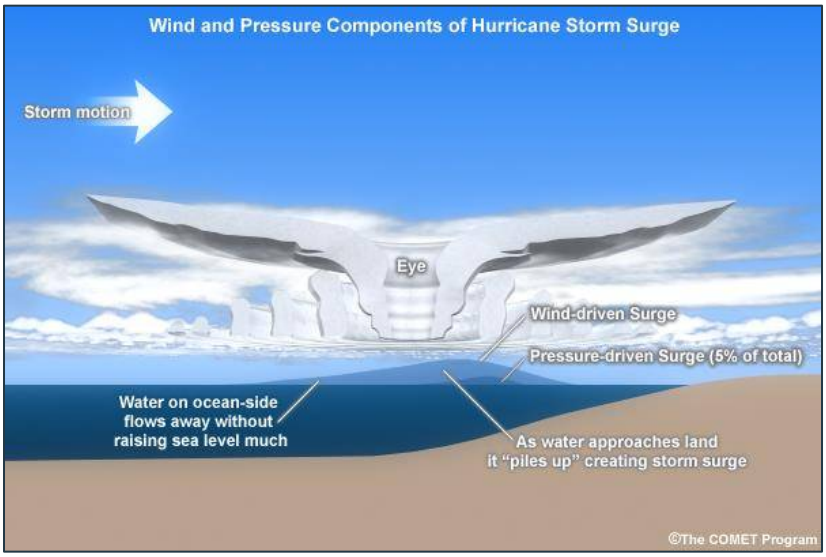
As an incipient hurricane develops, barometric pressure (measured in millibars or inches) at its center falls and winds increase. If the atmospheric and oceanic conditions are favorable, it can intensify into a tropical depression. When maximum sustained winds reach or exceed 39 miles per hour, the system is designated a tropical storm, given a name, and is monitored by the National Hurricane Center in Miami, Florida. When sustained winds reach or exceed 74 miles per hour the storm is deemed a hurricane. Hurricanes are given a classification based on the Saffir-Simpson Scale; this scale is reproduced in Table 2.43.

The greatest potential for loss of life related to a hurricane is from the storm surge. Storm surge is water that is pushed toward the shore by the force of the winds swirling around the storm as shown in Figure 2.17. 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 location depends on several 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 and the depth of the ocean bottom. A narrow shelf, or one that drops steeply from the shoreline and subsequently produces deep water close to the shoreline, tends to produce a lower surge but higher and more powerful storm waves. A shallow slope, as is found off the coast of Chatham County, will produce a greater storm surge than a steep shelf.

Figure 2.17 – Components of Hurricane Storm Surge



Source: NOAA/The COMET Program

Damage during hurricanes may also result from inland flooding from associated heavy rainfall.

Similar to hurricanes, nor'easters are ocean storms capable of causing substantial damage to coastal areas in the Eastern United States due to their strong winds and heavy surf. Nor'easters are named for the winds that blow in from the northeast and drive the storm up the East Coast along the Gulf Stream. They are caused by the interaction of the jet stream with horizontal temperature gradients and generally occur during the fall and winter months when moisture and cold air are plentiful.

Nor'easters are known for dumping heavy amounts of rain and snow, producing hurricane-force winds, and creating high surf that causes severe beach erosion and coastal flooding. There are two main components to a nor'easter: (1) a Gulf Stream low-pressure system (counter-clockwise winds) generated off the southeastern U.S. coast, gathering warm air and moisture from the Atlantic, and pulled up the East Coast by strong northeasterly winds at the leading edge of the storm; and (2) an Arctic high-pressure system (clockwise winds) which meets the low-pressure system with cold, arctic air blowing down from Canada. When the two systems collide, the moisture and cold air produce a mix of precipitation and can produce dangerously high winds and heavy seas. As the low-pressure system deepens, the intensity of the winds and waves increases and can cause serious damage to coastal areas as the storm moves northeast.

Warning Time: 1 – More than 24 hours

Duration: 3 – Less than 1 week

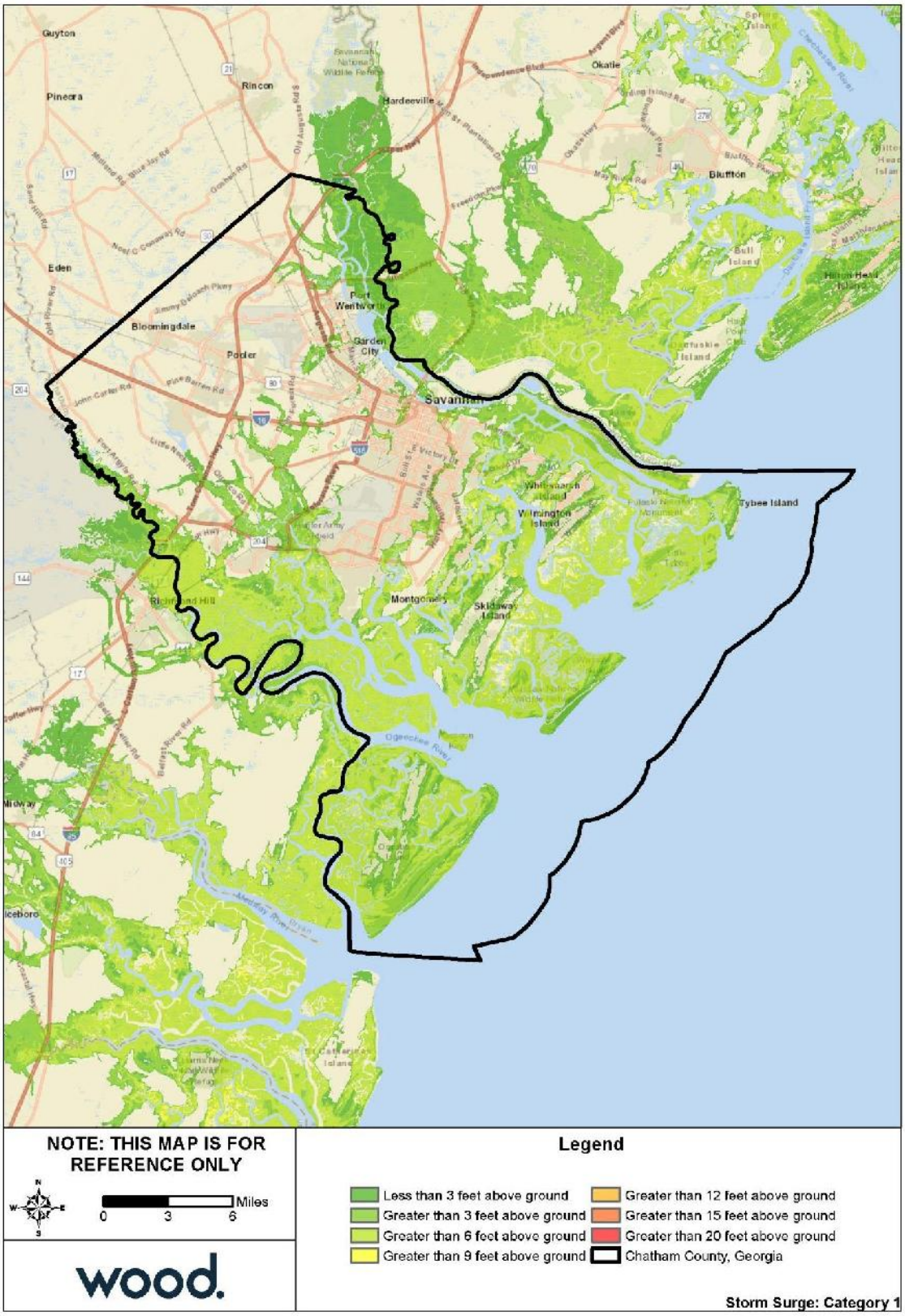
Location

Hurricanes and tropical storms can occur anywhere within the Chatham County planning area. While coastal areas are most vulnerable to hurricanes, their wind and rain impacts can be felt hundreds of miles

inland. Storm surge impacts are more limited, affecting areas along coastal and estuarine shorelines and reaching further inland depending on the height of the surge. All of Chatham County is vulnerable to hurricane and tropical storm surge, but to varying degrees, with areas closer to the coast and water bodies that drain into the coast (namely the Savannah and Ogeechee Rivers and their tributaries) facing greater risk than areas further inland.

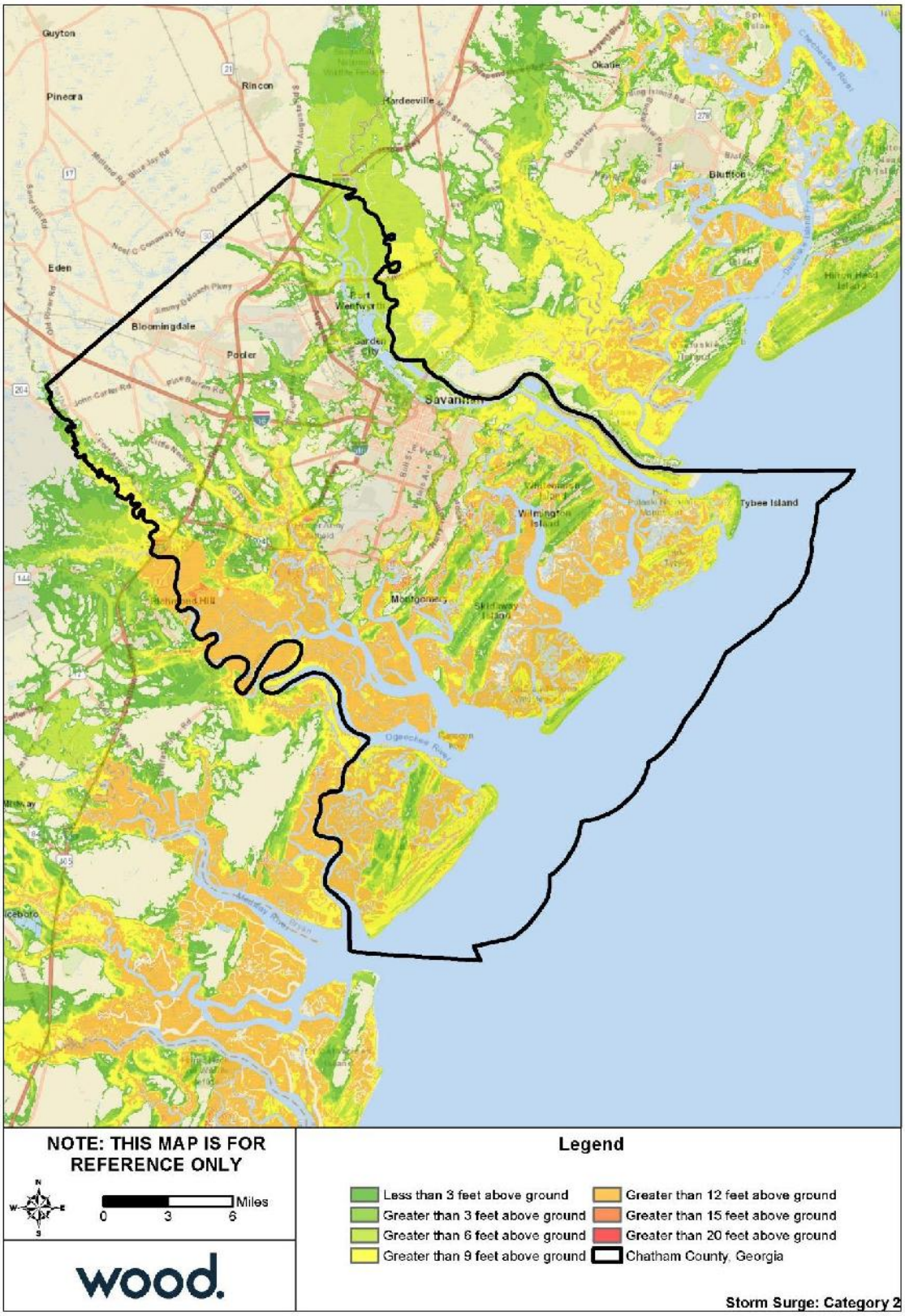
Figure 2.18 through Figure 2.22 show the estimated extent of surge by storm category according to NOAA Sea, Lake, and Overland Surges from Hurricanes (SLOSH) data. the SLOSH model is a computerized numerical model developed by the National Weather Service to estimate storm surge heights resulting from historical, hypothetical, or predicted hurricanes by taking into account the atmospheric pressure, size, forward speed, and track data. The model creates 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. Note that the MOM does not illustrate the storm surge that will occur from any given storm but rather the full potential extent of surge from all possible storms. As shown in these maps, Chatham County is vulnerable to storm surge impacts from all storm categories.

Figure 2.18 – Category 1 Storm Surge Inundation



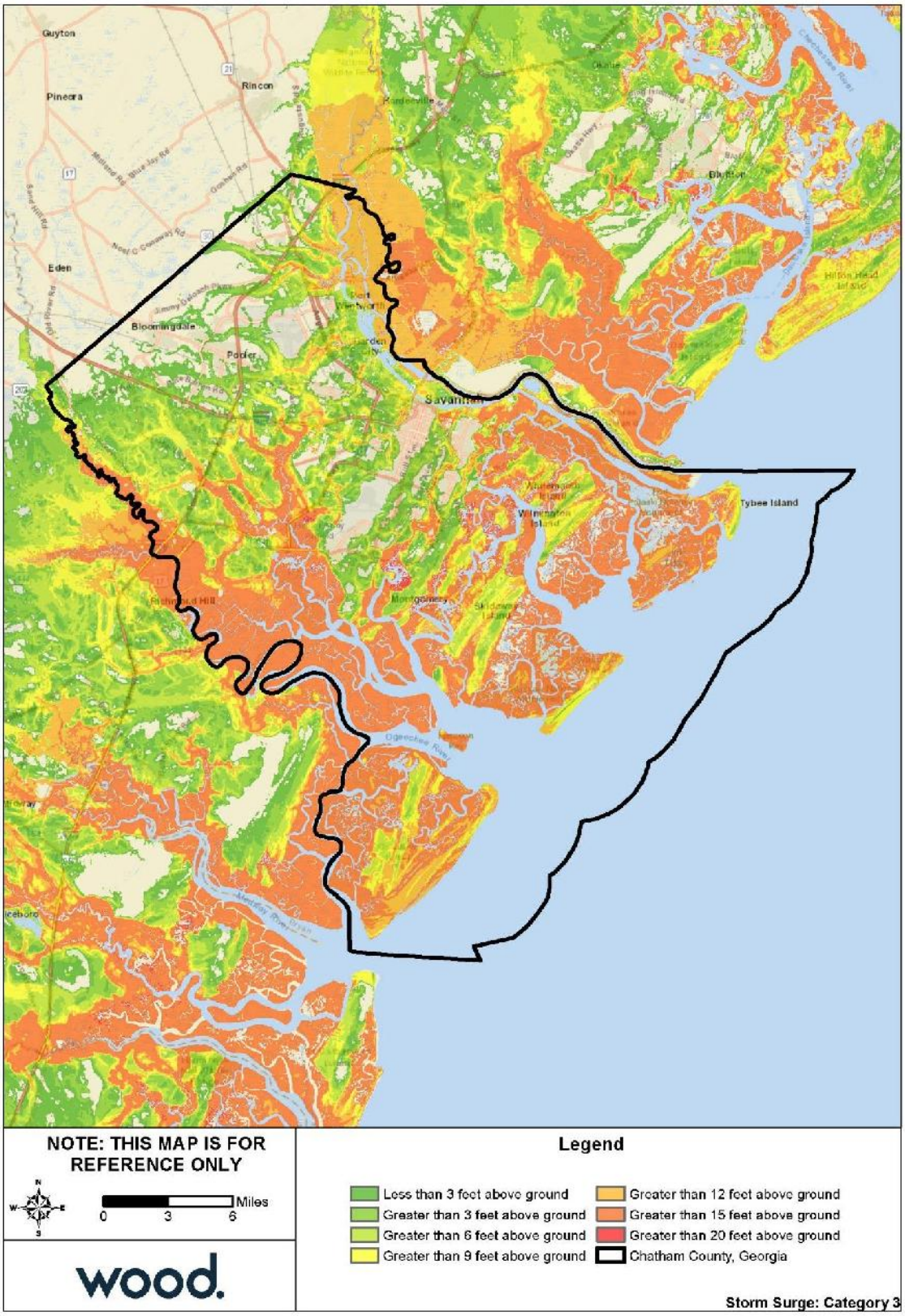
Source: NOAA National Storm Surge Hazard Maps – Version 2

Figure 2.19 – Category 2 Storm Surge Inundation



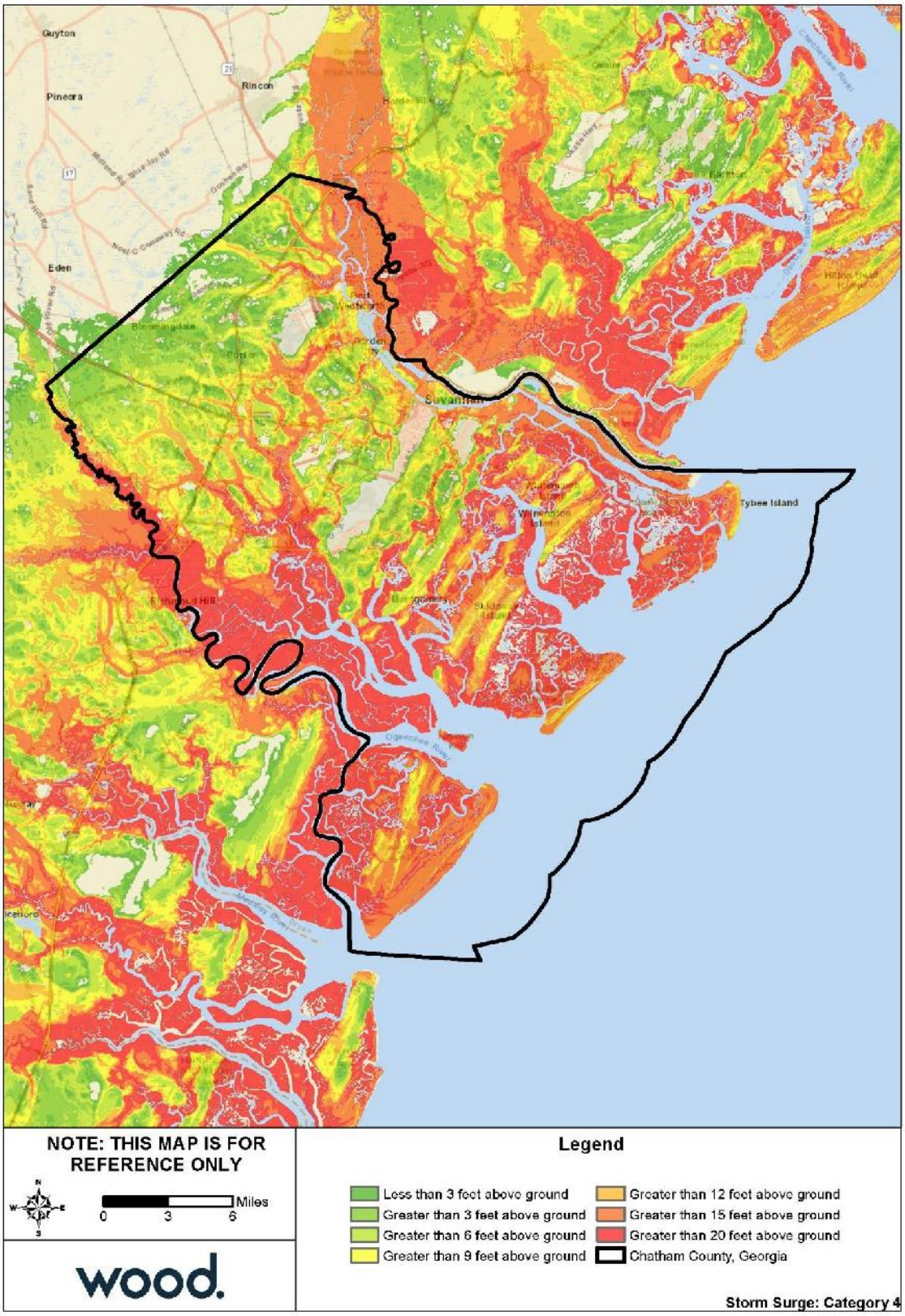
Source: NOAA National Storm Surge Hazard Maps – Version 2

Figure 2.20 – Category 3 Storm Surge Inundation



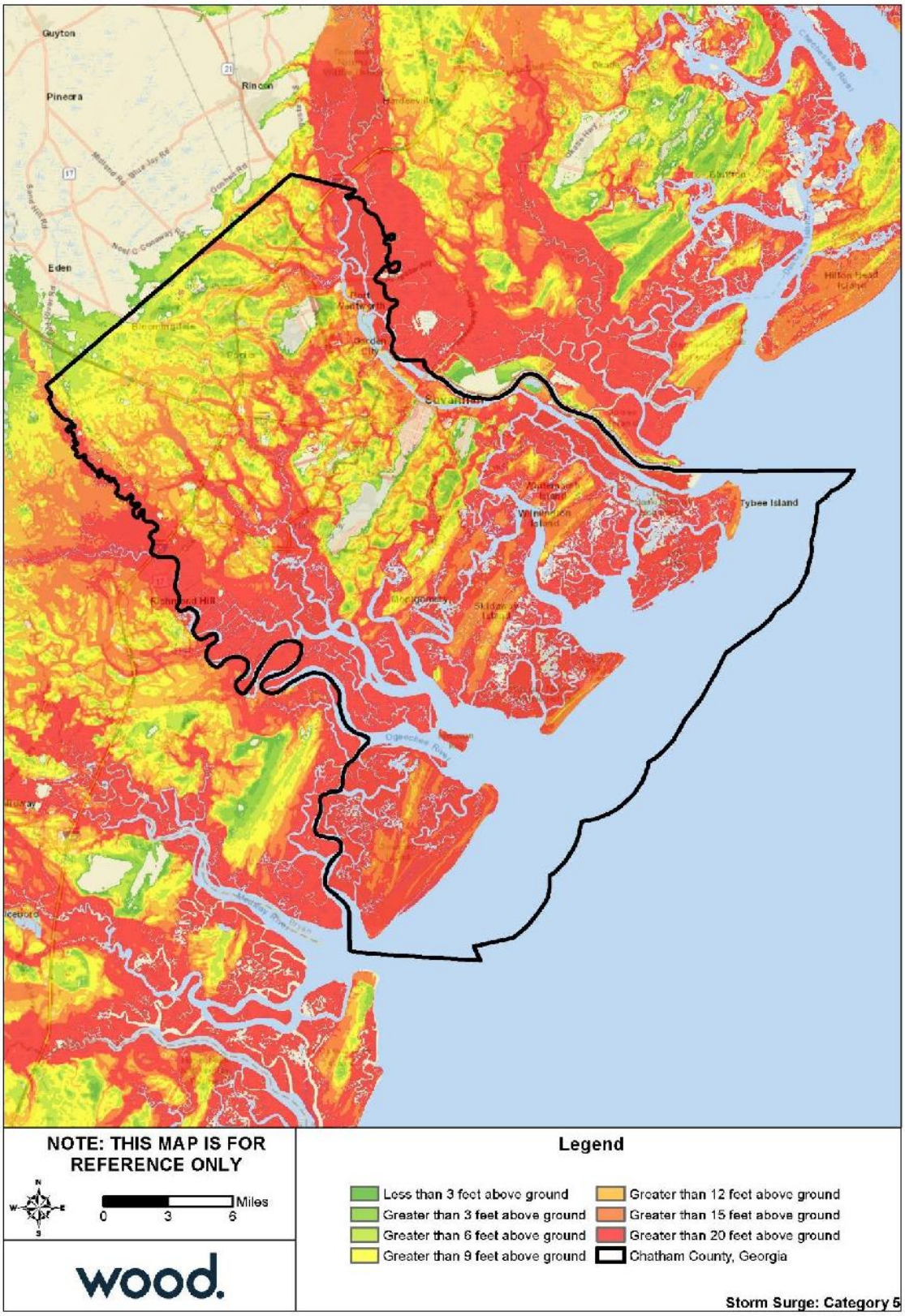
Source: NOAA National Storm Surge Hazard Maps – Version 2

Figure 2.21 – Category 4 Storm Surge Inundation



Source: NOAA National Storm Surge Hazard Maps – Version 2

Figure 2.22 – Category 5 Storm Surge Inundation



Source: NOAA National Storm Surge Hazard Maps – Version 2

Extent

As an incipient hurricane develops, barometric pressure (measured in millibars or inches) at its center falls and winds increase. If the atmospheric and oceanic conditions are favorable, it can intensify into a tropical depression. When maximum sustained winds reach or exceed 39 miles per hour, the system is designated a tropical storm, given a name, and is closely monitored by the National Hurricane Center in Miami, Florida. When sustained winds reach or exceed 74 miles per hour the storm is deemed a hurricane. Hurricane intensity is further classified by the Saffir-Simpson Scale (Table 2.43), which rates hurricane intensity on a scale of 1 to 5, with 5 being the most intense.

Table 2.43 – Saffir-Simpson Scale

Category	Maximum Sustained Wind Speed (MPH)	Types of 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	157 +	Catastrophic damage will occur; A high percentage of framed homes will be destroyed, with total roof failure and 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

The Saffir-Simpson Scale categorizes hurricane intensity linearly based upon maximum sustained winds and barometric pressure, which are combined to estimate potential damage. Categories 3, 4, and 5 are classified as “major” hurricanes and, while hurricanes within this range comprise only 20 percent of total tropical cyclone landfalls, they account for over 70 percent of the damage in the United States. Table 2.44 describes the damage that could be expected for each category of hurricane. Damage during hurricanes may also result from spawned tornadoes, storm surge, and inland flooding associated with heavy rainfall that usually accompanies these storms.

Table 2.44 – Hurricane Damage Classifications

Storm Category	Damage Level	Description of Damages	Photo Example
1	MINIMAL	No real damage to building structures. Damage primarily to unanchored mobile homes, shrubbery, and trees. Also, some coastal flooding and minor pier damage.	
2	MODERATE	Some roofing material, door, and window damage. Considerable damage to vegetation, mobile homes, etc. Flooding damages piers and small craft in unprotected moorings may break their moorings.	
3	EXTENSIVE	Some structural damage to small residences and utility buildings, with a minor amount of curtainwall failures. Mobile homes are destroyed. Flooding near the coast destroys smaller structures, with larger structures damaged by floating debris. Terrain may be flooded well inland.	
4	EXTREME	More extensive curtainwall failures with some complete roof structure failure on small residences. Major erosion of beach areas. Terrain may be flooded well inland.	
5	CATASTROPHIC	Complete roof failure on many residences and industrial buildings. Some complete building failures with small utility buildings blown over or away. Flooding causes major damage to lower floors of all structures near the shoreline. Massive evacuation of residential areas may be required.	

Source: National Hurricane Center; Federal Emergency Management Agency

The Saffir-Simpson scale provides a measure of extent of a hurricane. The county is susceptible to the full force of every category of hurricane.

Impact: 4 – Catastrophic

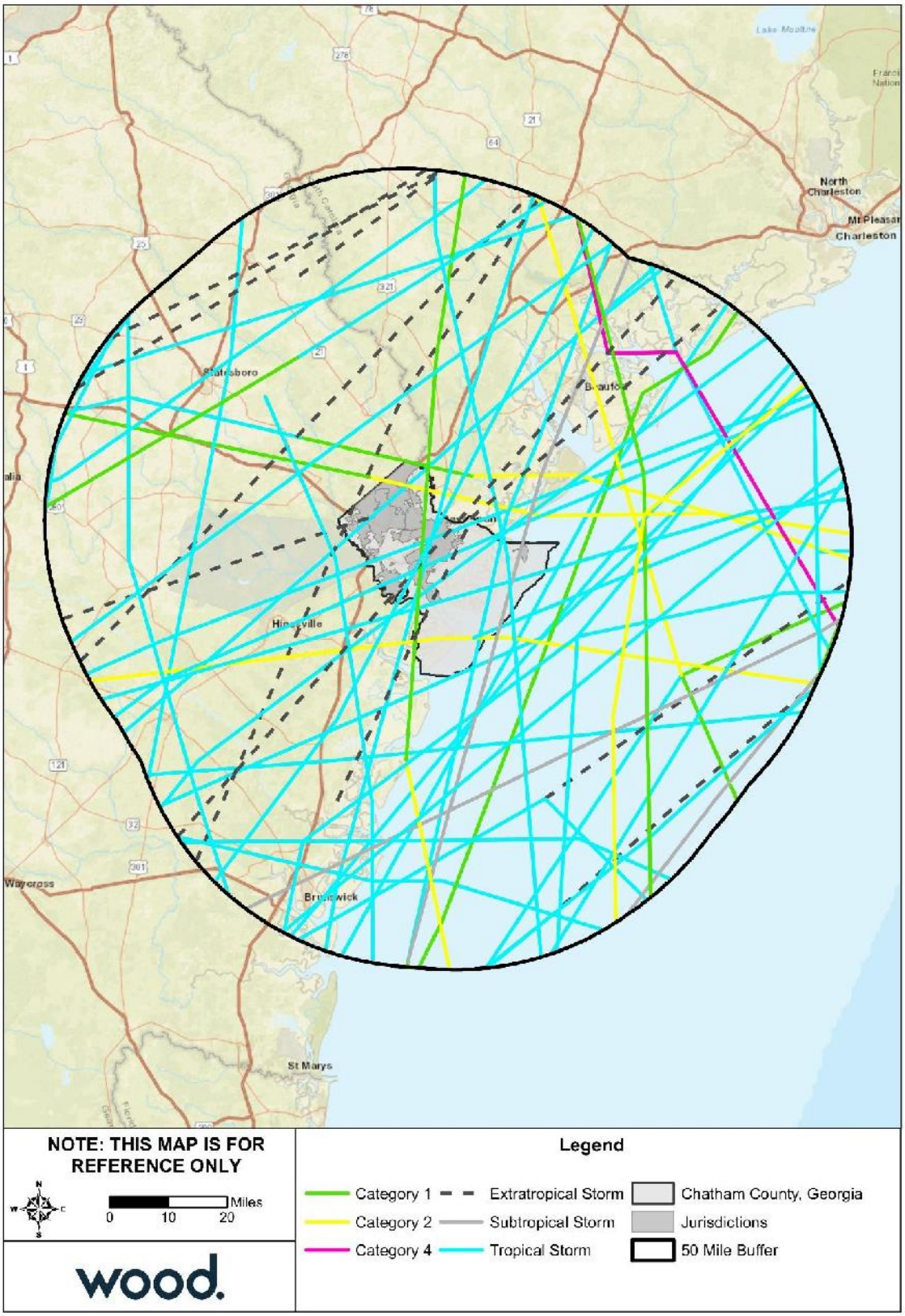
Spatial Extent: 4 – Large

Historical Occurrences

Chatham County has experienced two FEMA Major Disaster Declarations for hurricanes, for Hurricane Irma in 2017 and Hurricane Matthew in 2016, as well as six Emergency Declarations (in 1999, 2005, 2016, 2017, 2019, and 2019). According to the Office of Coastal Management's Tropical Cyclone Storm Segments data, which is a subset of the International Best Track Archive for Climate Stewardship (IBTrACS) dataset, 60 hurricanes and tropical storms passed within 50 miles of Chatham County between 1900 and 2016. These storm tracks are shown in Figure 2.23.

NOAA's Historical Hurricane Tracks database inventories storm tracks since 1850. The date, storm name, storm category, and maximum wind speed of storms that have passed within 75 miles of Chatham County since 1850 are detailed in Table 2.45. In total, NOAA has records of 145 storm tracks passing within 75 miles of Chatham County between 1850 and 2020.

Figure 2.23 – Hurricane/Tropical Storm Tracks within 50 miles of Chatham County, 1900-2016



Source: Office of Coastal Management, 2019; Digital Coast; https://marinecadastre.gov/data/

Table 2.45 – Tropical Cyclone Tracks Passing within 75 Miles of Chatham County, 1850-2020

Storm Name	Date	Max Storm Category*	Max Wind Speed (kts)
Unnamed	8/24/1851	Tropical Storm	100
Unnamed	10/10/1852	Tropical Storm	90
Not Named	9/3/1853	Tropical Storm	55
Unnamed	10/21/1853	Category 2	90
Unnamed	9/8/1854	Category 3	110
Unnamed	8/31/1856	Tropical Storm	100
Unnamed	8/14/1860	Tropical Storm	110
Not Named	9/27/1861	Category 1	70
Not Named	11/2/1861	Extratropical Storm	60
Not Named	9/17/1863	Tropical Storm	55
Unnamed	6/22/1867	Category 1	70
Not Named	8/14/1867	Tropical Depression	45
Unnamed	10/7/1867	Tropical Storm	90
Unnamed	10/5/1868	Tropical Storm	60
Unnamed	8/19/1871	Tropical Storm	100
Unnamed	8/29/1871	Tropical Storm	100
Unnamed	9/7/1871	Tropical Storm	70
Unnamed	10/6/1871	Tropical Storm	70
Unnamed	6/2/1873	Tropical Storm	40
Unnamed	9/19/1873	Tropical Storm	70
Unnamed	9/28/1874	Category 1	80
Unnamed	9/20/1877	Tropical Storm	70
Unnamed	10/3/1877	Tropical Storm	100
Unnamed	9/11/1878	Category 1	90
Unnamed	10/11/1878	Tropical Storm	70
Not Named	9/14/1879	Tropical Depression	55
Unnamed	9/9/1880	Tropical Storm	70
Unnamed	8/27/1881	Category 2	90
Unnamed	10/11/1882	Tropical Storm	120
Not Named	10/13/1883	Extratropical Storm	55
Unnamed	9/10/1884	Tropical Storm	80
Unnamed	8/24/1885	Category 2	90
Unnamed	8/31/1885	Tropical Storm	50
Unnamed	9/21/1885	Tropical Storm	80
Unnamed	10/12/1885	Tropical Storm	60
Unnamed	7/1/1886	Tropical Storm	85
Unnamed	9/9/1888	Tropical Storm	50
Unnamed	10/11/1888	Category 1	95
Unnamed	6/18/1889	Tropical Storm	65
Unnamed	6/16/1893	Tropical Storm	65
Unnamed	8/27/1893	Category 3	105
Unnamed	10/12/1893	Category 3	105
Unnamed	9/26/1894	Category 1	105
Unnamed	10/9/1894	Category 1	105
Unnamed	9/29/1896	Category 3	110
Unnamed	8/31/1898	Category 1	75
Unnamed	10/2/1898	Category 4	115
Unnamed	10/12/1900	Tropical Storm	40

Storm Name	Date	Max Storm Category*	Max Wind Speed (kts)
Unnamed	9/18/1901	Tropical Storm	70
Unnamed	6/15/1902	Tropical Storm	50
Unnamed	11/4/1904	Tropical Depression	45
Unnamed	10/20/1906	Category 1	105
Unnamed	6/29/1907	Tropical Storm	55
Unnamed	9/29/1907	Tropical Storm	45
Unnamed	7/2/1909	Tropical Depression	45
Unnamed	10/19/1910	Tropical Storm	130
Unnamed	8/5/1911	Tropical Depression	50
Unnamed	8/28/1911	Category 2	85
Unnamed	7/15/1912	Tropical Storm	45
Unnamed	9/6/1912	Tropical Depression	45
Unnamed	8/3/1915	Tropical Storm	65
Unnamed	5/16/1916	Tropical Storm	40
Unnamed	10/4/1916	Tropical Storm	50
Unnamed	9/30/1917	Tropical Storm	130
Unnamed	10/1/1919	Tropical Storm	40
Unnamed	6/27/1923	Tropical Storm	50
Unnamed	9/16/1924	Tropical Storm	75
Unnamed	9/30/1924	Extratropical Storm	55
Unnamed	10/3/1927	Tropical Storm	50
Unnamed	9/18/1928	Category 1	140
Unnamed	10/1/1929	Extratropical Storm	135
Unnamed	9/15/1932	Tropical Storm	120
Unnamed	9/6/1933	Tropical Storm	120
Unnamed	7/22/1934	Tropical Depression	75
Unnamed	9/5/1935	Tropical Storm	160
Unnamed	8/11/1940	Category 2	85
Unnamed	10/8/1941	Tropical Storm	105
Unnamed	10/19/1944	Tropical Storm	125
Unnamed	9/17/1945	Category 1	115
Unnamed	10/8/1946	Tropical Storm	85
Unnamed	11/3/1946	Tropical Depression	40
Unnamed	9/24/1947	Extratropical Storm	55
Unnamed	10/7/1947	Tropical Storm	50
Unnamed	10/15/1947	Category 2	90
Love	10/22/1950	Tropical Depression	70
Able	8/31/1952	Category 2	85
Unnamed	9/1/1953	Tropical Storm	35
Florence	9/27/1953	Extratropical Storm	100
Unnamed	7/10/1954	Tropical Storm	45
Flossy	9/26/1956	Extratropical Storm	80
Unnamed	6/9/1957	Tropical Storm	55
Gracie	9/29/1959	Category 4	115
Brenda	7/29/1960	Tropical Storm	60
Ginny	10/25/1963	Category 1	95
Cleo	8/29/1964	Tropical Storm	130
Dora	9/13/1964	Tropical Storm	115
Hilda	10/5/1964	Extraterritorial Storm	120

Storm Name	Date	Max Storm Category*	Max Wind Speed (kts)
Alma	6/10/1966	Tropical Storm	110
Abby	6/7/1968	Tropical Storm	65
Unnamed	9/1/1968	Tropical Depression	25
Alma	5/25/1970	Tropical Depression	70
Unnamed	9/11/1971	Tropical Depression	25
Alpha	5/28/1972	Tropical Storm	60
Dawn	9/13/1972	Tropical Depression	70
Hallie	10/26/1975	Tropical Depression	45
Unnamed	5/24/1976	Tropical Storm	45
Dottie	8/20/1976	Tropical Storm	45
Unnamed	9/15/1976	Tropical Storm	40
Clara	9/5/1977	Tropical Depression	65
Unnamed	6/16/1979	Tropical Depression	30
David	9/4/1979	Category 2	150
Unnamed	7/3/1981	Tropical Depression	30
Dennis	8/19/1981	Tropical Storm	70
Unnamed	6/18/1982	Tropical Storm	60
Isidore	9/29/1984	Tropical Storm	50
Bob	7/24/1985	Category 1	65
Claudette	8/9/1985	Tropical Depression	75
Isabel	10/11/1985	Tropical Storm	60
Kate	11/22/1985	Category 1	105
Charley	8/15/1986	Tropical Depression	70
Unnamed	8/17/1987	Tropical Depression	40
Chris	8/28/1988	Tropical Storm	45
Ana	7/2/1991	Tropical Depression	45
Gordon	11/21/1994	Tropical Depression	75
Allison	6/6/1995	Tropical Depression	65
Josephine	10/8/1996	Extratropical Storm	60
Earl	9/3/1998	Tropical Storm	85
Gordon	9/18/2000	Tropical Depression	70
Kyle	10/11/2002	Tropical Storm	40
Unnamed	7/26/2003	Tropical Depression	30
Bonnie	8/13/2004	Tropical Depression	55
Charley	8/14/2004	Category 1	130
Alberto	6/14/2006	Tropical Storm	60
Barry	6/3/2007	Tropical Depression	50
Cristobal	7/19/2008	Tropical Depression	55
Beryl	5/30/2012	Tropical Storm	60
Andrea	6/7/2013	Tropical Storm	55
Bonnie	5/29/2016	Tropical Storm	40
Colin	6/7/2016	Tropical Storm	45
Hermine	9/2/2016	Tropical Storm	70
Julia	9/14/2016	Tropical Storm	45
Matthew	10/8/2016	Category 3	135
Not Named	8/28/2017	Tropical Storm	35
Nestor	10/20/2019	Extratropical Storm	50

*Reports the most intense category that occurred within 75 miles of Chatham County, not for the storm event overall.
Source: Office of Coastal Management, 2019; Historical Hurricane Tracks

The above map of storms is not an exhaustive list of hurricanes that have affected Chatham County. Several storms have passed further than 75 miles away from the County yet had strong enough wind or rain to cause impacts. NCEI records hurricane and tropical storm events across the region by county and zone; therefore, one event that impacts multiple jurisdictions may be recorded multiple times. During the 21-year period from 1999 through 2019, NCEI records 16 hurricanes and tropical storms across 15 separate days. These events are summarized in Table 2.46. Where property damage estimates were broken out by type, NCEI reports only the value of wind-related damages, however flooding associated with such events often causes the majority of damage. Event narratives following this table provide a fuller scope of the impacts from selected events.

Table 2.46 – NCEI Recorded Hurricanes and Tropical Storms in Chatham County, 1999-2019

Date	Storm	Deaths/ Injuries	Property Damage	Crop Damage
9/15/1999	Hurricane Floyd	0/0	$0	$0
9/27/2004	Tropical Storm Jeanne	0/0	$0	$0
10/5/2005	Tropical Storm Tammy	0/0	$0	$0
6/12/2006	Tropical Storm Alberto	0/0	$0	$0
8/30/2006	Tropical Storm Ernesto	0/0	$0	$0
8/21/2008	Tropical Storm Fay	0/0	$4,500	$0
5/27/2012	Tropical Storm Beryl	0/0	$2,500	$0
6/6-6/7/2013	Tropical Storm Andrea	0/0	$7,500	$0
9/2/2016	Tropical Storm Hermine	0/0	$0	$0
10/7-10/8/2016	Hurricane Matthew	0/0	$0	$0
9/11/2017	Hurricane Irma	0/0	$5,000,000	$0
10/10/2018	Tropical Storm Michael	0/0	$0	$0
9/4/2019	Tropical Storm Dorian	0/0	$0	$0
	Total	**0/0**	**$5,014,500**	**$0**

Source: NCEI

September 15, 1999 – 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 was 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 6-7, 2013 – Tropical Storm Andrea lifted northeast out of the Gulf of Mexico Thursday night and over southeast Georgia and southeast South Carolina into Friday. Periods of heavy rain and damaging wind gusts occurred with showers and thunderstorms associated with the tropical system as it passed over the area and eventually to the northeastern United States. The storm winds caused many downed trees and limbs. One tree fell and blocked a roadway, and another fell on the corner of a house.

September 2, 2016 – Hermine developed as a Tropical Depression near the north coast of Cuba on August 28th. According to the National Hurricane Center, Hermine made landfall as a Category 1 Hurricane at 1:30 am EDT on September 2nd along the Florida Big Bend coast. Across southeast Georgia and southeast South Carolina, the main impacts from Hermine included heavy rain and wind damage in the form of scattered to numerous trees being blown down. Storm total rainfall amounts generally ranged from 2 to 8 inches across the region. The wind damage produced numerous power outages and even some damage to homes and other structures throughout the area. Hermine spawned 2 tornadoes and produced a 1.5

to 2.5-foot storm surge along the coast, though no flooding was reported. Chatham County Emergency Management Agency reported trees down throughout the county. At Hunter Army Airfield, trees were blown down across the base with numerous power outages. One tree fell on a house along Florance Street in downtown Savannah which caused significant structural damage. Heavy rain also caused some roofs to leak. The ASOS site at KSAV measured a peak wind gust of 55 miles per hour and the AWOS site at KSVN measured a peak wind gust of 49 miles per hour. One tree fell on a house along Florance Street in downtown Savannah which caused significant structural damage. Mesonet observation sites in the coastal portion of Chatham County measured peak wind gusts ranging from 54 to 63 miles per hour.

September 11, 2017 – Irma first developed into a tropical storm on August 30th about 420 miles west of the Cabo Verde Islands, and within 24 hours strengthened into a hurricane. Irma continued to intensify and officially made landfall at Marco Island, FL at 3:35 pm September 10 as a Category 3 hurricane. Irma steadily weakened and was downgraded to a tropical storm near the big bend of Florida at 8:00 am on September 11th. Through the rest of September 11th, Irma tracked to the northwest into southern Georgia and widespread impacts occurred across the Southeast due to heavy rainfall, strong winds, tornadoes, and storm surge. Feeder bands around Irma continuously moved onshore on September 11th and produced very heavy rainfall rates with rainfall totals generally ranging from 3 to 9 inches. The peak storm total rainfall of 4.74" was recorded at the Savannah-Hilton Head International Airport (KSAV). This widespread heavy rain resulted in several reports of flash flooding with water entering homes and businesses.

Wind damage produced numerous power outages across the region with some damage to structures and numerous downed trees. The strongest winds were confined to coastal locations, but frequent gusts into the 40-50 mph range occurred well inland. Wind speeds were high across the county with gusts of up to 70 mph. Inland, gusts were up to 63 mph with sustained wind speeds as high as 49 mph. The entire southeast Georgia coast was impacted by storm surge generally ranging from 3 to 6 feet. A peak surge of 5.63 feet occurred at the Fort Pulaski tide gauge at 5:42 am. Significant beach erosion occurred at area beaches with widespread damage to docks and piers all along the coast, as well as numerous reports of inundated roadways. According to data received from the Georgia Emergency Management Agency, total damages from Irma in southeast Georgia were $29,150,000. This includes $20,000,000 in Chatham County.

September 4, 2019 – Chatham County Emergency Management Agency reported numerous trees down across the entire county due to strong winds associated with Hurricane Dorian. Some power lines were also down causing isolated to scattered power outages. The Weatherflow site on the north end of Tybee Island measured peak sustained winds of 38 mph and a peak wind gust of 60 mph. The Weatherflow site on the south end of Tybee Island measured peak sustained winds of 41 mph and a peak wind gust of 55 mph. The NOS tide gauge at Fort Pulaski measured peak sustained winds of 44 mph and a peak wind gust of 58 mph.

In addition to wind impacts, Chatham County is vulnerable to damage from storm surge flooding caused by hurricanes. Historical records of storm surge damages are compiled in Section 2.5.6 Flood.

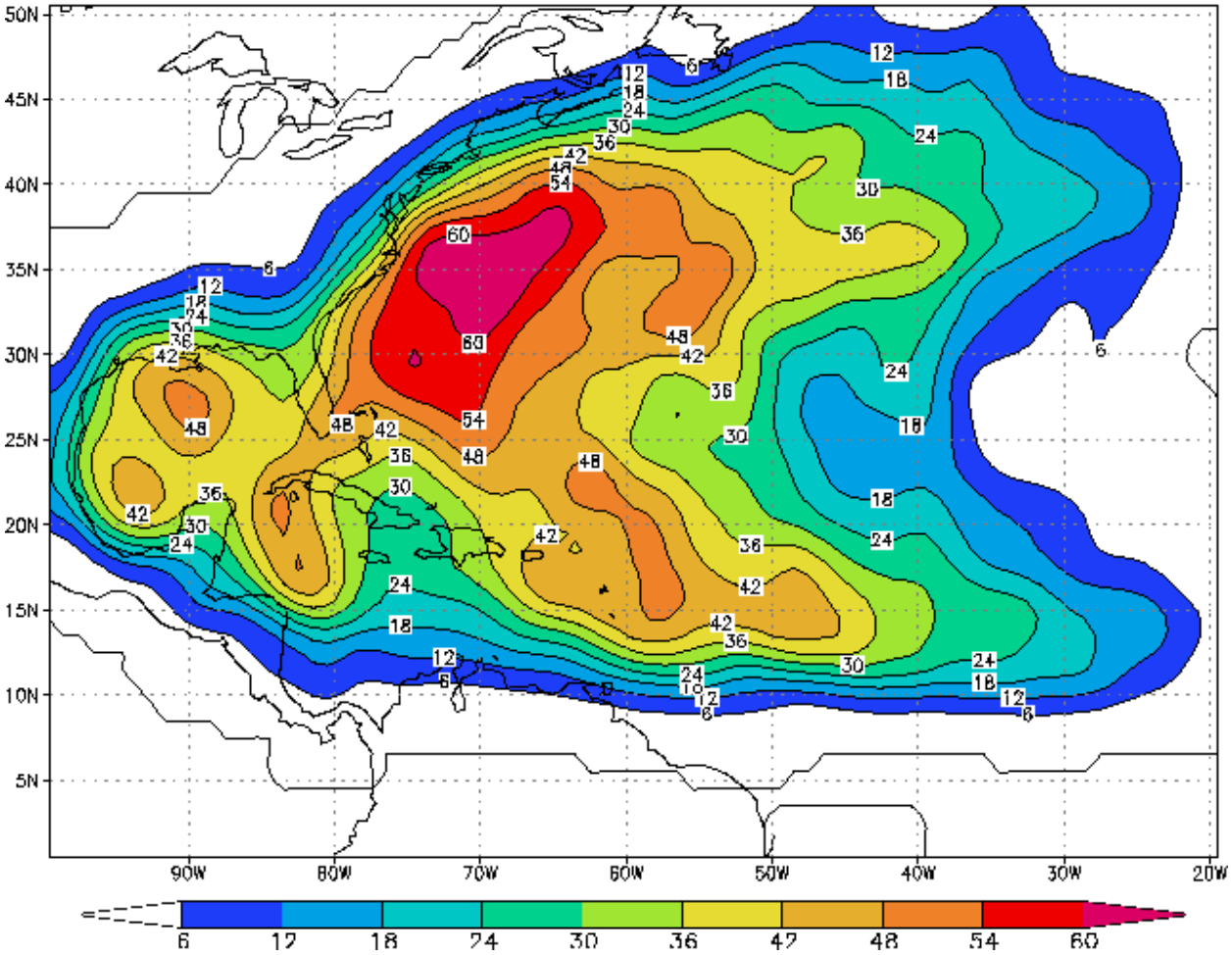
Probability of Future Occurrence

Probability: 3 – Likely

In the 21-year period from 1999 through 2019, 16 hurricanes and tropical storms have impacted Chatham County, which equates to a 76 percent annual probability of hurricane or tropical storm force winds impacting the planning area in any given year. This probability does not account for impacts from hurricane rains or storm surge, which may also be severe. The probability of a hurricane or tropical storm impacting Chatham County is likely.

Figure 2.24 shows, for any particular location, the chance of a hurricane or tropical storm affecting the area sometime during the Atlantic hurricane season. The figure was created by the National Oceanic and Atmospheric Administration's (NOAA) Hurricane Research Division, using data from 1944 to 1999. The figure shows the number of times a storm or hurricane was located within approximately 100 miles (165 kilometers) of a given spot in the Atlantic basin.

Figure 2.24 – Empirical Probability of a Named Hurricane or Tropical Storm



Source: National Oceanic and Atmospheric Administration, Hurricane Research Division

Georgia's 100 miles of coastland is shaped in a way that helps hide it from the direct hit of most storms. Direct hits do happen; however, they are less frequent than its coastal neighbors, Florida and North Carolina. The state is still vulnerable to the impacts of hurricanes and tropical storms as detailed in this section. Substantial hurricane damage is typically most likely to be expected in the easternmost counties of the state; however, hurricane and tropical storm-force winds have significantly impacted areas far inland.

Climate Change

Chatham County's coastal location makes it a prime target for hurricane landfalls and changing climate and weather conditions may increase the number and frequency of future hurricane events. Hurricanes and other coastal storms may result in increased flooding, injuries, deaths, and extreme property loss.

According to the US Government Accountability Office, national storm losses from changing frequency and intensity of storms is projected to increase anywhere from $4-6 billion in the near future.

According to NOAA, weather extremes will likely cause more frequent, stronger storms in the future due to rising surface temperatures. NOAA models predict that while there may be less frequent, low-category storm events (Tropical Storms, Category 1 Hurricanes), there will be more, high-category storm events (Category 4 and 5 Hurricanes) in the future. This means that there may be fewer hurricanes overall in any given year, but when hurricanes do form, it is more likely that they will become large storms that can create massive damage.

Vulnerability Assessment

Methodologies and Assumptions

Property at risk to hurricanes was estimated using general building stock information and 2010 Census data in Hazus. The vulnerability data displayed below is only for wind-related damages. Hurricanes may also cause substantial damages from heavy rains and subsequent flooding, which is addressed in Section 2.5.6 Flood.

People

The very young, the elderly and the handicapped are especially vulnerable to harm from hurricanes. For those who are unable to evacuate for medical reasons, there should be provision to take care of special-needs patients and those in hospitals and nursing homes. Many of these patients are either oxygen-dependent, insulin-dependent, or in need of intensive medical care. There is a need to provide ongoing treatment for these vulnerable citizens, either on the coast or by air evacuation to upland hospitals. The stress from disasters such as a hurricane can result in immediate and long-term physical and emotional health problems among victims.

Individuals in mobile homes are more vulnerable to hurricane winds, especially if their unit does not have tie downs and other wind safety measures. Overall, there are 5,600 mobile home units in Chatham County, detailed in Table 2.47. Over 10 percent of the housing stock in Bloomingdale, Garden City, and Port Wentworth is mobile home units. Additionally, there are over 1,000 mobile home units in unincorporated Chatham County and Savannah. These communities may face more severe impacts from hurricane events as a result.

Table 2.47 – Mobile Home Units by Jurisdiction, 2017

Jurisdiction	Total Housing Units	Mobile Home Units	Mobile Home Units, Percent of Total
Unincorporated Chatham County	39,171	2,261	5.8%
Bloomingdale	1,182	207	17.5%
Garden City	3,537	853	24.1%
Pooler	9,099	603	6.6%
Port Wentworth	3,154	382	12.1%
Savannah	62,775	1,182	1.9%
Thunderbolt	1,212	112	9.2%
Tybee Island	3,361	0	0.0%
Vernonburg	64	0	0.0%
Total	**123,555**	**5,600**	**4.5%**

Source: American Community Survey 2013-2017 5-Year Estimates

Property

Hurricanes can cause catastrophic damage to coastlines and several hundred miles inland. Hurricanes can produce winds exceeding 157 mph as well as tornadoes and microbursts. Additionally, hurricanes often bring intense rainfall that can result in flash flooding. Floods and flying debris from the excessive winds are often the deadly and most destructive results of hurricanes.

Hazus was used to determine hurricane risk based on probabilistic parameters for the 100-year and 500-year return periods. This analysis produced estimates of the likelihood of varying levels of damage as well as building-related economic losses. Note that Hazus only assesses hurricane wind and does not account for any other hazards associated with hurricane.

Table 2.48 and Table 2.49 provide the likelihood of damage at varying levels of severity by occupancy type. During the probabilistic hurricane event with a 100-year return period, it's estimated that less than 13% of buildings in the county are likely to sustain damages. During the 500-year return period event, over 62% of the county's buildings are likely to be damaged.

Table 2.48 – Likelihood of Damage by Severity and Occupancy, 100-year Hurricane Event

Occupancy	Buildings at Risk	Value at Risk	Likelihood of Damage (%)				
			None	Minor	Moderate	Severe	Destruction
Agriculture	5	$108,100	89.36%	8.12%	1.77%	0.71%	0.05%
Commercial	14,736	$7,293,007,333.40	90.52%	7.27%	1.81%	0.38%	0.02%
Industrial	3,500	$3,232,246,820.10	86.68%	8.60%	3.28%	1.31%	0.12%
Residential	92,182	$12,013,880,154.20	84.88%	13.47%	1.53%	0.08%	0.05%
Total	**110,423**	**$22,539,242,407.70**	**87.42%**	**9.79%**	**2.15%**	**0.58%**	**0.06%**

Source: Hazus

Table 2.49 – Likelihood of Damage by Severity and Occupancy, 500-year Hurricane Event

Occupancy	Buildings at Risk	Value at Risk	Likelihood of Damage (%)				
			None	Minor	Moderate	Severe	Destruction
Agriculture	5	$108,100	37.03%	31.00%	18.66%	10.98%	2.34%
Commercial	14,736	$7,293,007,333.40	43.24%	23.08%	20.53%	12.08%	1.07%
Industrial	3,500	$3,232,246,820.10	33.69%	20.59%	23.47%	18.81%	3.43%
Residential	92,182	$12,013,880,154.20	35.04%	39.85%	17.80%	4.85%	2.46%
Total	**110,423**	**$22,539,242,407.70**	**37.22%**	**28.52%**	**20.35%**	**11.58%**	**2.33%**

Source: Hazus

Table 2.50 details estimated property damages from the 100-year and 500-year hurricane wind events by occupancy type.

Table 2.50 – Estimated Property Damages, 100-year and 500-year Hurricane Wind Events

Area	Residential	Commercial	Industrial	Others	Total
100-year Hurricane Event					
Building	$338,629,830	$19,712,810	$2,911,310	$3,396,690	$364,650,640
Content	$86,369,740	$5,581,160	$1,228,150	$759,180	$93,938,240
Total	**$424,999,570**	**$25,293,970**	**$4,139,460**	**$4,155,870**	**$458,588,880**
500-year Hurricane Event					
Building	$2,324,212,640	$328,483,960	$66,286,180	$72,746,520	$2,791,729,290
Content	$817,242,110	$187,595,110	$50,297,420	$38,540,330	$1,093,674,970
Total	**$3,141,454,750**	**$516,079,070**	**$116,583,600**	**$111,286,850**	**$3,885,404,260**

Source: Hazus

Estimated property damages for the 100-year hurricane wind event total $458,588,880, which equates to a loss ratio of less than two percent. Estimated property damages for the 500-year event total $3,885,404,260, which represents a loss ratio of over 14 percent. FEMA considers a loss ratio of 10 percent or more to be an indicator that a community will have significant difficulty recovering from an event. The 500-year event will cause significant difficulties for recovery. Damages from an actual hurricane event would likely also involve flood impacts that would raise the damage total. Therefore, even a 100-year hurricane event may cause more serious damages that what is reported here from Hazus.

Further GIS analysis was used to understand the compound risk associated with hurricanes due to storm surge. Table 2.51 below summarizes the number of buildings and their value at risk from storm surge by category and jurisdiction. In total, a storm surge caused by a category 1 hurricane could potentially impact over 14,000 buildings and more than $3 billion in damages. A category 4 storm could lead to a storm surge potentially damaging over 95,000 buildings and causing over $18 billion in damages.

Table 2.51 – Buildings at Risk to Storm Surge by Category

Jurisdiction	Category 1	Category 2	Category 3	Category 4	Category 5
Bloomingdale					
# Buildings	0	0	90	1,358	1,468
Total Value	--	--	$4,263,636.86	$106,255,827.16	$113,842,908.76
Garden City					
# Buildings	250	1,331	3,129	4,325	4,647
Total Value	$12204396.84	124825512.86	364,141,411.51	485,904,061.91	521,455,131.88
Pooler					
# Buildings	0	532	2,814	8,109	8479
Total Value	--	141,196,503	708,172,600	1,978,802,248	2,099,269,741
Port Wentworth					
# Buildings	37	540	1,792	3,588	3,915
Total Value	$1,743,076	$69,430,122	$329,185,795	$600,077,631	$632,073,488
Savannah					
# Buildings	1,606	9,296	28,805	37,744	41,095
Total Value	$330,406,154	$1,696,209,692	$5,136,641,042	$7,366,425,701	$7,902,293,670
Thunderbolt					
# Buildings	362	494	903	1,131	1,131
Total Value	$48,334,784	$71,558,699	$117,877,892	$139,410,353	$139,410,353
Tybee Island					
# Buildings	2,109	2,483	2,497	2,497	2,497
Total Value	$441,000,606	$564,095,818	$572,317,601	$572,317,601	$572,317,601
Vernonburg					
# of Buildings	34	80	107	107	107
Total Value	$5,730,517	$14,167,400	$17,037,567	$17,037,567	$17,037,567
Unincorporated Chatham County					
# of Buildings	9,651	25,878	35,842	36,414	36,601
Total Value	$2,283,346,157	$5,547,087,556	$7,484,583,320	$7,573,156,609	$7,602,423,740

Source: GIS Analysis, NOAA SLOSH Data

Given equal vulnerability to hurricane winds across all of Chatham County, all critical facilities are considered to be at risk. Certain buildings may perform better than others based on their age and construction, among other factors. Depending on their locations, critical facilities may also be at risk to storm surge flooding.

Aside from an overall increase in exposure due to development throughout the planning area, there have been no significant changes in development in the planning area that could affect vulnerability to hurricane in Chatham County.

Environment

Aquatic species within the lake will either be displaced or destroyed. The velocity of the flood wave will likely destroy riparian and instream vegetation and destroy wetland function. The flood wave will like cause erosion within and adjacent to the stream. Deposition of eroded deposits may choke instream habitat or disrupt riparian areas. Sediments within the lake bottom and any low oxygen water from within the lake will be dispersed, potentially causing fish kills or releasing heavy metals found in the lake sediment layers.

Consequence Analysis

Table 2.52 summarizes the potential negative consequences of hurricanes and tropical storms.

Table 2.52 – Consequence Analysis – Hurricane and Tropical Storm

Category	Consequences
Public	Impacts include injury or death, loss of property, outbreak of diseases, mental trauma and loss of livelihoods. Power outages and flooding are likely to displace people from their homes. Water can become polluted such that if consumed, diseases and infection can be easily spread. Residential, commercial, and public buildings, as well as critical infrastructure such as transportation, water, energy, and communication systems may be damaged or destroyed, resulting in cascading impacts on the public.
Responders	Localized impact expected to limit damage to personnel in the inundation area at the time of the incident.
Continuity of Operations (including Continued Delivery of Services)	Damage to facilities/personnel from flooding or wind may require temporary relocation of some operations. Operations may be interrupted by power outages. Disruption of roads and/or utilities may postpone delivery of some services. Regulatory waivers may be needed locally. Fulfillment of some contracts may be difficult. Impact may reduce deliveries.
Property, Facilities and Infrastructure	Structural damage to buildings may occur; loss of glass windows and doors by high winds and debris; loss of roof coverings, partial wall collapses, and other damages requiring significant repairs are possible in a major (category 3 to 5) hurricane.
Environment	Hurricanes can devastate wooded ecosystems and remove all the foliation from forest canopies, and they can change habitats so drastically that the indigenous animal populations suffer as a result. Specific foods can be taken away as high winds will often strip fruits, seeds and berries from bushes and trees. Secondary impacts may occur; for example, high winds and debris may result in damage to an above-ground fuel tank, resulting in a significant chemical spill.
Economic Condition of the Jurisdiction	Local economy and finances adversely affected, possibly for an extended period of time, depending on damages. Intangible impacts also likely, including business interruption and additional living expenses.
Public Confidence in the Jurisdiction's Governance	Likely to impact public confidence due to possibility of major event requiring substantial response and long-term recovery effort.

Hazard Summary by Jurisdiction

The following table summarizes hurricane hazard risk by jurisdiction. Due to its coastal geography, the entire county is susceptible to the impacts of hurricanes, tropical storms, and the associated storm surges and flooding. While hurricanes have the possibility of being catastrophic across all jurisdictions, certain

areas have higher vulnerability. Impacts may be greater in more highly developed areas with greater amounts of impervious surface and higher exposure in terms of both property and population density. Areas with more mobile homes are also more vulnerable to damage, while areas with higher property values have greater overall exposure and potential for damages. Despite these differences, all jurisdictions have the possibility for catastrophic impacts.

Jurisdiction	Probability	Impact	Spatial Extent	Warning Time	Duration	Score	Priority
Chatham County	4	4	4	1	3	3.3	H
Bloomingdale	4	4	4	1	3	3.3	H
Garden City	4	4	4	1	3	3.3	H
Pooler	4	4	4	1	3	3.3	H
Port Wentworth	4	4	4	1	3	3.3	H
Savannah	4	4	4	1	3	3.3	H
Thunderbolt	4	4	4	1	3	3.3	H
Tybee Island	4	4	4	1	3	3.3	H
Vernonburg	4	4	4	1	3	3.3	H

2.5.8 Sea Level Rise

Hazard Background

Sea level rise is the increase in sea levels as a result of atmospheric and oceanic warming which causes water expansion as well as ice melt from ice sheets and glaciers. Sea level rise is a result of global climate change. 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 greenhouse 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. In 2018, the Intergovernmental Panel on Climate Change (IPCC) reported with high confidence that warming due to such emissions will cause long-term changes in the climate system such as sea level rise and its associated impacts.

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.

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). Coastal Chatham County is particularly vulnerable to the effects of sea level rise due to its coastal location, subtropical environment, low topography and tourism economy.

Warning Time: 1 – More than 24 hours

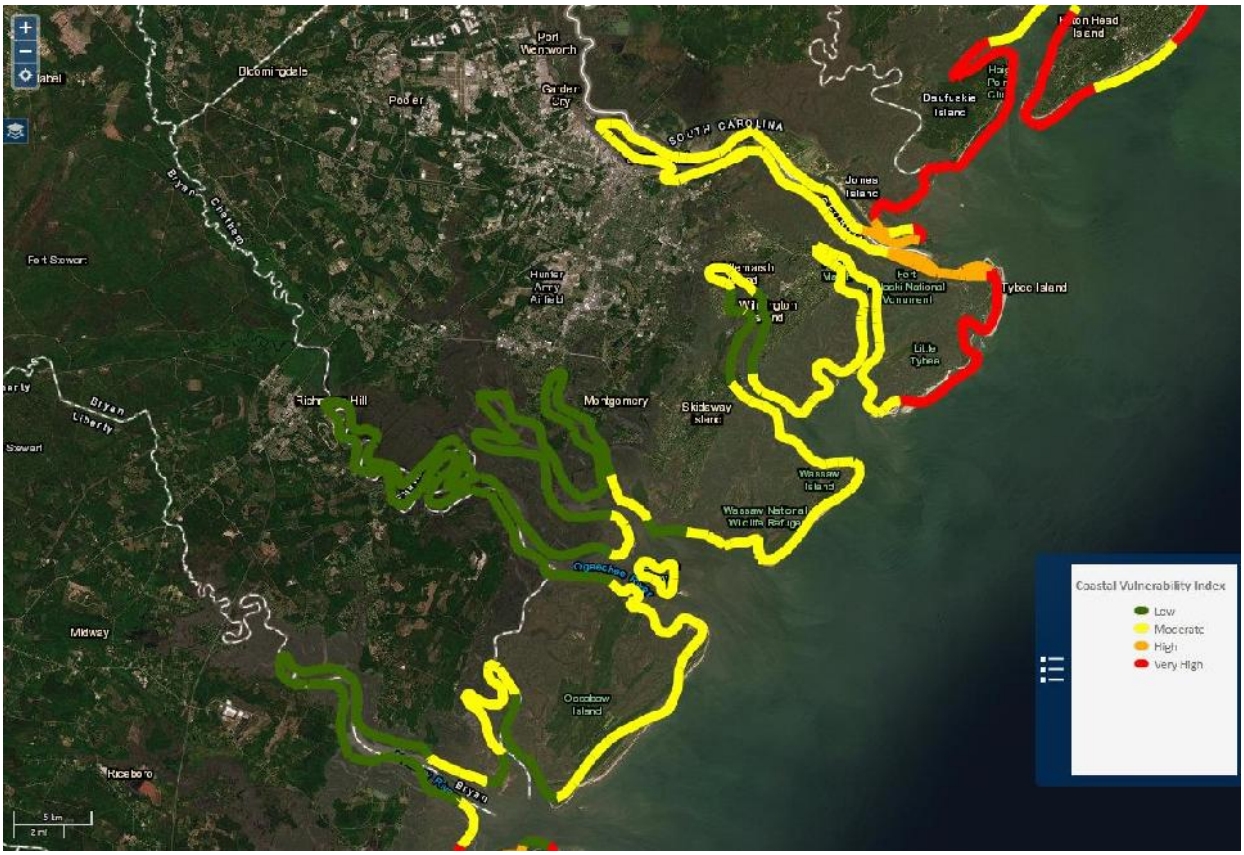
Duration: 4 – More than one week

Location

Sea level rise can occur anywhere along the coast and along major waterways in Chatham County. The Coastal Vulnerability Index (CVI), developed by United States Geological Survey (USGS), provides a preliminary overview of the relative susceptibility of the United States coast to sea level rise. The CVI is based on geomorphology, regional coastal slope, tide range, wave height, relative sea level rise, and shoreline erosion and acceleration rates. For each study area, each variable is scored on a 1-5 scale based on defined parameters, where “1” indicates low contribution to coastal vulnerability and “5” indicates high contribution to vulnerability. These scores are then aggregated into a single index through a mathematical formula. The resulting index gives an overview of where physical changes may occur due to sea-level rise.

Figure 2.25 shows the CVI for Chatham County. The Atlantic Coastline at Tybee Island is the most vulnerable area in the region, rated very high. Shorelines along the Savannah River, on the border between Georgia and South Carolina as well as the remainder of the Atlantic Coastline are all rated moderate to high vulnerability.

Figure 2.25 – Coastal Vulnerability Index, Chatham County

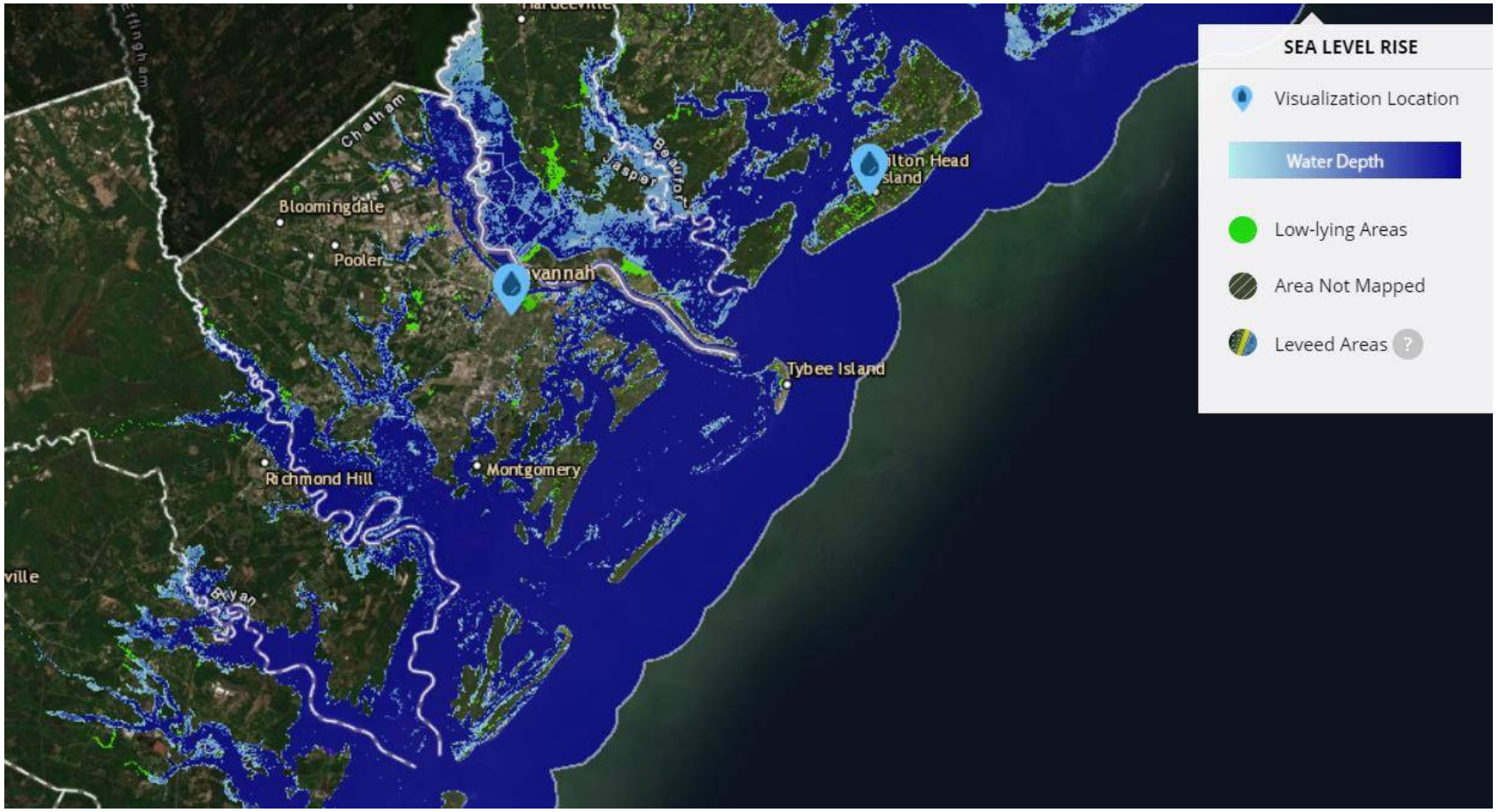


Source: USGS Coastal Change Hazards Portal

Extent

Sea level rise is measured by the number of feet of relative rise and the areas that such rise would inundate. The estimated impacts of 1-foot, 2-foot, and 3-foot, sea level rise (SLR) are shown in Figure 2.26 through Figure 2.28. The SLR estimate maps show inundation above mean higher high water (the average of each day's higher high tide line). SLR will likely affect coastal marsh lands as well as land along the Ogeechee and Savannah rivers and their tributaries. Additionally, SLR will likely increase future risk of flooding from the other flood hazards discussed later in this plan, as more land will have a lower elevation relative to sea level. For example, with much of the barrier islands and wetlands inundated, inland areas will lose their natural protection and may become susceptible to coastal flooding with velocity wave action.

Figure 2.26 – Estimated Impact of 1 Foot SLR on Chatham County

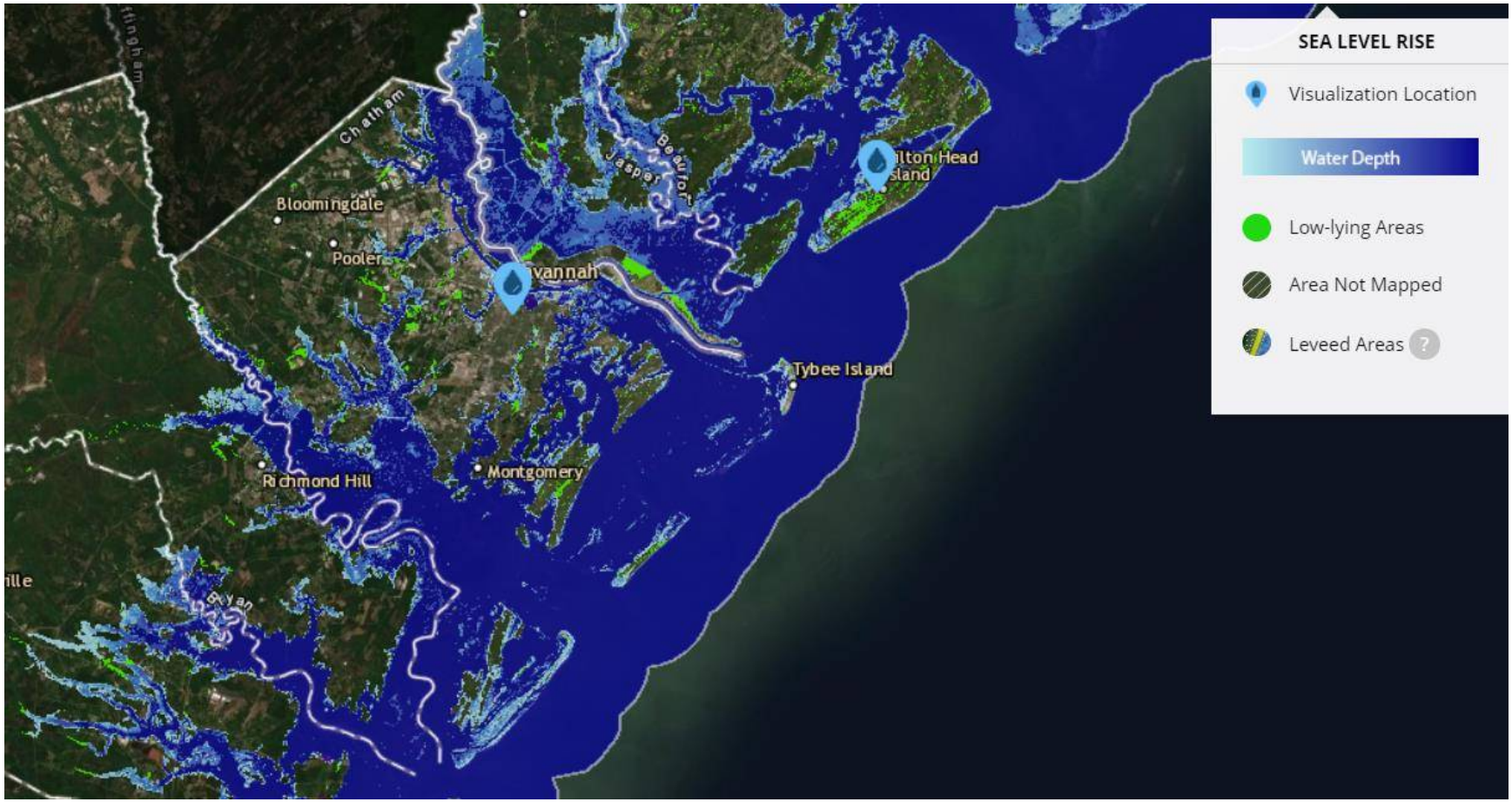


Source: NOAA Sea Level Rise Viewer

Figure 2.27 – Estimated Impact of 2 Foot SLR on Chatham County

Source: NOAA Sea Level Rise Viewer

Figure 2.28 – Estimated Impact of 3 Foot SLR on Chatham County



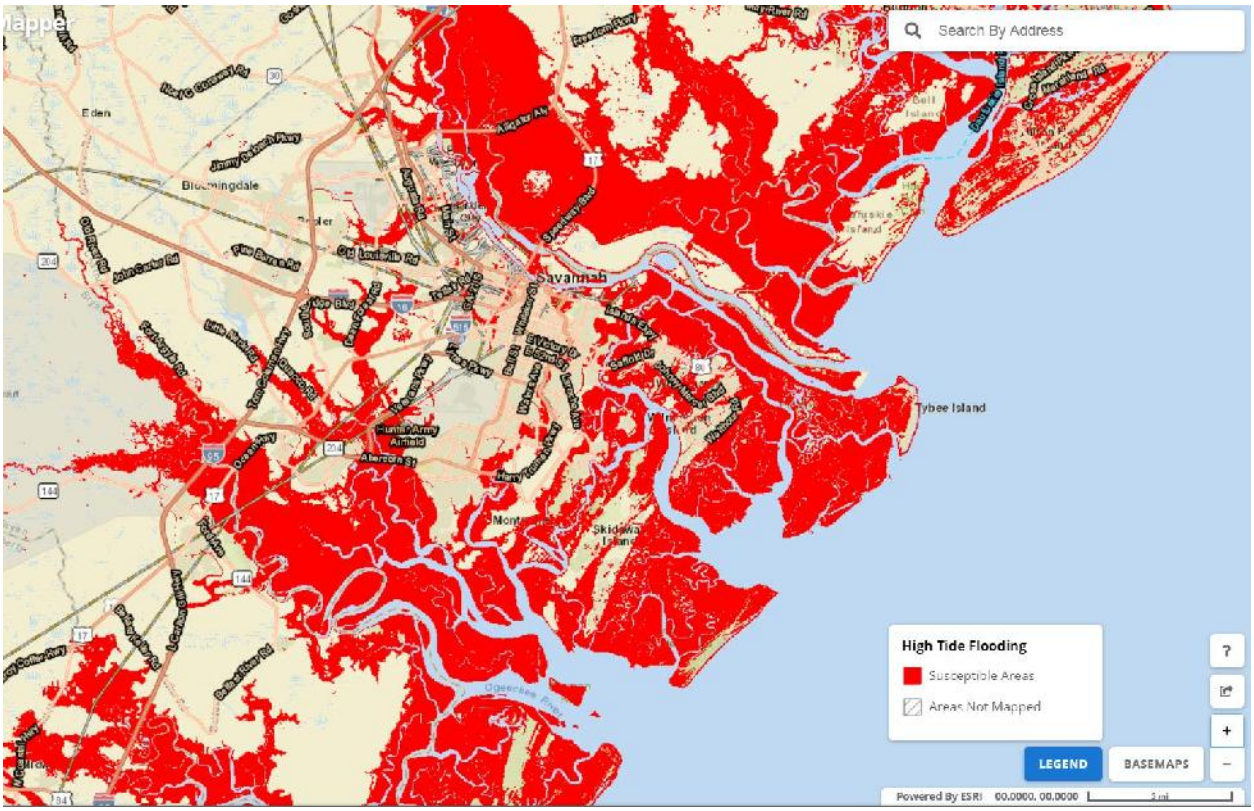
Source: NOAA Sea Level Rise Viewer

Sea level rise is a slow onset hazard, and because the full extent of anticipated sea level rise has not yet been realized, the effects of sea level rise have not yet been fully felt. However, sea level rise has already begun to cause "clear sky" or "nuisance" flooding, which is brought on by high tidewaters rather than storm or rain events. Tidal flooding causes temporary inundation of low-lying areas during high-tide events. While tidal flooding is not caused by sea level rise itself, a 2015 tidal flooding report published by NOAA notes that tidal flood rates are steadily increasing, and daily highest tides surpass fixed elevations increasingly frequently, due in part to sea level rise. According to NOAA, annual occurrences of high tide flooding have increased 5- to 10-fold since the 1960s. Sea level rise may cause flooding to occur more frequently and last for longer durations of time. According to Climate Central, Fort Pulaski, GA, on Tybee Island, experienced 152 total coastal flood days between 2005 through 2014 up from 115 between 1995-2004. Of these days, 88 percent would not have occurred without climate change and the resulting sea level rise. As sea level continues to rise, tidal flooding will continue to occur more frequently and over a greater inland area. Figure 2.29 shows areas in Chatham County that are susceptible to high tide flooding.

Impact: 3 – Critical

Spatial Extent: 3 – Moderate

Figure 2.29 – Areas Susceptible to High Tide Flooding, Chatham County



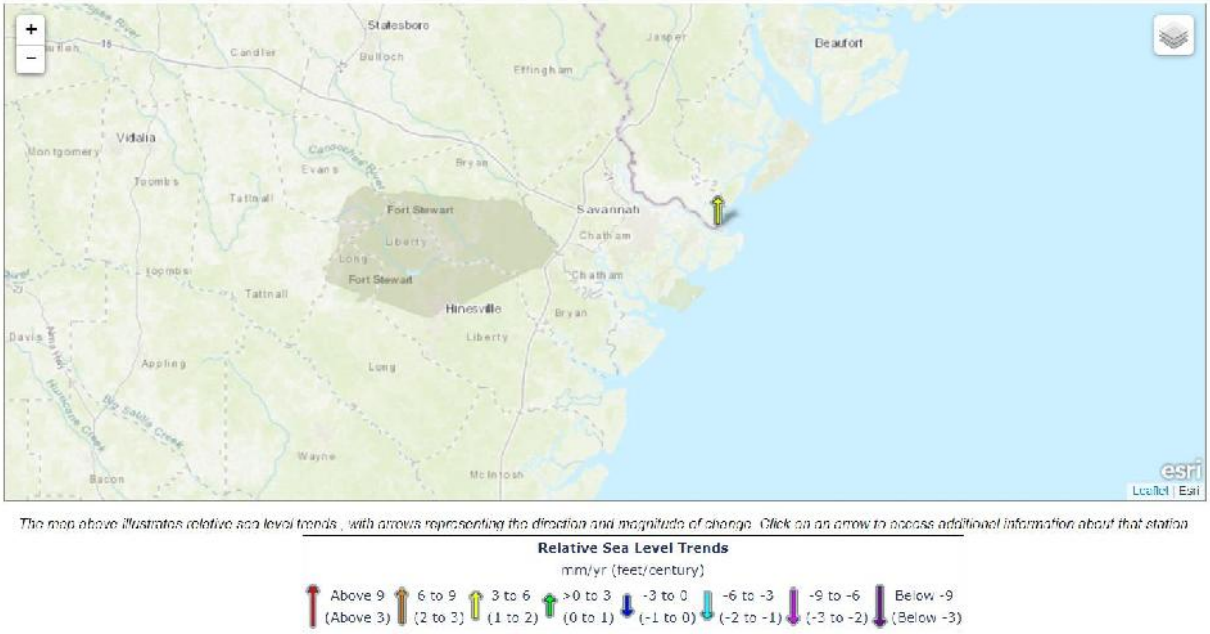
Source: NOAA Coastal Flood Exposure Mapper

Historical Occurrences

Historic trends in local MSL are best determined from tide gauge records. The Center for Operational Oceanographic Products and Services (CO-OPS) 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 2.30 illustrates regional trends in sea level from NOAA. At the Fort Pulaski, GA station (indicated by the yellow arrow), the relative sea level trend is 3.25 mm/year with a 95% confidence interval of +/- 0.27 mm/year based on monthly mean sea level data from 1935 to 2018 which is equivalent to a change of 1.07 feet in 100 years.

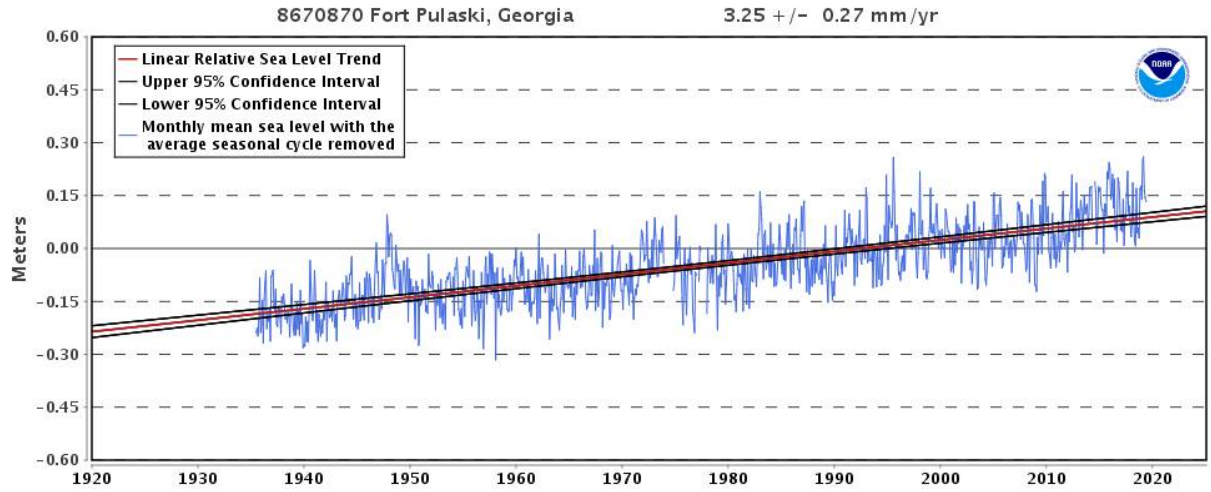
Figure 2.30 – Sea Level Trends, Chatham County



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

Figure 2.31 shows the monthly mean sea level at NOAA's Fort Pulaski, GA station without the regular seasonal fluctuations due to coastal ocean temperatures, salinities, winds, atmospheric pressures, and ocean currents. The long-term linear trend is also shown, including its 95% confidence interval. The plotted values are relative to the most recent Mean Sea Level datum established by CO-OPS.

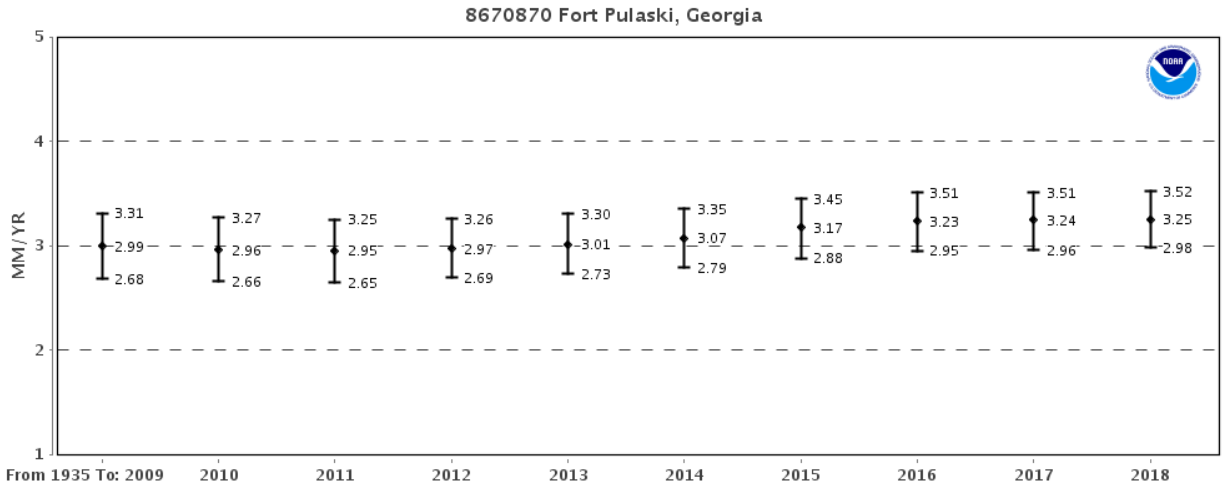
Figure 2.31 – Mean Sea Level Trends, Fort Pulaski, GA



Source: NOAA Tides and Currents, August 2019

Figure 2.32 shows this trend compared with previous mean sea level trends. The values indicate the trend of the entire data period up to the given year. As such, each year's trend estimate is more precise than previous years' estimates. The sea level trend through 2018 at the Fort Pulaski, GA tide gauge is 3.25 mm/year with a 95% confidence interval of 2.98 mm/year to 3.52 mm/year.

Figure 2.32 – Previous Mean Sea Level Trends for Fort Pulaski, GA



Source: NOAA Tides and Currents, August 2019

Probability of Future Occurrence

The U.S. Army Corps of Engineers (USACE) has provided guidance to evaluate designs over a project's life cycle in order to account for the rise of global mean sea level (USACE, 2014). The USACE guidance is based on original guidance by the National Research Council (NRC, 1987). The 1987 NRC report recommended that feasibility studies for coastal projects consider the high probability of accelerating global mean sea level (GMSL) rise and provided three different acceleration scenarios through the year 2100. The NRC committee provided an equation for calculating sea level rise and recommended "projections be updated approximately every decade to incorporate additional data."

The USACE guidance adjusted the NRC equation to include the historic GMSL change rate of 1.7 mm/year as presented by the IPCC (IPCC, 2007) and the start date of 1992 (which corresponds to the midpoint of the National Tidal Datum Epoch of 1983-2001), instead of 1986 (the start date for NRC's equation). These changes resulted in values for the variable *b* being equal to 2.71E-5 for modified NRC Curve I, 7.00E-5 for modified NRC Curve II, and 1.13E-4 for modified NRC Curve III. The resulting equation is as follows:

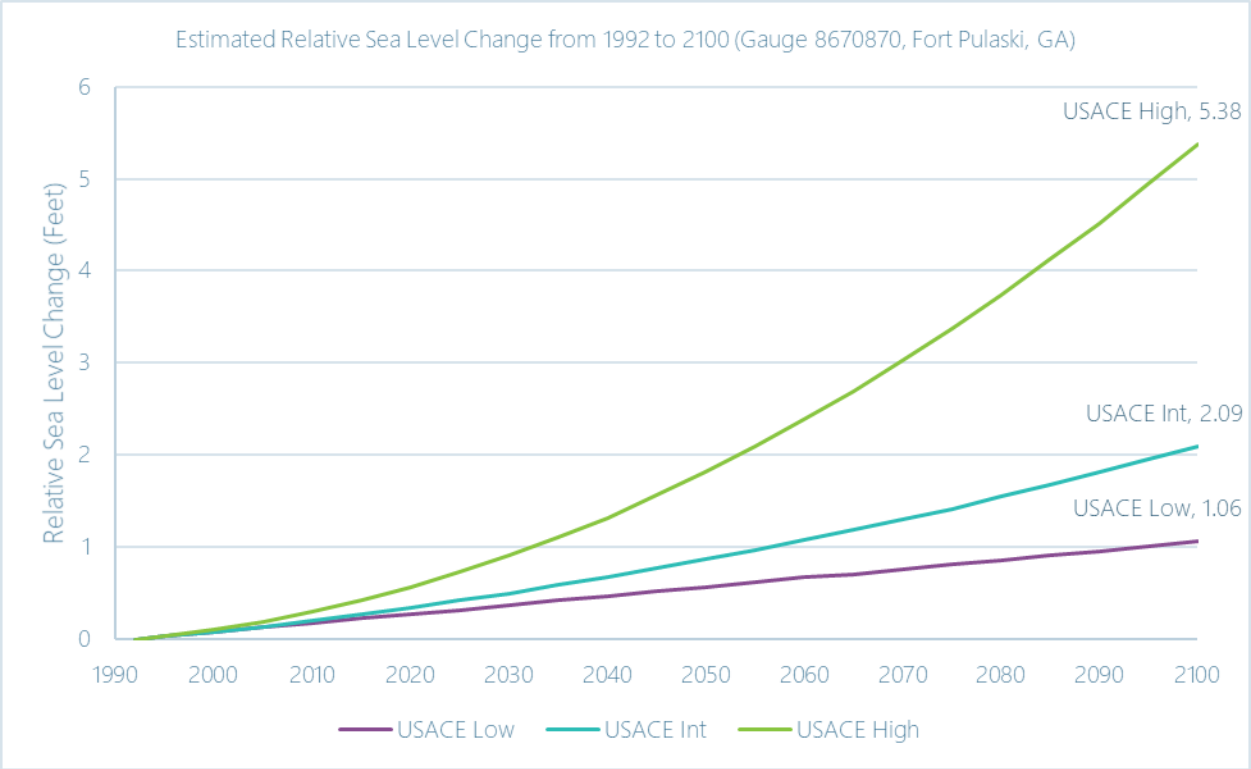
$$E(t) = 0.0017m/yr*t + bt^2$$

In the above equation, t represents years, b is a constant, and E(t) is the relative sea-level change, in meters, as a function of t. The three updated GMSL rise acceleration scenarios are depicted in Figure 2.33 on the following page.

Based on the USACE guidance and data from the Oregon Inlet Marina, NC NOAA gauge, a projected sea level rise to be used for future planning decisions can be calculated. Figure 2.33 shows sea level rise projections for three scenarios from the USACE. The USACE Low curve uses the historic rate of sea level change as the rate, the USACE Intermediate curve uses the NRC Curve I modified by recent IPCC low emissions projections and the local rate of vertical land movement, and the USACE High curve uses the NRC Curve II modified by recent IPCC higher emissions projections and the local rate of vertical land movement. Given that the USACE Low curve does not consider further climate change, the USACE

Intermediate and High curves are more likely. However, which of the curves is the more likely scenario depends on future emissions levels. Based on the more conservative estimate of the Intermediate curve, Chatham County should plan for 0.87 feet of sea level rise from 1992 levels by 2050.

Figure 2.33 – Sea Level Rise Projections for Chatham County (1992-2100)



Source: USACE, 2014

Probability: 3 – Likely

Climate Change

Sea level rise is a direct result of global climate change. Estimates for sea level rise are based on projected greenhouse gas emission levels and their associated impacts on global temperature change. Most sea level rise models do not fully account for ice melt, and therefore actual sea level rise may be significantly higher than current estimates suggest. As such, these projections contain substantial variability but are nonetheless important to consider when planning for coastal areas because they indicate where flooding can be expected should actual sea level rise meet estimated levels.

Vulnerability Assessment

Methodologies and Assumptions

Vulnerability to Sea Level Rise was assessed using Climate Central's Surging Seas Risk Finder using estimated sea level rise of 4 feet above Mean Higher High Water (MHHW). This estimate was chosen as it is in alignment with the National Climate Assessment's intermediate high sea level rise scenario, which project a local rise of 4.2 feet by 2100, from a 1992 baseline. Risk is estimated using sea level rise projections as well as data from the NOAA water level station at Fort Pulaski, GA. Note that this assessment assumes future storms will be similar in magnitude to current storms, isolating impacts of sea level rise. Additional assessment is based on past occurrences nationally and internationally as well as data from NOAA, USGS, the Intergovernmental Panel on Climate Change (IPCC), and other sources.

In addition to the data presented below, the forthcoming Southeast Coastal Assessment from the United States Army Corps of Engineers (USACE) South Atlantic Division will provide supplementary data and details through a comprehensive coastal shoreline risks and needs assessment. This tool will look at four hazards (hurricanes and storms, long-term erosion, flooding, and potential sea level rise) and how they will impact population, the built environment, and the natural environment.

People

Sea level rise will lead to increased flooding and the associated harms to humans, such as illness, or injury or death from driving into flooded waters and drowning. Though sea level rise impacts will likely affect the entire county, people living along the coast will be most impacted, particularly burdening lower income, elderly, minority, or otherwise disproportionately vulnerable individuals. Figure 2.34 below illustrates Chatham County's social vulnerability to sea level rise.

Figure 2.34 – Social Vulnerability to Sea Level Rise, Chatham County

Source: Climate Central
Note: This map uses the Hazards and Vulnerability Research Institute (HVRI)'s Social Vulnerability Index.

As reported by climate central, approximately 17,393 in Chatham County people currently live in areas expected to be impacted by 4-feet of sea level rise. Table 2.53 below further breaks this number down into the social vulnerability categories in the map above and Table 2.54 by jurisdiction.

Table 2.53 – Population at Risk to Sea Level Rise by Social Vulnerability Category

Social Vulnerability Category	Population at Risk	Percent of Total Population at Risk
Low Social Vulnerability	8,492	48.8%
Medium Social Vulnerability	3,768	21.7%
High Social Vulnerability	5,133	29.5%
Total	**17,393**	--

Source: Climate Central

Table 2.54 – Population at Risk to Sea Level Rise by Jurisdiction

Jurisdiction	Population at Risk	Percent of Total Population at Risk
Bloomingdale	0	0%
Pooler	20	0.1%
Savannah	3,362	19.3%
Garden City	408	2.3%
Thunderbolt	684	3.9%
Port Wentworth	174	1.0%
Tybee Island	1,821	10.5%
Unincorporated Areas	10,924	62.8%
Total	**17,939**	--

Source: Climate Central

Property

The increased number of flood days and general encroachment of shoreline associated with sea level rise will likely cause property damage, although it is unclear exactly what this will look like. Homes, businesses and vehicles will be susceptible to increased water damage. Homes within the areas that may be inundated will potentially be uninhabitable. Additionally, rising seas, and associated increased flood days, can overwhelm and undermine the effectiveness of stormwater drainage system and other infrastructure, such as roads and bridges.

According to Climate Central, over 8,605 buildings totaling $2.6 billion in value, currently exist in areas that would be underwater given 4 feet of sea level rise. $925 million of this value exists in Savannah alone. Table 2.55 below further details this value by jurisdiction.

Table 2.55 – Property at Risk to Sea Level Rise by Jurisdiction

Jurisdiction	Property Value	Percent of Total Property Value
Bloomingdale	$20,000,000	0.8%
Pooler	$198,000,000	7.6%
Savannah	$925,000,000	35.6%
Garden City	$33,000,000	1.3%
Thunderbolt	$24,000,000	0.9%
Port Wentworth	$18,000,000	0.7%
Tybee Island	$60,000,000	2.3%
Unincorporated Areas	$1,322,000,000	0.8%
Total	**$2,600,000,000**	--

Source: Climate Central

Of the total buildings at risk, Climate Central estimates 8,590 are homes, and the remaining 5 are houses of worship, government buildings, libraries, public safety facilities, schools, museums, and hospitals.

No significant changes in development have occurred to affect the county's vulnerability to sea level rise.

Environment

Sea level rise can have numerous negative consequences on the environment including increased erosion and all impacts associated with that. Another concern is the inundation of normally dry land, which could lead to the loss of marshes and wetlands and the positive benefits associated with those areas. These areas buffer against waves and storm surge, protect from erosion and even encourage accretion, and provide natural wildlife habitats. Finally, sea level rise may lead to saltwater intrusion as the groundwater table may also rise, potentially leading to contaminated drinking and agriculture water.

Consequence Analysis

Table 2.56 summarizes the potential negative consequences of Sea Level Rise.

Table 2.56 – Consequence Analysis – Sea Level Rise

Category	Consequences
Public	Sea Level Rise may cause increased flooding which may lead to illness, injury, or death. Additionally, sea level rise may cause psychological stress from loss of home, economy, and culture.
Responders	Sea Level Rise induced flooding may cause increased burden on responders.
Continuity of Operations (including Continued Delivery of Services)	As sea levels rise and cause more regular, chronic flooding, continuity of operations, such as delivery of services may be interrupted due to localized disruption of roads, facilities, and/or utilities.
Property, Facilities and Infrastructure	Sea level rise can cause damage to property as flooding becomes more regular in the short term and as sea levels continue to rise in the long term. SLR can also compromise infrastructure such as drainage systems and roads.
Environment	Sea level rise can lead to increased erosion, salt water intrusion, and inundation of wetlands and previous dry land.
Economic Condition of the Jurisdiction	Sea level rise can severely disrupt the economy, particularly in a region that relies so heavily on tourism.
Public Confidence in the Jurisdiction's Governance	Sea level rise is unlikely to impact public confidence.

Hazard Summary by Jurisdiction

The following table summarizes sea level rise risk by jurisdiction. Most jurisdictions face at least some risk from sea level rise, but coastal and waterfront areas have greater exposure. Spatial extent was varied by jurisdiction depending on the area exposed to sea level rise impacts, with a rating of negligible for Bloomingdale and Pooler, small for Garden City and Port Wentworth, large for Tybee Island, and moderate for the remaining jurisdictions.

Jurisdiction	Probability	Impact	Spatial Extent	Warning Time	Duration	Score	Priority
Chatham County	3	3	3	1	4	2.9	H
Bloomingdale	3	3	1	1	4	2.5	H
Garden City	3	3	2	1	4	2.7	H
Pooler	3	3	1	1	4	2.5	H
Port Wentworth	3	3	2	1	4	2.7	H
Savannah	3	3	3	1	4	2.9	H
Thunderbolt	3	3	3	1	4	2.9	H
Tybee Island	3	3	4	1	4	3.1	H
Vernonburg	3	3	3	1	4	2.9	H

2.5.9 Severe Weather (Thunderstorm Wind, Lightning, Hail)

Hazard Background

Thunderstorm Winds

Thunderstorms result from the rapid upward movement of warm, moist air. They can occur inside warm, moist air masses and at fronts. As the warm, moist air moves upward, it cools, condenses, and forms cumulonimbus clouds that can reach heights of greater than 35,000 ft. As the rising air reaches its dew point, water droplets and ice form and begin falling the long distance through the clouds towards earth's surface. As the droplets fall, they collide with other droplets and become larger. The falling droplets create a downdraft of air that spreads out at earth's surface and causes strong winds associated with thunderstorms.

There are four ways in which thunderstorms can organize: single cell, multi-cell cluster, multi-cell lines (squall lines), and supercells. Even though supercell thunderstorms are most frequently associated with severe weather phenomena, thunderstorms most frequently organize into clusters or lines. Warm, humid conditions are favorable for the development of thunderstorms. The average single cell thunderstorm is approximately 15 miles in diameter and lasts less than 30 minutes at a single location. However, thunderstorms, especially when organized into clusters or lines, can travel intact for distances exceeding 600 miles.

Thunderstorms are responsible for the development and formation of many severe weather phenomena, posing great hazards to the population and landscape. Damage that results from thunderstorms is mainly inflicted by downburst winds, large hailstones, and flash flooding caused by heavy precipitation. Stronger thunderstorms are capable of producing tornadoes and waterspouts. While conditions for thunderstorm conditions may be anticipated within a few hours, severe conditions are difficult to predict. Regardless of severity, storms generally pass within a few hours.

Warning Time: 4 – Less than six hours

Duration: 1 – Less than six hours

Lightning

Lightning is a sudden electrical discharge released from the atmosphere that follows a course from cloud to ground, cloud to cloud, or cloud to surrounding air, with light illuminating its path. Lightning's unpredictable nature causes it to be one of the most feared weather elements.

All thunderstorms produce lightning, which often strikes outside of the area where it is raining and is known to fall more than 10 miles away from the rainfall area. When lightning strikes, electricity shoots through the air and causes vibrations creating the sound of thunder. A bolt of lightning can reach temperatures approaching 50,000 degrees Fahrenheit. Nationwide, lightning kills 75 to 100 people each year. Lightning strikes can also start building fires and wildland fires, and damage electrical systems and equipment.

The watch/warning time for a given storm is usually a few hours. There is no warning time for any given lightning strike. Lightning strikes are instantaneous. Storms that cause lightning usually pass within a few hours.

Warning Time: 4 – Less than six hours

Duration: 1 – Less than six hours

Hail

According to the National Oceanic and Atmospheric Administration (NOAA), hail is precipitation that is formed when updrafts in thunderstorms carry raindrops upward into extremely cold areas of the atmosphere causing them to freeze. The raindrops form into small frozen droplets and then continue to grow as they come into contact with super-cooled water which will freeze on contact with the frozen rain droplet. This frozen rain droplet can continue to grow and form hail. As long as the updraft forces can support or suspend the weight of the hailstone, hail can continue to grow.

At the time when the updraft can no longer support the hailstone, it will fall down to the earth. For example, a ¼" diameter or pea sized hail requires updrafts of 24 mph, while a 2 ¾" diameter or baseball sized hail requires an updraft of 81 mph. The largest hailstone recorded in the United States was found in Vivian, South Dakota on July 23, 2010; it measured eight inches in diameter, almost the size of a soccer ball. While soccer-ball-sized hail is the exception, but even small pea sized hail can do damage.

Hailstorms in Georgia cause damage to property, crops, and the environment, and kill and injure livestock. In the United States, hail causes more than $1 billion in damage to property and crops each year. Much of the damage inflicted by hail is to crops. Even relatively small hail can shred plants to ribbons in a matter of minutes. Vehicles, roofs of buildings and homes, and landscaping are the other things most commonly damaged by hail. Hail has been known to cause injury to humans; occasionally, these injuries can be fatal.

The onset of thunderstorms with hail is generally rapid. However, advancements in meteorological forecasting allow for some warning. Storms usually pass in a few hours.

Warning Time: 4 – Less than six hours

Duration: 1 – Less than six hours

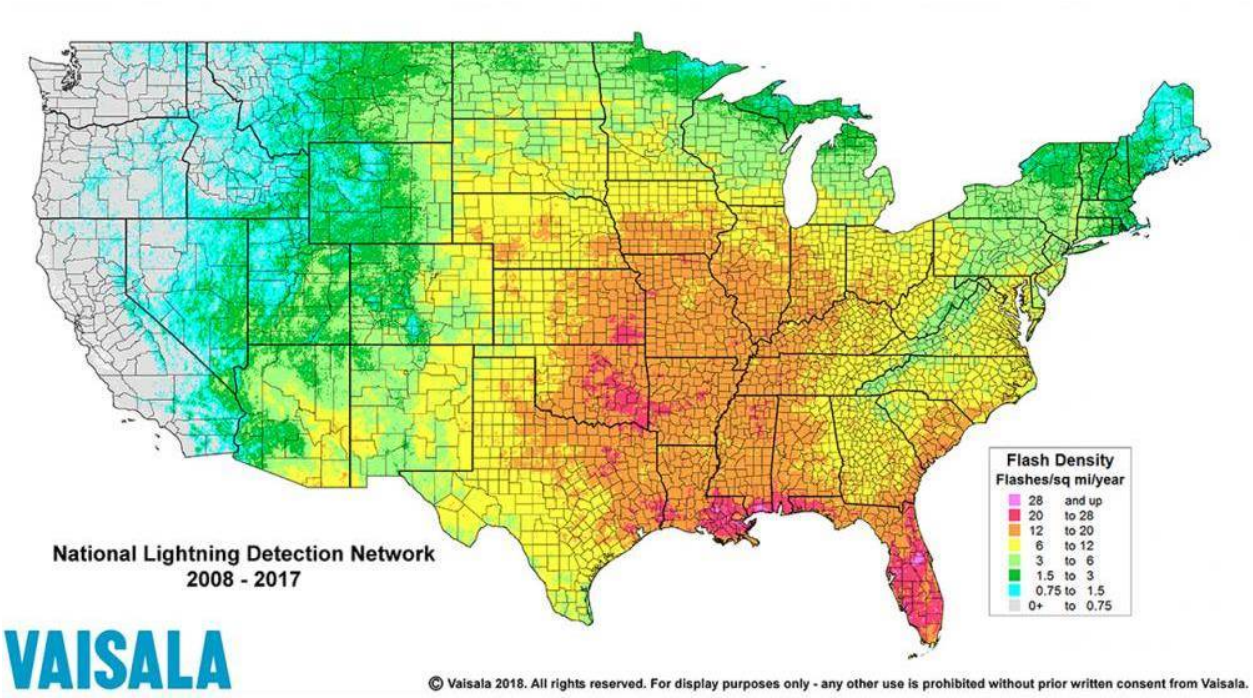
Location

Thunderstorm wind, lightning, and hail events do not have a defined vulnerability zone. The scope of lightning and hail is generally confined to the footprint of its associated thunderstorm. The entirety of Chatham County shares equal risk to the threat of severe weather.

According to the Vaisala 2018 Annual Lightning Report, Georgia had the tenth most cloud-to-ground lightning flashes and seventh for highest flash density per square mile. According to Vaisala's flash density map, shown in Figure 2.35, the majority of Chatham County is located in an area that experiences 12 to 20 lightning flashes per square mile per year.

It should be noted that future lightning occurrences may exceed these figures.

Figure 2.35 – Lightning Flash Density (2008-2017)



Source: Vaisala

Extent

Thunderstorm Winds

The magnitude of a thunderstorm event can be defined by the storm's maximum wind speed and its impacts. NCEI divides wind events into several types including High Wind, Strong Wind, Thunderstorm Wind, Tornado and Hurricane. For this severe weather risk assessment, High Wind, Strong Wind and Thunderstorm Wind data was collected. Hurricane Wind and Tornadoes are addressed as individual hazards. The following definitions come from the NCEI Storm Data Preparation document.

- **High Wind** – Sustained non-convective winds of 40mph or greater lasting for one hour or longer or winds (sustained or gusts) of 58 mph for any duration on a widespread or localized basis.
- **Strong Wind** – Non-convective winds gusting less than 58 mph, or sustained winds less than 40 mph, resulting in a fatality, injury, or damage.
- **Thunderstorm Wind** – Winds, arising from convection (occurring within 30 minutes of lightning being observed or detected), with speeds of at least 58 mph, or winds of any speed (non-severe thunderstorm winds below 58 mph) producing a fatality, injury or damage.

The strongest recorded thunderstorm wind event in the county occurred on January 11, 2014 with a measured gust of 91 mph in Garden City and estimated gusts of 69 to 80 mph elsewhere across the county. The event reportedly caused no fatalities, injuries, or damages.

Impact: 2 – Limited

Spatial Extent: 4 – Large

Lightning

Lightning is measured by the Lightning Activity Level (LAL) scale, created by the National Weather Service to define lightning activity into a specific categorical scale. The LAL, shown in Table 2.57, is a common parameter that is part of fire weather forecasts nationwide.

Table 2.57 – Lightning Activity Level Scale

Lightning Activity Level Scale	
LAL 1	No thunderstorms
LAL 2	Isolated thunderstorms. Light rain will occasionally reach the ground. Lightning is very infrequent, 1 to 5 cloud to ground lightning strikes in a five minute period
LAL 3	Widely scattered thunderstorms. Light to moderate rain will reach the ground. Lightning is infrequent, 6 to 10 cloud to ground strikes in a five minute period
LAL 4	Scattered thunderstorms. Moderate rain is commonly produced. Lightning is frequent, 11 to 15 cloud to ground strikes in a five minute period
LAL 5	Numerous thunderstorms. Rainfall is moderate to heavy. Lightning is frequent and intense, greater than 15 cloud to ground strikes in a five minute period
LAL 6	Dry lightning (same as LAL 3 but without rain). This type of lightning has the potential for extreme fire activity and is normally highlighted in fire weather forecasts with a Red Flag warning

Source: National Weather Service

With the right conditions in place, the entire county is susceptible to each lightning activity level as defined by the LAL. Most lightning strikes cause limited damage to specific structures in a limited area, and cause very few injuries or fatalities, and minimal disruption on quality of life.

Impact: 1 – Minor

While the total area vulnerable to a lightning strike corresponds to the footprint of a given thunderstorm, a specific lightning strike is usually a localized event and occurs randomly. It should be noted that while lightning is most often affiliated with severe thunderstorms, it may also strike outside of heavy rain and might occur as far as 10 miles away from any rainfall. All of Chatham County is uniformly exposed to the threat of lightning.

Spatial Extent: 1 – Negligible

Hail

The National Weather Service classifies hail by diameter size, and corresponding everyday objects to help relay scope and severity to the population. Table 2.58 indicates the hailstone measurements utilized by the National Weather Service.

Table 2.58 – Hailstone Measurement Comparison Chart

Average Diameter	Corresponding Household Object
.25 inch	Pea
.5 inch	Marble/Mothball
.75 inch	Dime/Penny
.875 inch	Nickel
1.0 inch	Quarter
1.5 inch	Ping-pong ball
1.75 inch	Golf ball
2.0 inch	Hen egg
2.5 inch	Tennis ball
2.75 inch	Baseball
3.00 inch	Teacup
4.00 inch	Grapefruit
4.5 inch	Softball

Source: National Weather Service

The Tornado and Storm Research Organization (TORRO) has further described hail sizes by their typical damage impacts. Table 2.59 describes typical intensity and damage impacts of the various sizes of hail.

Table 2.59 – Tornado and Storm Research Organization Hailstorm Intensity Scale

Intensity Category	Diameter (mm)	Diameter (inches)	Size Description	Typical Damage Impacts
Hard Hail	5-9	0.2-0.4	Pea	No damage
Potentially Damaging	10-15	0.4-0.6	Mothball	Slight general damage to plants, crops
Significant	16-20	0.6-0.8	Marble, grape	Significant damage to fruit, crops, vegetation
Severe	21-30	0.8-1.2	Walnut	Severe damage to fruit and crops, damage to glass and plastic structures, paint and wood scored
Severe	31-40	1.2-1.6	Pigeon's egg > squash ball	Widespread glass damage, vehicle bodywork damage
Destructive	41-50	1.6-2.0	Golf ball > Pullet's egg	Wholesale destruction of glass, damage to tiled roofs, significant risk of injuries
Destructive	51-60	2.0-2.4	Hen's egg	Bodywork of grounded aircraft dented, brick walls pitted
Destructive	61-75	2.4-3.0	Tennis ball > cricket ball	Severe roof damage, risk of serious injuries
Destructive	76-90	3.0-3.5	Large orange > softball	Severe damage to aircraft bodywork
Super Hailstorms	91-100	3.6-3.9	Grapefruit	Extensive structural damage. Risk of severe or even fatal injuries to persons caught in the open
Super Hailstorms	>100	4.0+	Melon	Extensive structural damage. Risk of severe or even fatal injuries to persons caught in the open

Source: Tornado and Storm Research Organization (TORRO), Department of Geography, Oxford Brookes University
Notes: In addition to hail diameter, factors including number and density of hailstones, hail fall speed and surface wind speeds affect severity.

The average hailstone size recorded between 1960 and 2019 in Chatham County was a little over 1.1" in diameter; the largest hailstone recorded was 3.5", recorded on April 4, 1993 in Savannah. The largest hailstone ever recorded in the U.S. fell in Vivian, SD on June 23, 2010, with a diameter of 8 inches and a circumference of 18.62 inches.

Impact: 1 – Minor

Hailstorms frequently accompany thunderstorms, so their locations and spatial extents coincide. Chatham County is uniformly exposed to severe thunderstorms; therefore, the entire planning area is equally exposed to hail which may be produced by such storms. However, large-scale hail tends to occur in a more localized area within the storm.

Spatial Extent: 2 – Small

Historical Occurrences

Thunderstorm Winds

Between 1960 and 2019, NCEI recorded 502 separate incidents of thunderstorm wind. These incidents are recorded in Table 2.60. These events caused $3,820,800 in recorded property damage, $1,000 in recorded crop damages, 8 injuries and 1 fatality. The recorded gusts averaged roughly 51 miles per hour, with the highest gusts recorded at nearly 127 mph on September 8, 1980. Of these events, 198 caused recorded property damage. Wind gusts with property damage recorded by NCEI averaged $19,297 in damage, with one event on September 3, 1998 causing a reported $1,250,000 in damage.

Table 2.60 – Recorded Thunderstorm Winds, Chatham County, 1960-2019

Location	Date	Wind Speed	Fatalities	Injuries	Property Damage
CHATHAM CO.	7/3/1960	0	0	0	$0
CHATHAM CO.	4/12/1961	0	0	0	$0
CHATHAM CO.	7/22/1962	60	0	0	$0
CHATHAM CO.	7/22/1962	65	0	0	$0
CHATHAM CO.	9/6/1962	52	0	0	$0
CHATHAM CO.	4/12/1963	53	0	0	$0
CHATHAM CO.	6/6/1963	50	0	0	$0
CHATHAM CO.	3/15/1964	63	0	0	$0
CHATHAM CO.	7/13/1966	0	0	0	$0
CHATHAM CO.	3/7/1967	0	0	0	$0
CHATHAM CO.	6/10/1968	0	0	0	$0
CHATHAM CO.	8/18/1968	0	0	0	$0
CHATHAM CO.	6/27/1970	50	0	0	$0
CHATHAM CO.	7/15/1970	0	0	0	$0
CHATHAM CO.	4/23/1971	64	0	0	$0
CHATHAM CO.	6/10/1972	70	0	0	$0
CHATHAM CO.	8/20/1972	57	0	0	$0
CHATHAM CO.	5/29/1973	0	0	0	$0
CHATHAM CO.	5/5/1974	0	0	0	$0
CHATHAM CO.	5/12/1974	0	0	0	$0
CHATHAM CO.	1/25/1975	0	0	0	$0
CHATHAM CO.	5/16/1975	61	0	0	$0
CHATHAM CO.	6/12/1975	0	0	0	$0
CHATHAM CO.	6/19/1975	0	0	0	$0
CHATHAM CO.	7/25/1975	0	0	0	$0
CHATHAM CO.	8/11/1975	55	0	0	$0
CHATHAM CO.	3/16/1976	0	0	0	$0
CHATHAM CO.	3/16/1976	0	0	0	$0
CHATHAM CO.	7/13/1976	0	0	0	$0
CHATHAM CO.	8/8/1976	0	0	0	$0
CHATHAM CO.	6/23/1977	60	0	0	$0
CHATHAM CO.	5/1/1978	0	0	0	$0
CHATHAM CO.	6/29/1978	0	0	0	$0
CHATHAM CO.	6/11/1979	0	0	0	$0
CHATHAM CO.	7/17/1979	50	0	0	$0
CHATHAM CO.	9/7/1979	0	0	0	$0
CHATHAM CO.	5/23/1980	0	0	0	$0
CHATHAM CO.	7/10/1980	0	0	0	$0

Location	Date	Wind Speed	Fatalities	Injuries	Property Damage
CHATHAM CO.	9/8/1980	110	0	0	$0
CHATHAM CO.	3/16/1981	50	0	0	$0
CHATHAM CO.	3/18/1981	0	0	0	$0
CHATHAM CO.	7/11/1983	0	0	0	$0
CHATHAM CO.	7/22/1983	52	0	0	$0
CHATHAM CO.	9/11/1983	0	0	0	$0
CHATHAM CO.	11/20/1983	0	0	0	$0
CHATHAM CO.	11/20/1983	0	0	0	$0
CHATHAM CO.	1/18/1984	0	0	0	$0
CHATHAM CO.	5/3/1984	59	0	0	$0
CHATHAM CO.	6/2/1985	0	0	0	$0
CHATHAM CO.	6/2/1985	0	0	0	$0
CHATHAM CO.	7/12/1986	0	0	0	$0
CHATHAM CO.	7/15/1986	0	0	0	$0
CHATHAM CO.	7/21/1986	55	0	0	$0
CHATHAM CO.	7/21/1986	0	0	0	$0
CHATHAM CO.	7/21/1986	0	0	0	$0
CHATHAM CO.	7/21/1986	0	0	0	$0
CHATHAM CO.	7/31/1986	0	0	0	$0
CHATHAM CO.	7/6/1987	51	0	0	$0
CHATHAM CO.	4/19/1988	0	0	1	$0
CHATHAM CO.	9/9/1988	0	0	0	$0
CHATHAM CO.	5/23/1989	0	0	0	$0
CHATHAM CO.	5/23/1989	0	0	0	$0
CHATHAM CO.	6/16/1989	0	0	0	$0
CHATHAM CO.	6/21/1989	0	0	0	$0
CHATHAM CO.	7/18/1989	0	0	0	$0
CHATHAM CO.	2/22/1990	0	0	0	$0
CHATHAM CO.	2/22/1990	0	0	0	$0
CHATHAM CO.	8/1/1990	50	0	0	$0
CHATHAM CO.	8/1/1990	61	0	0	$0
CHATHAM CO.	8/1/1990	0	0	0	$0
CHATHAM CO.	8/1/1990	0	0	0	$0
CHATHAM CO.	8/1/1990	0	0	0	$0
CHATHAM CO.	8/1/1990	0	0	0	$0
CHATHAM CO.	8/7/1990	0	0	0	$0
CHATHAM CO.	10/4/1990	53	0	0	$0
CHATHAM CO.	3/2/1991	0	0	0	$0
CHATHAM CO.	3/3/1991	0	0	0	$0
CHATHAM CO.	3/3/1991	0	0	2	$0

Location	Date	Wind Speed	Fatalities	Injuries	Property Damage
CHATHAM CO.	3/3/1991	55	0	0	$0
CHATHAM CO.	4/30/1991	0	0	0	$0
CHATHAM CO.	4/30/1991	0	0	0	$0
CHATHAM CO.	6/1/1991	0	0	0	$0
CHATHAM CO.	7/1/1992	0	0	0	$0
CHATHAM CO.	7/1/1992	0	0	0	$0
CHATHAM CO.	8/5/1992	0	0	0	$0
CHATHAM CO.	8/10/1992	0	0	0	$0
CHATHAM CO.	8/10/1992	0	0	0	$0
Garden City	3/13/1993	0	0	0	$0
Savannah	4/5/1993	0	0	0	$5,000
Savannah	5/13/1993	0	0	0	$50,000
Savannah	10/30/1993	0	0	0	$500,000
Savannah	6/9/1994	0	0	0	$5,000
Savannah	6/25/1994	64	0	0	$500,000
Hunter Army A.F.	6/25/1994	70	0	0	$5,000
Savannah	6/25/1994	0	0	0	$500,000
Savannah	6/26/1994	2	0	0	$5,000
Savannah	8/6/1994	0	0	0	$500
CHATHAM CO.	5/15/1995	82	0	0	$250,000
CHATHAM CO.	6/9/1995	0	0	0	$10,000
Savannah	6/29/1995	0	0	0	$2,000
Savannah	6/29/1995	0	0	0	$35,000
CHATHAM CO.	7/25/1995	0	0	0	$5,000
SAVANNAH	6/13/1996	50	0	0	$0
SAVANNAH	6/21/1996	50	0	0	$0
SAVANNAH	7/5/1996	50	0	0	$0
THUNDERBOLT	7/16/1997	50	0	0	$0
SAVANNAH	7/17/1997	50	0	0	$0
PORT WENTWORTH	8/30/1997	50	0	0	$0
VERNONBURG	8/30/1997	50	0	0	$0
SAVANNAH	3/8/1998	52	0	0	$0
PORT WENTWORTH	5/3/1998	50	0	0	$0
WILSHIRE	5/8/1998	52	0	0	$0
POOLER	6/5/1998	50	0	0	$0
SAVANNAH	6/19/1998	50	0	0	$0
SAVANNAH	6/19/1998	50	0	0	$0
POOLER	7/4/1998	50	0	0	$0

Location	Date	Wind Speed	Fatalities	Injuries	Property Damage
SAVANNAH	7/4/1998	50	0	0	$0
SAVANNAH	7/31/1998	50	0	0	$0
COUNTYWIDE	9/3/1998	55	0	0	$1,250,000
SAVANNAH	6/29/1999	50	0	0	$0
SAVANNAH MUNI ARPT	8/20/1999	52	0	0	$0
SAVANNAH	9/29/1999	50	0	1	$0
THUNDERBOLT	7/16/2000	52	0	0	$0
PORT WENTWORTH	8/10/2000	50	0	0	$0
SAVANNAH MUNI ARPT	3/29/2001	50	0	0	$0
SAVANNAH	6/14/2001	50	0	0	$0
SAVANNAH	7/26/2001	50	0	0	$100,000
GARDEN CITY	8/24/2001	50	0	0	$0
POOLER	6/7/2002	50	0	0	$0
SAVANNAH	7/11/2002	50	0	0	$0
SAVANNAH	8/18/2002	50	0	0	$0
BLOOMINGDALE	11/6/2002	50	0	0	$0
SAVANNAH	12/24/2002	52	0	0	$0
COUNTYWIDE	2/22/2003	52	0	0	$0
MEINHARD	5/11/2003	50	0	0	$0
(SAV)SAVANNAH INTL A	6/3/2003	50	0	0	$0
GARDEN CITY	7/19/2003	50	0	0	$0
SAVANNAH	7/28/2003	50	0	0	$0
SAVANNAH	7/28/2003	50	0	0	$0
BLOOMINGDALE	5/2/2004	50	0	0	$0
BLOOMINGDALE	5/2/2004	50	0	0	$0
WILMINGTON IS	6/22/2004	50	0	0	$0
SAVANNAH	6/23/2004	50	0	0	$0
SAVANNAH	6/25/2004	50	0	0	$0
FT SCREVEN	8/5/2004	50	0	0	$0
BURROUGHS	9/5/2004	60	0	0	$0
POOLER	9/6/2004	50	0	0	$0
BLOOMINGDALE	9/7/2004	50	0	0	$0
BLOOMINGDALE	9/26/2004	50	0	0	$0
SAVANNAH	5/17/2005	45	1	1	$0
POOLER	5/20/2005	50	0	0	$0
WILMINGTON IS	5/20/2005	55	0	0	$0
SAVANNAH	7/13/2005	55	0	0	$0

Location	Date	Wind Speed	Fatalities	Injuries	Property Damage
GARDEN CITY	8/22/2005	50	0	0	$0
SAVANNAH	4/8/2006	50	0	0	$100,000
ISLE OF HOPE	4/8/2006	50	0	0	$1,000
SAVANNAH	4/26/2006	50	0	0	$1,000
SAVANNAH	4/26/2006	50	0	0	$500
SAVANNAH	4/26/2006	50	0	0	$2,000
SAVANNAH	4/26/2006	50	0	0	$10,000
SAVANNAH	4/26/2006	50	0	0	$1,000
SAVANNAH	4/26/2006	50	0	0	$1,000
SAVANNAH	5/27/2006	50	0	0	$2,000
POOLER	6/4/2006	50	0	0	$2,000
BLOOMINGDALE	6/4/2006	50	0	0	$10,000
ISLE OF HOPE	7/6/2006	50	0	0	$10,000
SAVANNAH	7/29/2006	50	0	0	$1,000
ISLE OF HOPE	7/29/2006	55	0	0	$2,000
SAVANNAH	8/4/2006	50	0	0	$10,000
SAVANNAH	9/19/2006	50	0	0	$0
BURROUGHS	6/7/2007	50	0	0	$500
(SAV)SAVANNAH INTL A	6/11/2007	60	0	0	$11,000
CENTRAL JCT	6/11/2007	50	0	0	$2,000
WILMINGTON IS	6/11/2007	50	0	0	$2,000
CENTRAL JCT	7/7/2007	50	0	0	$5,000
BONA BELLA	7/14/2007	50	0	0	$2,000
WILLIAM HILL	7/14/2007	50	0	0	$2,000
THUNDERBOLT	2/26/2008	50	0	0	$1,500
SANDFLY	3/7/2008	50	0	0	$4,000
PORT WENTWORTH	4/5/2008	50	0	0	$750
THUNDERBOLT	6/15/2008	50	0	0	$1,000
SAVANNAH	6/19/2008	50	0	0	$2,500
SAVANNAH	6/19/2008	50	0	0	$0
SAVANNAH	6/19/2008	50	0	0	$20,000
SAVANNAH	6/19/2008	52	0	0	$0
SAVANNAH	6/19/2008	50	0	0	$5,000
BURNSIDE	6/21/2008	52	0	0	$0
BURNSIDE	6/21/2008	50	0	0	$250
BURNSIDE	6/21/2008	50	0	0	$250
SAVANNAH	6/29/2008	50	0	0	$2,000
BURROUGHS	7/5/2008	50	0	0	$2,000

Location	Date	Wind Speed	Fatalities	Injuries	Property Damage
BURROUGHS	7/5/2008	55	0	0	$5,000
SAVANNAH	7/5/2008	55	0	0	$25,000
SAVANNAH	7/27/2008	50	0	0	$500
SAVANNAH	7/27/2008	50	0	0	$1,500
BONA BELLA	12/11/2008	50	0	0	$500
SANDFLY	4/13/2009	50	0	0	$2,000
VERNONBURG	6/13/2009	50	0	0	$1,500
SAVANNAH	6/16/2009	50	0	0	$2,000
WILMINGTON IS	6/16/2009	50	0	0	$5,000
VERNONBURG	6/18/2009	50	0	0	$1,000
SAVANNAH STATE COLLE	6/18/2009	50	0	0	$500
SAVANNAH STATE COLLE	6/18/2009	50	0	0	$750
SAVANNAH	7/27/2009	40	0	0	$250
SAVANNAH	7/27/2009	50	0	0	$1,000
THUNDERBOLT	7/27/2009	50	0	0	$250
SAVANNAH	7/27/2009	50	0	0	$1,000
VERNONBURG	7/27/2009	50	0	0	$1,000
(SVN)HUNTER AAF SAVA	7/27/2009	50	0	0	$1,000
SANDFLY	7/27/2009	55	0	0	$5,000
PARKERSBURG	7/29/2009	50	0	0	$500
(SVN)HUNTER AAF SAVA	7/31/2009	50	0	0	$500
SAVANNAH	7/31/2009	50	0	0	$500
SAVANNAH	8/5/2009	50	0	0	$500
PORT WENTWORTH	8/12/2009	50	0	0	$500
CENTRAL JCT	8/12/2009	50	0	0	$500
SAVANNAH	8/12/2009	50	0	0	$1,000
SAVANNAH STATE COLLE	8/21/2009	50	0	0	$500
PARADISE PARK	8/21/2009	50	0	0	$500
VERNONBURG	8/21/2009	50	0	0	$500
SAVANNAH	5/23/2010	50	0	0	$1,000
VERNONBURG	5/23/2010	50	0	0	$7,500
BURNSIDE	5/23/2010	50	0	0	$1,500
BONA BELLA	5/24/2010	50	0	0	$2,000
BURROUGHS	6/15/2010	50	0	0	$2,000
PORT WENTWORTH	6/27/2010	50	0	0	$2,000

Location	Date	Wind Speed	Fatalities	Injuries	Property Damage
CENTRAL JCT	6/27/2010	50	0	0	$1,000
BONA BELLA	6/27/2010	50	0	0	$3,000
BONA BELLA	6/27/2010	50	0	0	$2,000
SAVANNAH	6/27/2010	50	0	0	$3,000
BONA BELLA	6/27/2010	50	0	0	$2,000
SAVANNAH	6/27/2010	50	0	0	$3,000
BLOOMINGDALE	6/27/2010	50	0	0	$1,000
SAVANNAH	7/10/2010	50	0	0	$500
SAVANNAH	7/10/2010	50	0	0	$500
FERNWOOD	7/10/2010	50	0	0	$500
POOLER	7/12/2010	52	0	0	$0
PARADISE PARK	7/12/2010	50	0	0	$500
BLOOMINGDALE	7/14/2010	50	0	0	$3,000
GARDEN CITY	7/14/2010	50	0	0	$1,000
SAVANNAH	8/20/2010	50	0	0	$2,000
SAVANNAH	8/20/2010	52	0	0	$0
WILLIAMS	8/26/2010	50	0	0	$1,250
GARDEN CITY	4/5/2011	50	0	0	$0
PORT WENTWORTH	6/6/2011	50	0	0	$1,000
THUNDERBOLT	6/15/2011	50	0	0	$3,000
PORT WENTWORTH	6/18/2011	50	0	0	$1,250
BLOOMINGDALE	6/18/2011	50	0	0	$1,250
FERNWOOD	6/18/2011	50	0	0	$2,000
FAIRWAY OAKS	6/18/2011	50	0	0	$1,000
THUNDERBOLT	6/18/2011	55	0	0	$2,750
THUNDERBOLT	6/18/2011	60	0	0	$2,000
PARKERSBURG	6/18/2011	50	0	0	$4,000
PARKERSBURG	6/18/2011	55	0	0	$4,000
PARKERSBURG	6/18/2011	55	0	0	$4,000
SAVANNAH	6/18/2011	50	0	0	$2,250
SAVANNAH	6/18/2011	50	0	0	$2,000
THUNDERBOLT	6/23/2011	50	0	0	$0
FT SCREVEN	6/23/2011	50	0	0	$0
WILSHIRE	6/23/2011	50	0	0	$1,000
WILSHIRE	6/23/2011	50	0	0	$7,500
BONA BELLA	7/9/2011	50	0	0	$2,500
(SAV)SAVANNAH INTL A	7/31/2011	56	0	0	$0

Location	Date	Wind Speed	Fatalities	Injuries	Property Damage
(SAV)SAVANNAH INTL A	7/31/2011	55	0	0	$5,500
(SAV)SAVANNAH INTL A	7/31/2011	61	0	0	$0
POOLER	7/31/2011	50	0	0	$500
BURNSIDE	8/6/2011	55	0	0	$2,500
BURROUGHS	8/8/2011	55	0	0	$5,000
BURROUGHS	8/8/2011	50	0	0	$2,000
(SVN)HUNTER AAF SAVA	8/8/2011	55	0	0	$4,000
VERNONBURG	8/8/2011	50	0	0	$2,000
FT SCREVEN	8/8/2011	50	0	0	$1,000
SAVANNAH STATE COLLE	8/8/2011	50	0	0	$1,000
LIBERTY CITY	8/8/2011	50	0	0	$1,000
FT SCREVEN	8/8/2011	50	0	0	$2,000
BURROUGHS	8/8/2011	50	0	0	$1,000
SAVANNAH STATE COLLE	8/8/2011	50	0	0	$1,000
SAVANNAH	8/8/2011	50	0	0	$500
GARDEN CITY	8/9/2011	50	0	0	$1,000
SAVANNAH STATE COLLE	8/9/2011	50	0	0	$1,000
THUNDERBOLT	8/9/2011	50	0	0	$1,250
MEINHARD	8/14/2011	50	0	0	$0
PORT WENTWORTH	8/14/2011	50	0	0	$4,250
SAVANNAH	8/14/2011	50	0	0	$1,000
FT SCREVEN	8/22/2011	60	0	0	$1,000
GARDEN CITY	8/23/2011	50	0	0	$2,000
BONA BELLA	9/5/2011	55	0	0	$5,000
VERNONBURG	2/24/2012	50	0	0	$2,000
VERNONBURG	2/24/2012	78	0	0	$50,000
LIBERTY CITY	2/24/2012	50	0	0	$500
WILLIAMS	5/9/2012	50	0	0	$500
LIBERTY CITY	5/9/2012	50	0	0	$500
GARDEN CITY	5/31/2012	50	0	0	$500
SAVANNAH	6/11/2012	50	0	0	$5,000
(SAV)SAVANNAH INTL A	7/1/2012	50	0	0	$0
POOLER	7/1/2012	61	0	0	$8,000
SAVANNAH BEACH	7/1/2012	61	0	2	$10,000

Location	Date	Wind Speed	Fatalities	Injuries	Property Damage
POOLER	7/1/2012	50	0	0	$1,000
(SAV)SAVANNAH INTL A	7/1/2012	50	0	0	$1,000
SAVANNAH	7/1/2012	60	0	0	$6,000
FAIRWAY OAKS	7/1/2012	50	0	0	$5,000
THUNDERBOLT	7/1/2012	60	0	0	$3,000
BURROUGHS	7/1/2012	50	0	0	$1,000
BONA BELLA	7/5/2012	55	0	0	$3,000
VERNONBURG	7/20/2012	43	0	0	$5,000
WILSHIRE	7/28/2012	50	0	0	$5,000
CENTRAL JCT	7/29/2012	50	0	0	$3,000
GARDEN CITY	8/2/2012	50	0	0	$1,500
BURROUGHS	8/2/2012	50	0	0	$500
WILLIAM HILL	8/7/2012	50	0	0	$500
WILMINGTON IS	8/11/2012	55	0	0	$3,000
BEAULIEU	8/17/2012	55	0	0	$3,000
BURNSIDE	8/17/2012	55	0	0	$500
VERNONBURG	8/17/2012	55	0	0	$200
VERNONBURG	8/17/2012	55	0	0	$500
BURROUGHS	8/17/2012	55	0	0	$5,000
PORT WENTWORTH	8/23/2012	50	0	0	$2,000
BURNSIDE	9/7/2012	50	0	0	$1,000
BLOOMINGDALE	12/17/2012	50	0	0	$1,000
BURROUGHS	12/17/2012	50	0	0	$0
FAIRWAY OAKS	12/17/2012	62	0	0	$0
MONTEITH	4/29/2013	65	0	0	$5,000
CENTRAL JCT	6/4/2013	52	0	0	$0
FAIRWAY OAKS	6/4/2013	50	0	0	$2,000
BONA BELLA	6/4/2013	50	0	0	$2,000
FAIRWAY OAKS	6/4/2013	50	0	0	$1,000
BLOOMINGDALE	6/10/2013	56	0	0	$0
BLOOMINGDALE	6/10/2013	56	0	0	$0
BLOOMINGDALE	6/10/2013	52	0	0	$0
BLOOMINGDALE	6/10/2013	55	0	0	$5,500
BLOOMINGDALE	6/10/2013	50	0	0	$11,000
BLOOMINGDALE	6/10/2013	50	0	0	$1,000
POOLER	6/10/2013	50	0	0	$3,250
POOLER	6/10/2013	55	0	0	$2,000
(SVN)HUNTER AAF SAVA	6/19/2013	50	0	0	$2,750

Location	Date	Wind Speed	Fatalities	Injuries	Property Damage
BLOOMINGDALE	6/27/2013	50	0	0	$2,250
LIBERTY CITY	7/31/2013	50	0	0	$500
POOLER	7/31/2013	50	0	0	$500
POOLER	7/31/2013	50	0	0	$1,000
BURNSIDE	1/11/2014	50	0	0	$1,000
BONA BELLA	4/7/2014	50	0	0	$1,000
BONA BELLA	5/28/2014	50	0	0	$0
PORT WENTWORTH	6/6/2014	50	0	0	$0
SANDFLY	6/14/2014	50	0	0	$0
VERNONBURG	6/24/2014	50	0	0	$0
POOLER	6/24/2014	50	0	0	$0
POOLER	6/24/2014	50	0	0	$0
SAVANNAH	6/24/2014	50	0	0	$0
LIBERTY CITY	6/24/2014	50	0	0	$0
CENTRAL JCT	6/24/2014	50	0	0	$0
WILMINGTON IS	7/3/2014	50	0	0	$0
SAVANNAH STATE COLLE	7/15/2014	50	0	0	$0
SAVANNAH STATE COLLE	7/15/2014	50	0	0	$0
VERNONBURG	7/15/2014	50	0	0	$0
BURROUGHS	8/19/2014	50	0	0	$0
LIBERTY CITY	8/19/2014	50	0	0	$0
SAVANNAH STATE COLLE	8/19/2014	50	0	0	$0
SAVANNAH	8/19/2014	50	0	0	$0
FT SCREVEN	8/19/2014	50	0	0	$0
PARKERSBURG	9/16/2014	50	0	0	$0
FERNWOOD	10/14/2014	50	0	0	$0
BEAULIEU	10/14/2014	50	0	0	$0
VERNONBURG	11/23/2014	50	0	0	$0
FAIRWAY OAKS	1/1/2015	50	0	0	$0
LIBERTY CITY	1/1/2015	50	0	0	$0
CENTRAL JCT	1/4/2015	50	0	0	$0
BURROUGHS	4/19/2015	50	0	0	$0
BURROUGHS	4/19/2015	50	0	0	$0
BURROUGHS	4/19/2015	50	0	0	$0
BURNSIDE	4/19/2015	50	0	0	$0
SANDFLY	4/19/2015	50	0	0	$0
BLOOMINGDALE	4/25/2015	60	0	0	$0

Location	Date	Wind Speed	Fatalities	Injuries	Property Damage
MEINHARD	4/25/2015	60	0	0	$0
POOLER	4/25/2015	60	0	0	$0
(SAV)SAVANNAH INTL A	4/25/2015	70	0	0	$0
(SAV)SAVANNAH INTL A	4/25/2015	70	0	0	$0
POOLER	4/25/2015	60	0	0	$0
POOLER	4/25/2015	60	0	0	$0
PORT WENTWORTH	4/25/2015	60	0	0	$0
GARDEN CITY	4/25/2015	79	0	0	$0
GARDEN CITY	4/25/2015	79	0	0	$0
GARDEN CITY	4/25/2015	79	0	0	$0
PORT WENTWORTH	4/25/2015	60	0	0	$0
PORT WENTWORTH	4/25/2015	60	0	0	$0
BONA BELLA	4/25/2015	60	0	0	$0
CENTRAL JCT	4/25/2015	50	0	0	$0
LIBERTY CITY	4/25/2015	60	0	0	$0
CENTRAL JCT	4/25/2015	50	0	1	$0
LIBERTY CITY	4/25/2015	50	0	0	$0
THUNDERBOLT	4/25/2015	70	0	0	$0
SAVANNAH	4/25/2015	60	0	0	$0
THUNDERBOLT	4/25/2015	50	0	0	$0
WILMINGTON IS	4/25/2015	50	0	0	$0
SAVANNAH BEACH	4/25/2015	52	0	0	$0
SAVANNAH BEACH	4/25/2015	53	0	0	$0
WILLIAMS	6/2/2015	50	0	0	$0
FERNWOOD	6/3/2015	50	0	0	$0
SANDFLY	6/9/2015	50	0	0	$0
(SAV)SAVANNAH INTL A	6/19/2015	51	0	0	$0
GARDEN CITY	6/19/2015	50	0	0	$0
PORT WENTWORTH	6/19/2015	50	0	0	$0
(SAV)SAVANNAH INTL A	6/22/2015	56	0	0	$0
(SAV)SAVANNAH INTL A	6/22/2015	59	0	0	$0
FERNWOOD	6/22/2015	50	0	0	$0
FERNWOOD	6/22/2015	50	0	0	$0

Location	Date	Wind Speed	Fatalities	Injuries	Property Damage
SAVANNAH BEACH	7/2/2015	51	0	0	$0
SAVANNAH STATE COLLE	7/4/2015	50	0	0	$0
VERNONBURG	7/5/2015	50	0	0	$0
LIBERTY CITY	7/7/2015	50	0	0	$0
GARDEN CITY	7/15/2015	50	0	0	$0
CENTRAL JCT	7/15/2015	50	0	0	$0
SAVANNAH BEACH	7/15/2015	50	0	0	$0
FT SCREVEN	7/15/2015	50	0	0	$0
SAVANNAH BEACH	7/15/2015	50	0	0	$0
BURNSIDE	7/19/2015	50	0	0	$0
CENTRAL JCT	7/19/2015	50	0	0	$0
FT SCREVEN	7/19/2015	50	0	0	$0
SAVANNAH	7/23/2015	55	0	0	$0
FT SCREVEN	7/23/2015	50	0	0	$0
PARKERSBURG	7/23/2015	50	0	0	$0
VERNONBURG	2/16/2016	55	0	0	$0
BONA BELLA	2/16/2016	50	0	0	$0
SAVANNAH	2/16/2016	50	0	0	$0
WILSHIRE	5/17/2016	50	0	0	$0
WILLIAMS	6/2/2016	50	0	0	$0
BLOOMINGDALE	6/14/2016	50	0	0	$0
BLOOMINGDALE	6/14/2016	40	0	0	$1,250
BLOOMINGDALE	6/14/2016	70	0	0	$0
BLOOMINGDALE	6/14/2016	50	0	0	$0
BLOOMINGDALE	6/14/2016	50	0	0	$0
VERNONBURG	6/14/2016	52	0	0	$0
BONA BELLA	6/17/2016	50	0	0	$0
FT SCREVEN	6/17/2016	53	0	0	$0
BONA BELLA	6/17/2016	50	0	0	$0
FT SCREVEN	6/17/2016	50	0	0	$0
SAVANNAH	6/28/2016	50	0	0	$0
SAVANNAH	6/28/2016	50	0	0	$0
THUNDERBOLT	6/28/2016	50	0	0	$0
THUNDERBOLT	6/28/2016	55	0	0	$0
VERNONBURG	6/28/2016	50	0	0	$0
PARKERSBURG	6/28/2016	50	0	0	$0
VERNONBURG	7/14/2016	50	0	0	$0

Location	Date	Wind Speed	Fatalities	Injuries	Property Damage
SAVANNAH	7/17/2016	50	0	0	$0
THUNDERBOLT	7/17/2016	50	0	0	$0
THUNDERBOLT	7/20/2016	50	0	0	$0
SAVANNAH	7/20/2016	50	0	0	$0
BLOOMINGDALE	7/24/2016	50	0	0	$0
BLOOMINGDALE	1/22/2017	50	0	0	$0
BLOOMINGDALE	5/13/2017	40	0	0	$500
PORT WENTWORTH	5/22/2017	50	0	0	$0
PORT WENTWORTH	5/22/2017	50	0	0	$0
FERNWOOD	5/23/2017	50	0	0	$0
FAIRWAY OAKS	5/23/2017	50	0	0	$0
SAVANNAH	7/2/2017	50	0	0	$0
POOLER	7/5/2017	56	0	0	$0
PORT WENTWORTH	7/5/2017	56	0	0	$0
(SAV)SAVANNAH INTL A	7/5/2017	56	0	0	$0
FT SCREVEN	7/16/2017	40	0	0	$500
SAVANNAH BEACH	4/23/2018	39	0	0	$1,250
SAVANNAH BEACH	4/23/2018	39	0	0	$1,250
SAVANNAH BEACH	4/23/2018	39	0	0	$1,250
SAVANNAH BEACH	4/23/2018	58	0	0	$0
CENTRAL JCT	6/2/2018	40	0	0	$5,000
FT SCREVEN	6/2/2018	50	0	0	$0
FT SCREVEN	6/2/2018	53	0	0	$0
VERNONBURG	6/27/2018	50	0	0	$0
SAVANNAH	7/6/2018	50	0	0	$0
BURROUGHS	4/19/2019	50	0	0	$0
WILLIAMS	4/19/2019	50	0	0	$0
BLOOMINGDALE	4/19/2019	45	0	0	$2,500
WILLIAMS	4/19/2019	45	0	0	$2,500
FERNWOOD	4/19/2019	45	0	0	$2,500
POOLER	4/19/2019	50	0	0	$0
FERNWOOD	4/19/2019	45	0	0	$2,500
FERNWOOD	4/19/2019	50	0	0	$0
FERNWOOD	4/19/2019	50	0	0	$0
WILLIAM HILL	4/19/2019	50	0	0	$0

Location	Date	Wind Speed	Fatalities	Injuries	Property Damage
BONA BELLA	4/19/2019	50	0	0	$0
(SAV)SAVANNAH INTL A	4/19/2019	45	0	0	$500
(SAV)SAVANNAH INTL A	4/19/2019	50	0	0	$0
BONA BELLA	4/19/2019	50	0	0	$0
MEINHARD	4/19/2019	65	0	0	$0
MEINHARD	4/19/2019	50	0	0	$0
MONTEITH	4/19/2019	50	0	0	$0
MEINHARD	4/19/2019	65	0	0	$0
PORT WENTWORTH	4/19/2019	65	0	0	$0
BONA BELLA	4/19/2019	50	0	0	$0
MEINHARD	4/19/2019	50	0	0	$0
(SAV)SAVANNAH INTL A	4/19/2019	57	0	0	$0
CENTRAL JCT	4/19/2019	54	0	0	$0
VERNONBURG	4/19/2019	45	0	0	$1,500
BLOOMINGDALE	4/19/2019	55	0	0	$0
SAVANNAH	4/19/2019	50	0	0	$0
SANDFLY	4/19/2019	50	0	0	$0
(SVN)HUNTER AAF SAVA	5/4/2019	49	0	0	$100
(SVN)HUNTER AAF SAVA	5/4/2019	50	0	0	$0
LIBERTY CITY	5/4/2019	50	0	0	$0
VERNONBURG	5/31/2019	50	0	0	$0
SAVANNAH	8/14/2019	50	0	0	$0
VERNONBURG	8/14/2019	50	0	0	$0
VERNONBURG	8/14/2019	50	0	0	$0
BEAULIEU	8/14/2019	50	0	0	$0
		Total	**1**	**8**	**$3,820,800**

In addition to recorded thunderstorm wind events, NCEI recorded 13 high wind events and 23 strong wind events occurring from 1960 through 2019. These events are detailed in Table 2.61 and Table 2.62, respectively.

Table 2.61 – NCEI Recorded High Winds Events, Chatham County, 1960-2019

Location	Date	Wind Speed (kts)	Fatalities	Injuries	Property Damage
INLAND CHATHAM (ZONE)	9/6/2004	50	0	0	$0
COASTAL CHATHAM (ZONE)	9/6/2004	50	0	0	$0
INLAND CHATHAM (ZONE)	2/27/2005	50	0	0	$0

Location	Date	Wind Speed (kts)	Fatalities	Injuries	Property Damage
INLAND CHATHAM (ZONE)	11/21/2005	50	0	0	$0
COASTAL CHATHAM (ZONE)	11/21/2005	50	0	0	$0
INLAND CHATHAM (ZONE)	3/8/2008	50	0	0	$500
COASTAL CHATHAM (ZONE)	3/8/2008	50	0	0	$4,000
COASTAL CHATHAM (ZONE)	3/8/2008	50	0	0	$500
COASTAL CHATHAM (ZONE)	3/8/2008	50	0	0	$1,000
COASTAL CHATHAM (ZONE)	3/8/2008	50	0	0	$1,000
INLAND CHATHAM (ZONE)	10/24/2008	55	0	0	$6,000
COASTAL CHATHAM (ZONE)	10/24/2008	55	0	0	$8,000
COASTAL CHATHAM (ZONE)	4/21/2013	43	0	0	$10,000
		Total	**0**	**0**	**$194,000**

Source: NCEI

Table 2.62 – NCEI Recorded Strong Winds Events, Chatham County, 1960-2019

Location	Date	Wind Speed (kts)	Fatalities	Injuries	Property Damage
INLAND CHATHAM (ZONE)	2/25/2007	43	0	0	$10,000
COASTAL CHATHAM (ZONE)	2/25/2007	43	0	0	$10,000
COASTAL CHATHAM (ZONE)	6/2/2007	45	0	0	$2,000
COASTAL CHATHAM (ZONE)	7/2/2010	30	0	0	$4,000
COASTAL CHATHAM (ZONE)	7/2/2010	30	0	0	$500
COASTAL CHATHAM (ZONE)	10/9/2011	35	0	0	$3,750
COASTAL CHATHAM (ZONE)	10/10/2011	40	0	0	$500
COASTAL CHATHAM (ZONE)	10/10/2011	40	0	0	$3,500
COASTAL CHATHAM (ZONE)	12/7/2011	35	0	0	$3,000
COASTAL CHATHAM (ZONE)	12/7/2011	35	0	0	$500
COASTAL CHATHAM (ZONE)	5/3/2013	35	0	0	$2,500
COASTAL CHATHAM (ZONE)	3/6/2014	40	0	0	$2,250
INLAND CHATHAM (ZONE)	1/26/2015	35	0	0	$5,000
COASTAL CHATHAM (ZONE)	2/24/2016	40	0	0	$4,500
COASTAL CHATHAM (ZONE)	5/1/2017	35	0	0	$3,000
INLAND CHATHAM (ZONE)	5/1/2017	35	0	0	$500
COASTAL CHATHAM (ZONE)	10/19/2019	40	0	0	$1,000
COASTAL CHATHAM (ZONE)	10/19/2019	40	0	0	$2,250
COASTAL CHATHAM (ZONE)	10/19/2019	40	0	0	$1,000
COASTAL CHATHAM (ZONE)	10/19/2019	40	0	0	$1,000
INLAND CHATHAM (ZONE)	10/19/2019	40	0	0	$2,250
COASTAL CHATHAM (ZONE)	10/19/2019	40	0	0	$1,250
COASTAL CHATHAM (ZONE)	10/19/2019	40	0	0	$1,000
		Total	**0**	**0**	**$65,250**

Source: NCEI

Of all wind events recorded during the period from 1960-2019, there were 6 incidents that directly caused deaths or injuries. These incidents are highlighted in Table 2.63.

Table 2.63 – NCEI Recorded Wind Events with Injuries and/or Fatalities, 1960-2019

Location	Event Type	Date	Wind Speed (mph)	Fatalities	Injuries	Property Damage
Chatham Co.	Thunderstorm Wind	4/19/1988	0	0	1	0
Chatham Co.	Thunderstorm Wind	3/3/1991	0	0	2	0
Savannah	Thunderstorm Wind	9/29/1999	57.5	0	1	$0
Savannah	Thunderstorm Wind	5/17/2005	51.8	1	1	$0
Savannah Beach	Thunderstorm Wind	7/1/2012	70.2	0	2	$10,000
Central Junction	Thunderstorm Wind	4/25/2015	57.5	0	1	$0
			Total	**1**	**8**	**$10,000**

Source: NCEI

The County received FEMA Major Disaster Declarations in 1994 and 1998 for severe storms that included heavy rains and high winds.

Lightning

According to NCEI data, there were 31 lightning strikes reported between 1996 and 2019, reported in Table 2.64. Of these, 20 recorded property damage totaling over $4.4 million, which was mostly recorded as fire damage ignited by lightning. The highest rate of property damage recorded for a single incident was $2,000,000. One event caused a fatality, and seven events caused a total of 13 injuries. Event narratives indicate in some cases that property damage occurred but was not estimated; therefore, actual property damage amounts are higher. No crop damage was recorded by these strikes. It should be noted that lightning events recorded by the NCEI are only those that are reported; it is certain that additional lightning incidents have occurred in Chatham County.

Table 2.64 – NCEI Recorded Lightning Strikes, Chatham County, 1996-2019

Location	Date	Time	Fatalities	Injuries	Property Damage
SAVANNAH	6/21/1996	1710	0	0	$0
SAVANNAH	8/7/1996	1315	0	0	$30,000
SAVANNAH	7/17/1997	1755	0	0	$0
SAVANNAH	8/22/1999	1945	0	2	$0
COUNTYWIDE	8/11/2000	1414	0	0	$0
SAVANNAH	6/25/2001	1155	1	1	$0
WILMINGTON IS	6/22/2004	1600	0	0	$2,000,000
POOLER	4/19/2006	1440	0	0	$0
WILLIAMS	7/14/2007	1518	0	0	$15,000
SAVANNAH BEACH	7/30/2007	1730	0	1	$0
CENTRAL JCT	7/30/2007	1930	0	1	$0
(SAV)SAVANNAH INTL A	10/9/2008	1245	0	0	$500
SAVANNAH	6/16/2009	1935	0	0	$10,000
WILLIAMS	7/31/2009	1630	0	0	$25,000
SAVANNAH	8/5/2009	1420	0	0	$10,000
POOLER	7/12/2010	1600	0	4	$0
BONA BELLA	7/14/2011	1329	0	0	$10,000
SAVANNAH	7/29/2012	1513	0	0	$10,000
POOLER	7/2/2013	1450	0	0	$20,000
MEINHARD	7/2/2013	1450	0	1	$0

Location	Date	Time	Fatalities	Injuries	Property Damage
SAVANNAH BEACH	7/3/2014	1800	0	3	$0
SANDFLY	6/28/2015	1508	0	0	$5,000
SAVANNAH	7/7/2015	1443	0	0	$15,000
SANDFLY	7/15/2015	1605	0	0	$15,000
BURROUGHS	8/6/2015	1316	0	0	$20,000
WILLIAMS	7/15/2017	1240	0	0	$200,000
THUNDERBOLT	7/28/2018	1530	0	0	$5,000
SAVANNAH BEACH	6/22/2019	1515	0	0	$75,000
LIBERTY CITY	8/14/2019	1356	0	0	$4,000
(SVN)HUNTER AAF SAVA	8/14/2019	1401	0	0	$15,000
FAIRWAY OAKS	8/24/2019	1250	0	0	$2,000,000
		Total	**1**	**13**	**$4,484,500**

Source: NCEI

The following are a selection of narrative descriptions recorded in NCEI for lightning events that occurred in Chatham County:

June 25, 2001 – A construction foreman was killed while trying to clear his crew from a construction site. After the bolt struck the foreman, it traveled through the ground and struck another worker, coming up through the ground into the leg of a 43-year-old male worker.

June 22, 2004 – Lightning struck a 7400 square foot home which sparked a fire causing millions of dollars in damage. The storm also knocked out power to 18,000 residents.

July 12, 2010 – Thunderstorms developed along a weak frontal boundary aided by a weak shortwave trough, and advanced eastward into an unstable and weakly sheared environment over southern South Carolina and southeast Georgia. Broadcast media reported that four residents of an apartment complex felt lightning go right through their building. The Pooler Fire Department said the residents were inside a building at the Carlisle when the lightning hit their units at 385 Godley Station Boulevard. They said no one was seriously injured.

July 15, 2017 – Scattered thunderstorms developed in the afternoon hours along the sea breeze. These thunderstorms produced damaging wind gusts and lightning strikes that led to structure fires. A lightning strike started a house fire on Sussex Retreat in the Savannah Quarters neighborhood. The fire caused significant damage to much of the roof and second level of the home.

Hail

NCEI records 166 hail incidents between 1957 and 2019 in Chatham County. Of these, three events were reported to have caused property damage totaling $510,500, and none caused death, injury or crop damage. The largest diameter hail recorded in the County was 3.5 inches, which occurred on April 5, 1993 in Savannah. The average hail size of all events in the County was just over one inch in diameter. Table 2.65 summarizes hail events by location. In some cases, hail was reported for multiple locations on the same day.

Table 2.65 – NCEI Hail Events, Chatham County, 1957-2019

Location	Date	Diameter (in.)	Deaths	Injuries	Property Damage
Chatham Co.	3/24/1957	0.75	0	0	$0
Chatham Co.	4/23/1967	1.75	0	0	$0
Chatham Co.	4/18/1969	1	0	0	$0

Location	Date	Diameter (in.)	Deaths	Injuries	Property Damage
Chatham Co.	5/5/1974	1.75	0	0	$0
Chatham Co.	4/27/1980	2	0	0	$0
Chatham Co.	6/18/1980	1.75	0	0	$0
Chatham Co.	6/18/1980	1	0	0	$0
Chatham Co.	6/21/1981	0.75	0	0	$0
Chatham Co.	4/27/1982	0.75	0	0	$0
Chatham Co.	8/5/1982	2	0	0	$0
Chatham Co.	8/5/1982	2	0	0	$0
Chatham Co.	9/11/1983	0.75	0	0	$0
Chatham Co.	7/31/1986	1	0	0	$0
Chatham Co.	4/25/1988	1	0	0	$0
Chatham Co.	5/24/1988	1.5	0	0	$0
Chatham Co.	5/24/1988	2.5	0	0	$0
Chatham Co.	8/7/1990	1.5	0	0	$0
Chatham Co.	4/28/1991	0.75	0	0	$0
Chatham Co.	4/28/1991	1	0	0	$0
Chatham Co.	4/28/1991	0.88	0	0	$0
Chatham Co.	4/30/1991	0.75	0	0	$0
Savannah	4/5/1993	1.75	0	0	$0
Isle of Hope	4/5/1993	1.75	0	0	$0
Savannah	4/5/1993	2.75	0	0	$500,000
Savannah	4/5/1993	3.5	0	0	$0
Savannah	4/5/1993	1.75	0	0	$0
Windsor Forest	4/5/1993	0.75	0	0	$0
Savannah	4/5/1993	0.75	0	0	$0
Windsor Forest	5/13/1993	0.75	0	0	$0
Savannah	5/13/1993	0.75	0	0	$0
Savannah	6/9/1994	0.75	0	0	$0
Odum	6/26/1994	0.88	0	0	$0
Savannah	6/25/1995	0.75	0	0	$0
Savannah	7/10/1995	1	0	0	$0
Savannah	7/10/1995	0.75	0	0	$0
SAVANNAH	6/13/1996	1.25	0	0	$0
SAVANNAH	6/13/1996	1.75	0	0	$0
VERNONBURG	6/13/1996	0.75	0	0	$0
SAVANNAH	5/3/1997	0.75	0	0	$0
SAVANNAH	7/9/1997	1	0	0	$0
THUNDERBOLT	7/16/1997	1.75	0	0	$0
POOLER	8/30/1997	0.75	0	0	$0
SAVANNAH	2/28/1998	1	0	0	$0

Location	Date	Diameter (in.)	Deaths	Injuries	Property Damage
WILSHIRE	5/8/1998	1	0	0	$0
ISLE OF HOPE	5/8/1998	1.75	0	0	$0
SAVANNAH	5/6/1999	1.75	0	0	$0
PORT WENTWORTH	8/10/2000	1.75	0	0	$0
HUNTER AFB	3/29/2001	1	0	0	$0
SAVANNAH	3/26/2002	1.75	0	0	$0
THUNDERBOLT	8/18/2002	0.88	0	0	$0
SAVANNAH	8/18/2002	1.25	0	0	$0
BURROUGHS	3/19/2003	1	0	0	$0
SAVANNAH	3/20/2003	0.88	0	0	$0
SAVANNAH	5/17/2005	0.88	0	0	$0
SAVANNAH	5/17/2005	1.75	0	0	$0
BLOOMINGDALE	5/20/2005	0.88	0	0	$0
SAVANNAH	7/13/2005	1	0	0	$0
BLOOMINGDALE	4/8/2006	1	0	0	$0
POOLER	4/8/2006	1.75	0	0	$0
SAVANNAH	4/8/2006	0.75	0	0	$0
PORT WENTWORTH	5/14/2006	2	0	0	$0
GARDEN CITY	9/19/2006	0.75	0	0	$0
WILSHIRE	3/2/2007	0.75	0	0	$0
WILSHIRE	7/1/2007	1.75	0	0	$0
VERNONBURG	7/26/2007	1	0	0	$0
PORT WENTWORTH	3/15/2008	1	0	0	$0
SAVANNAH	5/24/2008	1	0	0	$0
SAVANNAH	5/24/2008	1.25	0	0	$500
THUNDERBOLT	5/24/2008	0.75	0	0	$0
THUNDERBOLT	6/15/2008	0.75	0	0	$0
THUNDERBOLT	6/15/2008	1	0	0	$0
THUNDERBOLT	6/15/2008	1	0	0	$0
SAVANNAH	6/19/2008	0.88	0	0	$0
SAVANNAH	6/19/2008	1	0	0	$0
SAVANNAH	6/19/2008	1.75	0	0	$0
ISLE OF HOPE	6/21/2008	0.75	0	0	$0
BURNSIDE	6/21/2008	0.75	0	0	$0
BURNSIDE	6/21/2008	0.75	0	0	$0
BURNSIDE	6/21/2008	1	0	0	$0
BLOOMINGDALE	6/25/2008	0.88	0	0	$0
SAVANNAH	6/26/2008	0.75	0	0	$0
WILLIAM HILL	8/8/2008	0.75	0	0	$0
BLOOMINGDALE	3/1/2009	1.75	0	0	$0

Location	Date	Diameter (in.)	Deaths	Injuries	Property Damage
POOLER	3/1/2009	0.88	0	0	$0
SAVANNAH BEACH	3/28/2009	1	0	0	$0
THUNDERBOLT	5/5/2009	0.88	0	0	$0
WILMINGTON IS	5/11/2009	0.88	0	0	$0
WILMINGTON IS	5/11/2009	1	0	0	$0
SAVANNAH	5/11/2009	1.75	0	0	$0
SANDFLY	5/11/2009	1.75	0	0	$0
SAVANNAH	5/17/2009	1	0	0	$0
OLEARY	5/29/2009	0.75	0	0	$0
VERNONBURG	6/13/2009	0.88	0	0	$0
VERNONBURG	6/13/2009	0.75	0	0	$0
WILMINGTON IS	6/16/2009	0.88	0	0	$0
SAVANNAH	6/16/2009	0.75	0	0	$0
WILMINGTON IS	6/26/2009	0.75	0	0	$0
WILMINGTON IS	6/26/2009	0.75	0	0	$0
BLOOMINGDALE	7/20/2009	1	0	0	$0
PORT WENTWORTH	7/27/2009	0.75	0	0	$0
SAVANNAH STATE COLLE	8/5/2009	0.88	0	0	$0
POOLER	6/27/2010	0.75	0	0	$0
BONA BELLA	6/27/2010	1	0	0	$0
BURROUGHS	8/24/2010	0.88	0	0	$0
FERNWOOD	8/26/2010	0.75	0	0	$0
CENTRAL JCT	3/27/2011	1	0	0	$0
SAVANNAH	3/27/2011	1	0	0	$0
SAVANNAH	3/27/2011	0.75	0	0	$0
SAVANNAH	3/27/2011	0.88	0	0	$0
WILMINGTON IS	3/27/2011	1	0	0	$0
FT SCREVEN	3/27/2011	2	0	0	$0
WILMINGTON IS	3/27/2011	1	0	0	$0
PARKERSBURG	3/27/2011	1.5	0	0	$0
THUNDERBOLT	3/27/2011	1.75	0	0	$0
SAVANNAH	3/27/2011	1	0	0	$0
THUNDERBOLT	3/27/2011	0.88	0	0	$0
WILMINGTON IS	3/27/2011	1.25	0	0	$0
SAVANNAH BEACH	3/27/2011	1	0	0	$0
WILMINGTON IS	3/27/2011	1.25	0	0	$0
FT SCREVEN	3/27/2011	1.25	0	0	$0
SAVANNAH BEACH	3/27/2011	1	0	0	$0
SAVANNAH BEACH	3/27/2011	1	0	0	$0
SAVANNAH	3/27/2011	1	0	0	$10,000

Location	Date	Diameter (in.)	Deaths	Injuries	Property Damage
SANDFLY	3/27/2011	0.88	0	0	$0
THUNDERBOLT	3/27/2011	1	0	0	$0
PARKERSBURG	3/27/2011	1.75	0	0	$0
SAVANNAH BEACH	3/27/2011	1	0	0	$0
WILMINGTON IS	3/27/2011	1	0	0	$0
THUNDERBOLT	3/27/2011	1	0	0	$0
SAVANNAH BEACH	3/27/2011	1	0	0	$0
POOLER	5/27/2011	0.75	0	0	$0
THUNDERBOLT	6/15/2011	0.75	0	0	$0
BLOOMINGDALE	6/18/2011	0.75	0	0	$0
THUNDERBOLT	6/23/2011	0.75	0	0	$0
THUNDERBOLT	8/6/2011	1	0	0	$0
(SAV)SAVANNAH INTL A	5/15/2012	1.75	0	0	$0
BURROUGHS	5/15/2012	1	0	0	$0
(SAV)SAVANNAH INTL A	5/15/2012	1.5	0	0	$0
CENTRAL JCT	5/15/2012	1.75	0	0	$0
BONA BELLA	5/15/2012	1	0	0	$0
PORT WENTWORTH	5/15/2012	1.75	0	0	$0
BONA BELLA	5/15/2012	1.75	0	0	$0
PORT WENTWORTH	5/15/2012	1	0	0	$0
PORT WENTWORTH	5/31/2012	1	0	0	$0
BLOOMINGDALE	3/18/2013	1	0	0	$0
FAIRWAY OAKS	3/24/2013	0.88	0	0	$0
BONA BELLA	5/28/2014	0.88	0	0	$0
(SAV)SAVANNAH INTL A	6/11/2014	1	0	0	$0
SAVANNAH	6/14/2014	1	0	0	$0
WILLIAMS	8/8/2014	0.88	0	0	$0
BURROUGHS	6/2/2015	1	0	0	$0
WILLIAM HILL	6/3/2015	0.88	0	0	$0
OLEARY	6/22/2015	1	0	0	$0
SAVANNAH BEACH	4/5/2017	1	0	0	$0
SAVANNAH BEACH	4/5/2017	0.75	0	0	$0
SAVANNAH BEACH	4/5/2017	1	0	0	$0
SAVANNAH BEACH	4/5/2017	1.5	0	0	$0
SAVANNAH BEACH	4/5/2017	1.75	0	0	$0
PORT WENTWORTH	5/22/2017	0.88	0	0	$0
MULBERRY GROVE	5/22/2017	1	0	0	$0
PORT WENTWORTH	5/22/2017	0.75	0	0	$0
WILMINGTON IS	6/2/2018	0.88	0	0	$0
BONA BELLA	6/25/2018	0.88	0	0	$0

Location	Date	Diameter (in.)	Deaths	Injuries	Property Damage
PORT WENTWORTH	6/25/2018	0.88	0	0	$0
PORT WENTWORTH	8/14/2018	0.75	0	0	$0
MEINHARD	8/14/2018	1	0	0	$0
		Total	**0**	**0**	**$510,500**

Source: NCEI

The following narratives provide detail on select hailstorms from the above list of NCEI recorded events:

May 14, 2006 – 2" diameter hail was reported in Port Wentworth near the intersection of Highway 21 and Plantation Road.

May 24, 2008 – A cold front pushed southward through southern South Carolina and southeast Georgia and interacted with the sea breeze to produce scattered severe thunderstorms. Slightly larger than quarter size hail was reported in Savannah, Georgia. The hail resulted in a broken windshield of a car on Burroughs Street.

March 27, 2011 – A frontal boundary in combination with modest instability and strong deep layer shear, resulted in scattered strong to severe thunderstorm development across southern South Carolina and southeast Georgia. A CoCoRaHS observer reported golf ball to hen egg size hail, 2 miles north-northeast of Wilmington Island, Georgia. The public reported quarter size hail breaking car windows, 1 mile south of Savannah, Georgia.

Probability of Future Occurrence

Based on historical occurrences recorded by NCEI for the 60-year period from 1960 through 2019, Chatham County averages 8.37 wind events per year, which equates to a 100% change that the County will experience thunderstorm winds in any given year.

Over the 24-year period from 1996 through 2019, 31 lightning events were reported as having caused death, injury, or property damage, which equates to an average of 1.29 damaging lightning strikes per year, which equates to a 100% change that the County will experience damages from lightning in any given year.

The average hail storm in Chatham County occurs in the afternoon and has a hail stone with a diameter of just over one inch. Over the 63-year period from 1957 through 2019, Chatham County experienced 166 reported hail incidents; this averages to 2.63 events per year with reported incidents somewhere in the planning area, or a 100% chance that the County will experience a hail incident in any given year.

Based on these historical occurrences, there is a 100% chance that the County will experience severe weather each year. The probability of damaging impacts is highly likely.

Probability: 4 – Highly Likely

Vulnerability Assessment

People

People and populations exposed to the elements are most vulnerable to severe weather. A common hazard associated with wind events is falling trees and branches. Risk of being struck by lightning is greater in open areas, at higher elevations, and on the water.

Lightning can also cause cascading hazards, including power loss. Loss of power could critically impact those relying on energy to service, including those that need powered medical devices. Additionally, the ignition of fires is always a concern with lightning strikes.

The availability of sheltered locations such as basements, buildings constructed using hail-resistant materials and methods, and public storm shelters, all reduce the exposure of the population. Residents living in mobile homes are more vulnerable to hail events due to the lack of shelter locations and the vulnerability of the housing unit to damages. According to the 2017 American Community Survey (ACS) 5-Year Estimates, 4,675 occupied housing units (4.4 percent) in Chatham County are classified as "mobile homes or other types of housing." Using the 2017 ACS persons per household estimate of 2.54, the population at risk due to their housing type was estimated at 11,874 residents. Individuals who work outdoors may also face increased risk.

Overall, the housing stock in Chatham County includes 5,600 mobile home units, as detailed in Table 2.47 in Section 2.5.7. Over 10 percent of the housing stock in Bloomingdale, Garden City, and Port Wentworth comprises mobile home units. Additionally, there are over 1,000 mobile home units in unincorporated Chatham County and Savannah. These communities may face more severe impacts from hurricane events as a result.

Since 1999, the NCEI records one fatality and 13 injuries attributed to lightning in Chatham County. NCEI records 1 fatality and 5 injuries attributed to wind events in Chatham County. There are no injuries or fatalities attributed to hail.

Property

Property damage caused by lightning usually occurs in one of two ways – either by direct damages through fires ignited by lightning, or by secondary impacts due to power loss. According to data collected on lightning strikes in Chatham County, the vast majority of recorded property damage was due to structure fires.

NCEI records lightning impacts over 24 years (1996-2019), with $4,484,500 in property damage recorded (no incidents were recorded in 1998, 2002, 2003, 2005, or 2016). Based on these records, the planning area experiences an annualized loss of $186,854 in property damage. The average impact from lightning per incident in Chatham County is $144,661.

General damages to property from hail are direct, including destroyed windows, dented cars, and building, roof and siding damage in areas exposed to hail. Hail can also cause enough damage to cars to cause them to be totaled. The level of damage is commensurate with both a material's ability to withstand hail impacts, and the size of the hailstones that are falling. Construction practices and building codes can help maximize the resistance of the structures to damage. Large amounts of hail may need to be physically cleared from roadways and sidewalks, depending on accumulation. Hail can cause other cascading impacts, including power loss.

During a 63-year span from 1957 through 2019 in Chatham County, NCEI reported $510,500 in property damage as a direct result of hail. This equates to an annualized loss of $8,103. This damage was from only three storms. It should be noted that property damage due to hail is usually insured loss, with damages covered under most major comprehensive insurance plans. Because of this, hail losses are notoriously underreported by the NCEI. It is difficult to find an accurate repository of hail damages in Chatham County, thus the NCEI is still used to form a baseline.

Wind events reported in NCEI for the 60-year period from 1960 through 2019 totaled $4,080,050 in property damage, which equates to an annualized loss of $68,001 across the planning area.

Aside from an overall increase in exposure due to development throughout the planning area, there have been no significant changes in development in the planning area that could affect vulnerability to severe weather in Chatham County.

Environment

The main environmental impact from wind is damage to trees or crops. Wind events can also bring down power lines, which could cause a fire and result in even greater environmental impacts. Lightning may also result in the ignition of wildfires. This is part of a natural process, however, and the environment will return to its original state in time.

Hail can cause extensive damage to the natural environment, pelting animals, trees and vegetation with hailstones. Melting hail can also increase both river and flash flood risk.

Consequence Analysis

Table 2.66 summarizes the potential negative consequences of severe weather.

Table 2.66 – Consequence Analysis – Severe Weather (Thunderstorm Winds, Lightning, and Hail)

Category	Consequences
Public	Injuries; fatalities
Responders	Injuries; fatalities; potential impacts to response capabilities due to storm impacts
Continuity of Operations (including Continued Delivery of Services)	Potential impacts to continuity of operations due to storm impacts; delays in providing services
Property, Facilities and Infrastructure	Possibility of structure fire ignition; potential for disruptions in power and communications infrastructure; destruction and/or damage to any exposed property, especially windows, cars and siding; mobile homes see increased risk
Environment	Potential fire ignition from lightning; hail damage to wildlife and foliage
Economic Condition of the Jurisdiction	Lightning damage contingent on target; can severely impact/destroy critical infrastructure and other economic drivers
Public Confidence in the Jurisdiction's Governance	Public confidence is not generally affected by severe weather events.

Hazard Summary by Jurisdiction

The following table summarizes severe weather hazard risk by jurisdiction. Most aspects of severe weather risk do not vary substantially by jurisdiction; however, mobile home units are more vulnerable to wind damage. Over 10 percent of the housing stock in Bloomingdale, Garden City, and Port Wentworth comprises mobile home units. Additionally, there are over 1,000 mobile home units in unincorporated Chatham County and Savannah. These communities may therefore face more severe impacts from wind. Where priority ratings vary between thunderstorm wind, lightning, and hail for impact and spatial extent, these scores represent an average rating with greater weight given to thunderstorm wind because it occurs much more frequently.

Jurisdiction	Probability	Impact	Spatial Extent	Warning Time	Duration	Score	Priority
Chatham County	4	2	3	4	1	2.9	H
Bloomingdale	4	2	3	4	1	2.9	H
Garden City	4	2	3	4	1	2.9	H
Pooler	4	1	3	4	1	2.6	H
Port Wentworth	4	2	3	4	1	2.9	H
Savannah	4	2	3	4	1	2.9	H

Jurisdiction	Probability	Impact	Spatial Extent	Warning Time	Duration	Score	Priority
Thunderbolt	4	1	3	4	1	2.6	H
Tybee Island	4	1	3	4	1	2.6	H
Vernonburg	4	1	3	4	1	2.6	H

2.5.10 Severe Winter Weather

Hazard Background

A winter storm can range from a moderate snow over a period of a few hours to blizzard conditions with blinding wind-driven snow that lasts for several days. Events may include snow, sleet, freezing rain, or a mix of these wintry forms of precipitation. Some winter storms might be large enough to affect several states, while others might affect only localized areas. Occasionally, heavy snow might also cause significant property damages, such as roof collapses on older buildings.

All winter storm events have the potential to present dangerous conditions to the affected area. Larger snowfalls pose a greater risk, reducing visibility due to blowing snow and making driving conditions treacherous. A heavy snow event is defined by the National Weather Service as an accumulation of 4 or more inches in 12 hours or less. A blizzard is the most severe form of winter storm. It combines low temperatures, heavy snow, and winds of 35 miles per hour or more, which reduces visibility to a quarter mile or less for at least 3 hours. Winter storms are often accompanied by sleet, freezing rain, or an ice storm. Such freeze events are particularly hazardous as they create treacherous surfaces.

Ice storms are defined as storms with significant amounts of freezing rain and are a result of cold air damming (CAD). CAD is a shallow, surface-based layer of relatively cold, stably-stratified air entrenched against the eastern slopes of the Appalachian Mountains. With warmer air above, falling precipitation in the form of snow melts, then becomes either super-cooled (liquid below the melting point of water) or re-freezes. In the former case, super-cooled droplets can freeze on impact (freezing rain), while in the latter case, the re-frozen water particles are ice pellets (or sleet). Sleet is defined as partially frozen raindrops or refrozen snowflakes that form into small ice pellets before reaching the ground. They typically bounce when they hit the ground and do not stick to the surface. However, it does accumulate like snow, posing similar problems and has the potential to accumulate into a layer of ice on surfaces. Freezing rain, conversely, usually sticks to the ground, creating a sheet of ice on the roadways and other surfaces. All of the winter storm elements – snow, low temperatures, sleet, ice, etcetera – have the potential to cause significant hazard to a community. Even small accumulations can down power lines and trees limbs and create hazardous driving conditions and disrupt communication and power for days.

Advancements in meteorology and forecasting usually allow for mostly accurate forecasting a few days in advance of an impending storm. Most storms have a duration of a few hours; however, impacts can last a few days after the initial incident until cleanup is completed.

Warning Time: 1 – More than 24 hours

Duration: 3 – Less than 1 week

Location

Severe winter weather is usually a countywide or regional hazard, impacting the entire county at the same time. The risk of severe winter weather occurring is uniform across Chatham County.

Extent

The National Oceanic and Atmospheric Administration (NOAA) uses the Regional Snowfall Index (RSI), shown in Table 2.67 for the Chatham County region, to assess the societal impact of winter storms in the six easternmost regions in the United States. The index makes use of population and regional differences to assess the impact of snowfall. For example, areas which receive very little snowfall on average may be more adversely affected than other regions, resulting in a higher severity. The County may experience any level on the RSI scale. Per the 2015 plan, the greatest snowfall amounts to impact Chatham County have been between 4-6 inches. During the snowstorm of January 3 to January 5, 2018, from which 6-12 inches

were reported near Pooler, the county was classified as a Category 1 on the RSI scale. It is possible that more severe events and impacts could be felt in the future.

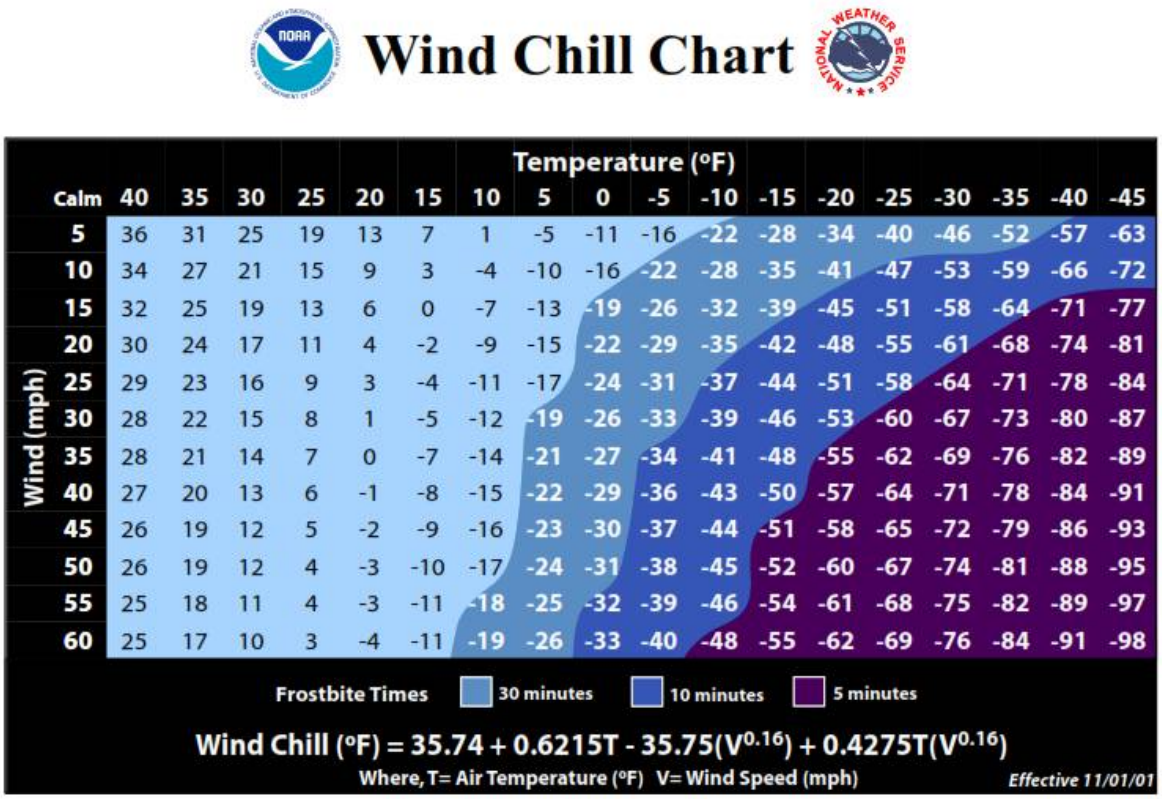
Table 2.67 – Regional Snowfall Index (RSI) Values

Category	RSI Value	Description
1	1-3	Notable
2	3-6	Significant
3	6-10	Major
4	10-18	Crippling
5	18+	Extreme

Source: NOAA

Severe winter weather often involves a mix of hazardous weather conditions. The magnitude of an event can be defined based on the severity of each of the involved factors, including precipitation type, precipitation accumulation amounts, temperature, and wind. The NWS Wind Chill Temperature Index, shown in Figure 2.36, provides a formula for calculating the dangers of winter winds and freezing temperatures.

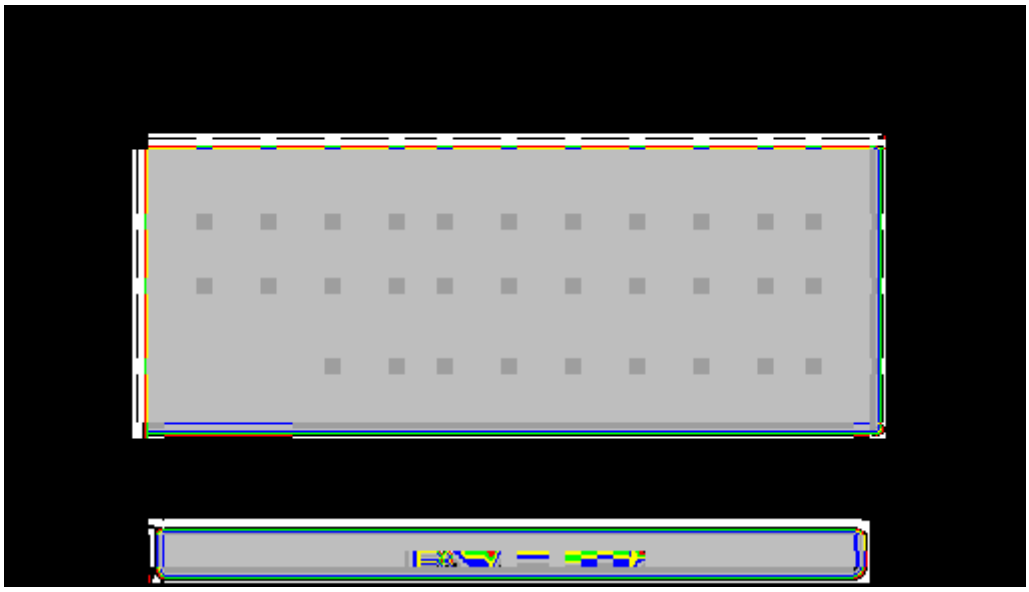
Figure 2.36 – NWS Wind Chill Temperature Index



Source: https://www.weather.gov/safety/cold-wind-chill-chart

Figure 2.37 below graphs snowfall extremes at the Savannah Airport from 1937 through 2012. This is the most recent data available for this weather station.

Figure 2.37 – Snowfall Extremes, Savannah Airport



Source: Southeast Regional Climate Center, https://sercc.com/cgi-bin/sercc/cliMAIN.pl?ga7847

The most significant recorded snow depth over the last 20 years took place in January 2018, with recorded depths of up to 4 inches across county.

Impact: 2 – Limited

Spatial Extent: 4 – Large

The entirety of Georgia is susceptible to winter storm and freeze events. Some ice and winter storms may be large enough to affect several states, while others might affect limited, localized areas. The degree of exposure typically depends on the normal expected severity of local winter weather. Chatham County is accustomed to smaller scale severe winter weather conditions and often receives winter weather during the winter months. Given the atmospheric nature of the hazard, the entire County has uniform exposure to a winter storm.

Historical Occurrences

To get a full picture of the range of impacts of a severe winter weather, data for the following weather types as defined by the National Weather Service (NWS) and tracked by NCEI were collected:

- **Blizzard** – A winter storm which produces the following conditions for 3 consecutive hours or longer: (1) sustained winds or frequent gusts 30 knots (35 mph) or greater, and (2) falling and/or blowing snow reducing visibility frequently to less than 1/4 mile.
- **Cold/Wind Chill** – Period of low temperatures or wind chill temperatures reaching or exceeding locally/regionally defined advisory conditions of 0°F to -14°F with wind speeds 10 mph (9 kt) or greater.
- **Extreme Cold/Wind Chill** – A period of extremely low temperatures or wind chill temperatures reaching or exceeding locally/regionally defined warning criteria, defined as wind chill -15°F or lower with wind speeds 10 mph (9 kt) or greater.
- **Frost/Freeze** – A surface air temperature of 32°F or lower, or the formation of ice crystals on the ground or other surfaces, for a period of time long enough to cause human or economic impact, during the locally defined growing season.

- **Heavy Snow** – Snow accumulation meeting or exceeding 12 and/or 24 hour warning criteria of 3 and 4 inches, respectively.
- **Ice Storm** – Ice accretion meeting or exceeding locally/regionally defined warning criteria of ¼ inch or greater resulting in significant, widespread power outages, tree damage and dangerous travel. Issued only in those rare instances where just heavy freezing rain is expected and there will be no "mixed bag" precipitation meaning no snow, sleet or rain.
- **Sleet** – Sleet accumulations meeting or exceeding locally/regionally defined warning criteria of ½ inch or more.
- **Winter Storm** – A winter weather event that has more than one significant hazard and meets or exceeds locally/regionally defined 12 and/or 24 hour warning criteria for at least one of the precipitation elements. Defined by NWS Raleigh Forecast Office as snow accumulations 3 inches or greater in 12 hours (4 inches or more in 24 hours); Freezing rain accumulations ¼ inch (6 mm) or greater; Sleet accumulations ½ inch (13 mm) or more. Issued when there is at least a 60% forecast confidence of any one of the three criteria being met.
- **Winter Weather** – A winter precipitation event that causes a death, injury, or a significant impact to commerce or transportation, but does not meet locally/regionally defined warning criteria.

The County has received one Major Disaster Declaration for a freeze event in 1977 and an additional Emergency Declaration for Severe Snowfall in 1993.

According to the NCEI Storm Events Database, there was one frost/freeze event, two heavy snow events, and one ice storm event in the 24-year period from 1996 through 2019. As reported in NCEI, severe winter weather did not cause any fatalities, injuries, property damage, or crop damage, though these types of impacts may not have been reported and are possible in future events. (Note that the event count reported here is lower than that of the previous plan because the previous plan incorrectly included winter storm events from Walton County in the Chatham County record.) Severe winter weather related events in Chatham County are recorded in Table 2.68. Note that all events were recorded for both the Inland Chatham County and Coastal Chatham County zones.

Table 2.68 – Recorded Severe Winter Weather Events in Chatham County, 1999-2018

Location(s)	Date	Event Type	Fatalities	Injuries	Property Damage	Crop Damage
Coastal Chatham, Inland Chatham	2/3/1996	Cold/Wind Chill	0	0	$0	$0
Coastal Chatham, Inland Chatham	4/8/2007	Frost/Freeze	0	0	$0	$0
Inland Chatham	2/12/2010	Heavy Snow	0	0	$0	$0
Coastal Chatham, Inland Chatham	1/28/2014	Ice Storm	0	0	$0	$0
Coastal Chatham, Inland Chatham	1/3/2018	Heavy Snow	0	0	$0	$0
		Total	**0**	**0**	**0**	**$0**

Source: NCEI

Storm impacts from NCEI are summarized below:

April 8, 2007 – A late season cold snap produced widespread frost and freezing temperatures across much of Georgia. Overall damage to the state was at least a 100-million-dollar loss due to damaged fruit and vegetable plants. Temperatures dipped down into the 20s most areas which produced widespread damage to crops and fruit trees. Total monetary losses are unknown but significant.

February 12, 2010 – A strong storm system tracked across northern Florida and then northeastward off the Georgia and South Carolina coast. Precipitation initially fell in the form of rain, but quickly changed over to snow in the late afternoon and evening hours as winds shifted to the north and allowed colder air

to wrap back into the region. Heavy snow accumulated across much of southeast Georgia. A trained weather spotter measured 2.0 inches of snow accumulation near Pooler, Georgia.

January 28, 2014 – A strong but shallow arctic cold front pushed through the region early in the day. By that evening, a strong cold air damming regime prevailed as northerly surface winds pushed temperatures to around freezing across nearly all of southeast Georgia. Above the shallow freezing layer, a prominent elevated warm layer developed which resulted in the predominant precipitation type being freezing rain for the event. Strong synoptic forcing produced widespread precipitation through the event. Storm total ice accumulations ranged up to one quarter of an inch around Tybee Island and downtown Savannah. The ice caused significant travel hazardous and county law enforcement had to close several bridges including the Sam Varnadoe Bridge, the Islands Expressway Bridge, and the Thunderbolt Bridge which provide access to Wilmington and Tybee Islands.

January 3, 2018 – A developing surface low pressure system offshore and an amplifying upper level trough approaching from the west combined with unusually cold air to produce widespread significant winter precipitation across southeast Georgia. Most of the precipitation fell as snow, with amounts ranging in coastal areas from 1 to 2 inches and inland areas from 2 to 4 inches. The event began as rain for many areas before changing over to snow, with a period of freezing rain along the coast where up to a quarter of an inch of ice accumulation occurred. The ice did cause some bridges around the coastal portion of the county to be closed due to hazardous travel conditions. The official storm total snowfall for the day at the Savannah-Hilton Head International Airport was 1.2 inches which ranks as the 7th highest one day snowfall on record, dating back to 1871. Elsewhere in the county, measurements included 2 inches Meinhard, 3 inches in Pooler, 3 inches in Port Wentworth, and 4 inches near Garden City. The event caused significant disruption to travel, with many businesses and schools closed the day of the event as well as the following day. Black ice was also an issue following the event, as well as several days of frigid wind chills.

Chatham County received one emergency declaration and one disaster declaration since 1968 for incidents related to severe winter weather, detailed in Table 2.69. As a state, Georgia received three disaster declarations related to severe winter weather during this timeframe.

Table 2.69 – Emergency & Disaster Declarations in Chatham County due to Severe Winter Weather

Disaster Number	Date	Incident Type	Declaration Title
536	6/2/1977	Freezing	Shrimp Loss Due to Cold Weather
3097	3/15/1993	Snow	Severe Snowfall, Winter Storm

Source: FEMA, December 20, 2018

Probability of Future Occurrence

NCEI records 5 severe winter weather related events during the 24-year period from 1996 through 2019, which equates to a 21 percent probability in any given year.

Probability: 3 – Likely

Vulnerability Assessment

People

Winter storms are considered deceptive killers because most deaths are indirectly related to the storm event. The leading cause of death during winter storms is from automobile or other transportation accidents due to poor visibility and/or slippery roads. Additionally, exhaustion and heart attacks caused by overexertion may result from winter storms.

Power outages during very cold winter storm conditions can also create potentially dangerous situations. Elderly people account for the largest percentage of hypothermia victims. In addition, if the power is out for an extended period, residents are forced to find alternative means to heat their homes. The danger arises from carbon monoxide released from improperly ventilated heating sources such as space or kerosene heaters, furnaces, and blocked chimneys. House fires also occur more frequently in the winter due to lack of proper safety precautions when using an alternative heating source.

Property

No property damage was reported in association with any winter weather events recorded by the NCEI between 1996 and 2019 for Chatham County. Therefore, no annualized loss estimate could be calculated for this hazard.

Aside from an overall increase in exposure due to development throughout the planning area, there have been no significant changes in development in the planning area that could affect vulnerability to severe winter weather in Chatham County.

Environment

Winter storm events may include ice or snow accumulation on trees which can cause large limbs, or even whole trees, to snap and potentially fall on buildings, cars, or power lines. This potential for winter debris creates a dangerous environment to be outside in; significant injury or fatality may occur if a large limb snaps while a local resident is out driving or walking underneath it.

Consequence Analysis

Table 2.70 summarizes the potential negative consequences of severe winter weather.

Table 2.70 – Consequence Analysis – Severe Winter Weather

Category	Consequences
Public	Localized impact expected to be severe for affected areas and moderate to light for other less affected areas.
Responders	Adverse impact expected to be severe for unprotected personnel and moderate to light for trained, equipped, and protected personnel.
Continuity of Operations (including Continued Delivery of Services)	Localized disruption of roads and/or utilities caused by incident may postpone delivery of some services.
Property, Facilities and Infrastructure	Localized impact to facilities and infrastructure in the areas of the incident. Power lines and roads most adversely affected.
Environment	Environmental damage to trees, bushes, etc.
Economic Condition of the Jurisdiction	Local economy and finances may be adversely affected, depending on damage.
Public Confidence in the Jurisdiction's Governance	Ability to respond and recover may be questioned and challenged if planning, response, and recovery not timely and effective.

Hazard Summary by Jurisdiction

The following table summarizes severe winter weather hazard risk by jurisdiction. Severe winter weather risk does not vary substantially by jurisdiction because these events are typically regional in nature.

Jurisdiction	Probability	Impact	Spatial Extent	Warning Time	Duration	Score	Priority
Chatham County	3	2	4	1	3	2.7	H
Bloomingdale	3	2	4	1	3	2.7	H
Garden City	3	2	4	1	3	2.7	H

Jurisdiction	Probability	Impact	Spatial Extent	Warning Time	Duration	Score	Priority
Pooler	3	2	4	1	3	2.7	H
Port Wentworth	3	2	4	1	3	2.7	H
Savannah	3	2	4	1	3	2.7	H
Thunderbolt	3	2	4	1	3	2.7	H
Tybee Island	3	2	4	1	3	2.7	H
Vernonburg	3	2	4	1	3	2.7	H

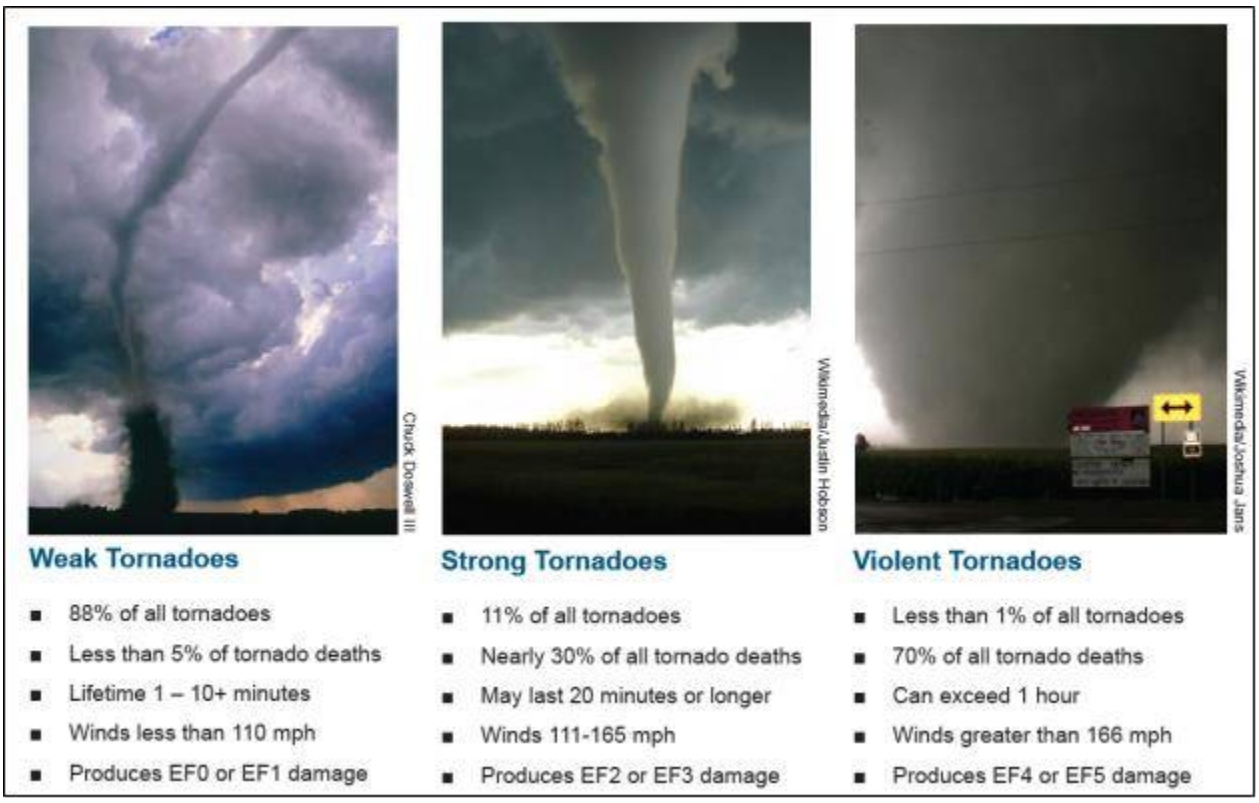
2.5.11 Tornado

Hazard Background

According to the Glossary of Meteorology (AMS 2000), a tornado is "a violently rotating column of air, pendant from a cumuliform cloud or underneath a cumuliform cloud, and often (but not always) visible as a funnel cloud." Tornadoes can appear from any direction. Most move from southwest to northeast, or west to east. Some tornadoes have changed direction amid path, or even backtracked.

Tornadoes are commonly produced by land falling tropical cyclones. Those making landfall along the Gulf coast traditionally produce more tornadoes than those making landfall along the Atlantic coast. Tornadoes that form within hurricanes are more common in the right front quadrant with respect to the forward direction but can occur in other areas as well. According to the NHC, about 10% of the tropical cyclone-related fatalities are caused by tornadoes. Tornadoes are more likely to be spawned within 24 hours of landfall and are usually within 30 miles of the tropical cyclone's center.

Tornadoes have the potential to produce winds in excess of 200 mph (EF5 on the Enhanced Fujita Scale) and can be very expansive – some in the Great Plains have exceeded two miles in width. Tornadoes associated with tropical cyclones, however, tend to be of lower intensity (EF0 to EF2) and much smaller in size than ones that form in the Great Plains.



Source: Georgia Hazard Mitigation Strategy / NOAA National Weather Service

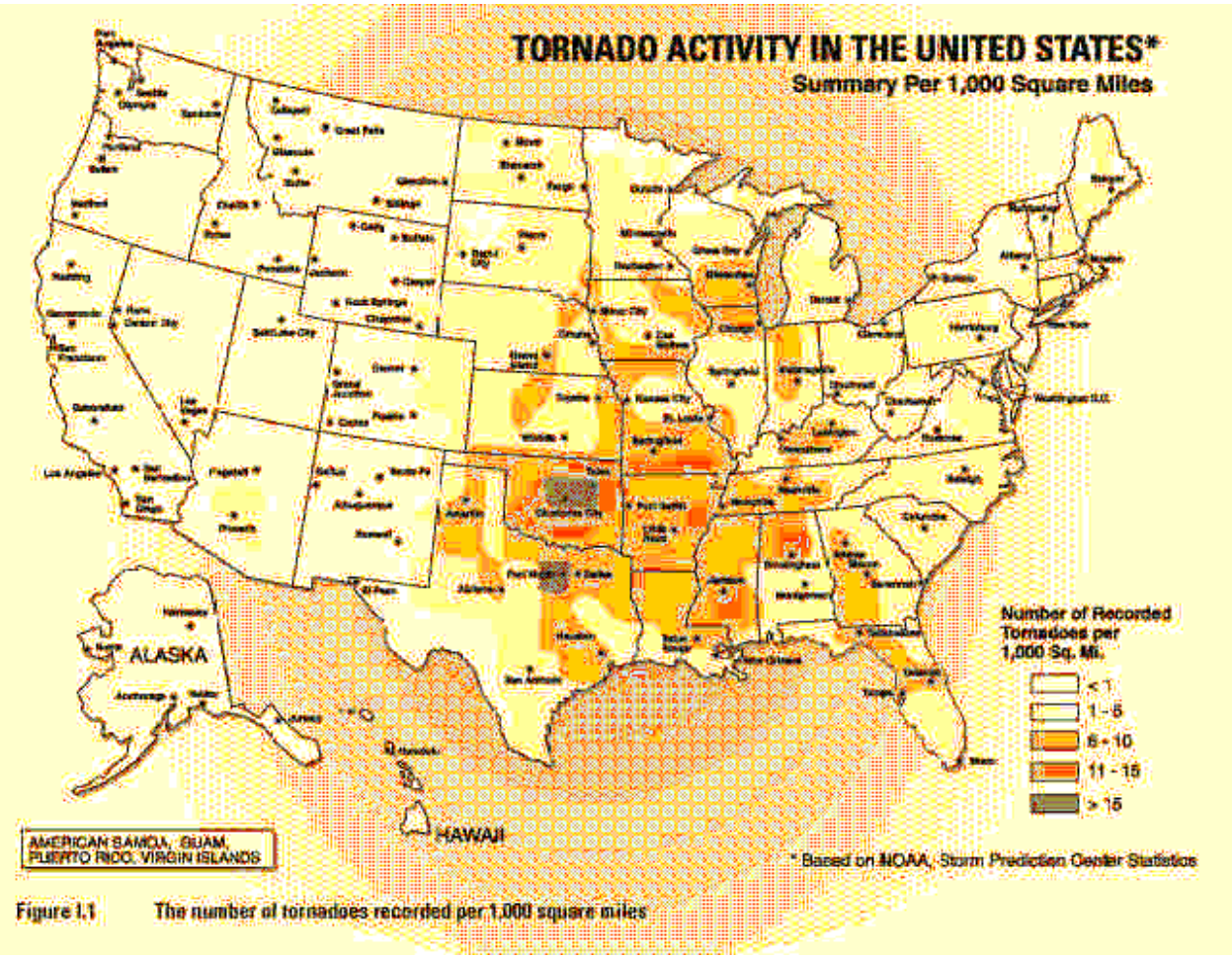
Warning Time: 4 – Less than 6 hours

Duration: 1 – Less than 6 hours

According to the NOAA Storm Prediction Center (SPC), the highest concentration of tornadoes in the United States has been in Oklahoma, Texas, Kansas and Florida respectively. Although the Great Plains region of the Central United States does favor the development of the largest and most dangerous

tornadoes (earning the designation of "tornado alley"), Florida experiences the greatest number of tornadoes per square mile of all U.S. states (SPC, 2002). Figure 2.38 shows tornado activity in the United States based on the number of recorded tornadoes per 1,000 square miles.

Figure 2.38 – Tornado Activity in the U.S.

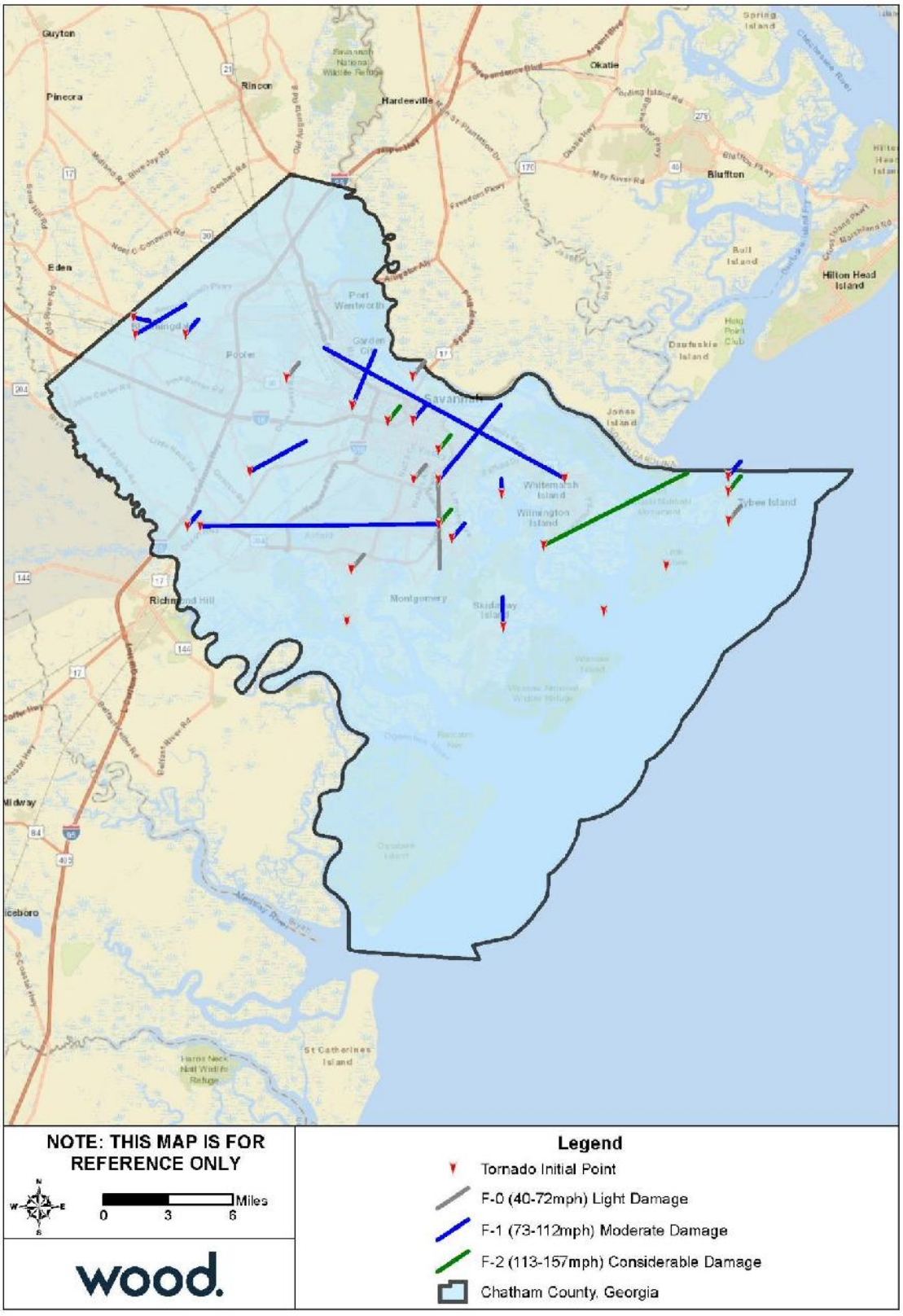


Source: American Society of Civil Engineers

Location

Figure 2.39 reflects the tracks of past tornados that passed through Chatham County from 1950 through 2017 according to data from the NOAA/National Weather Service Storm Prediction Center.

Figure 2.39 – Tornado Paths Through Chatham County, 1955-2019



Source: NOAA/NWS Storm Prediction Center 1955-2018; National Weather Service 2019 event

Tornados can occur anywhere in the County. Tornadoes typically impact a small area, but damage may be extensive. Tornado locations are completely random, meaning risk to tornado isn't increased in one area of the county versus another. All of Chatham County is uniformly exposed to this hazard.

Extent

Prior to February 1, 2007, tornado intensity was measured by the Fujita (F) scale. This scale was revised and is now the Enhanced Fujita (EF) scale. Both scales are sets of wind estimates (not measurements) based on damage. The new scale provides more damage indicators (28) and associated degrees of damage, allowing for more detailed analysis and better correlation between damage and wind speed. It is also more precise because it takes into account the materials affected and the construction of structures damaged by a tornado. Table 2.71 shows the wind speeds associated with the enhanced Fujita scale ratings and the damage that could result at different levels of intensity.

Table 2.71 – Enhanced Fujita Scale

EF Number	3 Second Gust (mph)	Damage
0	65-85	**Light damage.** Peels surface off some roofs; some damage to gutters or siding; branches broken off trees; shallow-rooted trees pushed over.
1	96-110	**Moderate damage.** Roofs severely stripped; mobile homes overturned or badly damaged; loss of exterior doors; windows and other glass broken.
2	111-135	**Considerable damage.** Roofs torn off well-constructed houses; foundations of frame homes shifted; mobile homes completely destroyed; large trees snapped or uprooted; light-object missiles generated; cars lifted off ground.
3	136-165	**Severe damage.** Entire stories of well-constructed houses destroyed; severe damage to large buildings such as shopping malls; trains overturned; trees debarked; heavy cars lifted off the ground and thrown; structures with weak foundations blown away some distance.
4	166-200	**Devastating damage.** Well-constructed houses and whole frame houses completely leveled; cars thrown and small missiles generated.
5	Over 200	**Incredible damage.** Strong frame houses leveled off foundations and swept away; automobile-sized missiles fly through the air in excess of 100 m; high-rise buildings have significant structural deformation; incredible phenomena will occur.

The most intense tornado to pass through Chatham County in the past 20 years was an EF2 in Wilmington Island on May 23, 2017. While NCEI reports no property damage occurred, narratives of the event approximate damage to 30 homes ranging from moderate to major. The tornado was 7.49 miles long and 300 yards wide.

Impact: 3 – Critical

Spatial Extent: 2 – Small

Historical Occurrences

According to NCEI, Chatham County experienced 32 tornado incidents between 1955 and 2019, causing 27 injuries, $7.06 million in property damage and no fatalities or crop damage. However, this damage estimate may be under reported, as damage was reported in the narratives of many events but was not recorded in terms of a monetary value. It is likely that there have been several tornados that occurred but went unreported. Table 2.72 shows historical tornadoes in Chatham County during this time period.

Table 2.72 – Recorded Tornadoes in Chatham County, 1955-2019

Location	Date	Time	Magnitude	Deaths	Injuries	Property Damage	Crop Damage
Chatham Co.	4/2/1955	2025	F1	0	0	$25,000	$0
Chatham Co.	4/5/1957	1034	F0	0	0	$30	$0
Chatham Co.	4/3/1961	2130	F0	0	0	$2,500	$0
Chatham Co.	4/9/1961	1700	F1	0	0	$25,000	$0
Chatham Co.	4/12/1961	900	F0	0	0	$25,000	$0
Chatham Co.	9/13/1961	1700	F2	0	0	$25,000	$0
Chatham Co.	7/12/1962	1515	F1	0	0	$25,000	$0
Chatham Co.	7/30/1966	1215	F0	0	0	$2,500	$0
Chatham Co.	7/20/1968	1230	F0	0	0	$2,500	$0
Chatham Co.	9/2/1969	1317	F0	0	0	$0	$0
Chatham Co.	5/25/1970	615	F2	0	0	$25,000	$0
Chatham Co.	5/29/1973	1100	F1	0	0	$2,500	$0
Chatham Co.	11/9/1973	1230	F2	0	0	$250,000	$0
Chatham Co.	9/23/1975	1520	F1	0	8	$25,000	$0
Chatham Co.	8/1/1978	1905	F1	0	1	$25,000	$0
Chatham Co.	4/9/1979	910	F1	0	10	$2,500,000	$0
Chatham Co.	4/8/1980	1720	F1	0	0	$250,000	$0
Chatham Co.	5/23/1980	1900	F2	0	2	$250,000	$0
Savannah	5/8/1998	1310	F0	0	0	$0	$0
Thunderbolt	9/6/2004	1002	F1	0	0	$0	$0
Wilmington Is	5/20/2005	1700	F0	0	0	$0	$0
Thunderbolt	6/13/2006	1215	F1	0	0	$500,000	$0
Sandfly	6/19/2008	1437	EF1	0	0	$3,100,000	$0
Burroughs	1/4/2015	1503	EF1	0	0	$0	$0
Bloomingdale	5/17/2016	1509	EF1	0	0	$0	$0
Montgomery	7/4/2016	1618	EF0	0	0	$0	$0
Wilmington Is	7/22/2016	1010	EF0	0	0	$0	$0
Wilshire	9/2/2016	412	EF1	0	0	$0	$0
Central Jct	5/4/2017	1650	EF1	0	5	$0	$0
Wilmington Is	5/23/2017	1653	EF2	0	0	$0	$0
Savannah	7/27/2018	1449	EF1	0	0	$0	$0
Parkersburg	5/4/2019	1553	EF1	0	1	$0	$0
Total				**0**	**27**	**$7,060,030**	**$0**

Source: NCEI

Narratives from NCEI illustrate that damage occurred in many of these incidents even if a monetary value was not recorded. Specific incidents with some level of impact include:

June 13, 2006 – NWS damage survey confirmed a tornado touched down 1.5 miles south of Riverside at 1:15 PM. The tornado lifted and touched down a couple of times before finally lifting about 1 mile south of Riverside at 1:17 PM. The tornado occurred in the Bradley Point subdivision. It snapped off huge oak trees and large branches causing damage to 15 to 20 homes and several vehicles. The path length was about 1/2 mile with a maximum width of 175 yards. The tornado was rated F1 with winds estimated in the 100 to 110 mph range.

June 19, 2008 – A weak trough of low pressure in combination with the sea breeze in a well sheared and highly unstable environment, resulted in numerous thunderstorms across southern South Carolina and

southeast Georgia. The National Weather Service Office in Charleston, South Carolina determined that an EF-1 Tornado occurred with a maximum width of about 100 yards, and maximum sustained winds estimated at 90 to 100 mph. This Tornado damaged a fire station and uprooted and snapped off numerous trees. The vast majority of the damage was caused by at least 5 strong downbursts. Downburst winds knocked the steeple off a church and knocked down or snapped off thousands of trees. Tree limbs and large branches damaged 40 to 50 homes, with about a dozen of the homes sustaining major damage, and a dozen vehicles. The winds knocked down power poles and power lines, resulting in thousands of people without power.

May 17, 2016 – A National Weather Service storm survey team confirmed an EF-1 tornado near Bloomingdale, Georgia. The tornado first touched down with EF-0 intensity near a mobile home on Pop Shearhouse Road. Most of the roof of the mobile home was blown off and some tree damage occurred. As the tornado progressed eastward, it intensified and snapped trees along Stagecoach Road. Roof fascia was also ripped off of a home. The degree of tree damage in this area was consistent with an EF-1 tornado with maximum winds estimated to be 90-95 miles per hour. The tornado continued eastward to Cheyenne Road where the damage pattern became more sporadic. Here, trees were uprooted and damage to the roof of an RV and outbuilding occurred. The tornado continued to produce isolated tree damage as it moved eastward before dissipating near Jimmy DeLoach Parkway.

May 4, 2017 – A National Weather Service storm survey team confirmed that an EF1 tornado occurred in Chatham County near Garden City. The tornado began near the intersection of Seaboard Coastline Drive and Telfair Road with damage limited to snapped trees and minor wind damage to some mobile office trailers. The tornado continued northward along Alfred Street, just east of Market Street causing snapped trees and minor damage to one home. About one third of a metal roof of an industrial building just north of Market Street was damaged. In the more industrial and commercial area just south of Highway 80, the tornado caused significant damage to an Advanced Auto Parts store where three walls collapsed and the roof was heavily damaged and shifted halfway off the remaining rear wall. Five people were injured inside the store and at least 5 cars were heavily damaged when the front wall of the store fell on them. At this point, the tornado had its strongest winds, estimated to be around 110 mph. The tornado finally terminating at the Port of Savannah-Garden City, where it pushed over some shipping containers and did minor damage to some container tanks in the area before moving into the Savannah River and dissipating.

May 23, 2017 – A National Weather Service storm survey team confirmed an EF2 tornado across Wilmington Island in Chatham County. The tornado touched down on the southern end of Wilmington Island and was rated EF1 in strength, with maximum winds of up to 100 to 110 mph. Across southern Wilmington Island, the bulk of the damage was in the form of large snapped and uprooted trees. Approximately 30 homes sustained damage, ranging from minor shingle loss to moderate or major damage due to trees or large limbs hitting the homes. At least one home surveyed along Walthour Road sustained direct structural damage from the tornado, with the roof to a sunroom being torn off. The tornado strengthened to a low end EF2 as it approached Fort Pulaski, where it caused the concrete walls and roof structure of the visitor center to shift and buckle. A smaller building next to the main visitor center had similar damage. There were many hardwood trees snapped close to the base of their trunks all around the complex of Fort Pulaski, along with at least two mid-sized vehicles in the parking lot that were pushed and rolled over. The tornado then progressed across the parking lot, just north of Fort Pulaski, where it exited into the Atlantic Ocean as a strong waterspout.

In 1994, Chatham County received a Major Disaster Declaration for a severe storm event that included incidences of tornadoes.

Probability of Future Occurrence

Probability of future occurrence was calculated based on past occurrences and was assumed to be uniform across the county.

In a 65-year span from 1955 through 2019, Chatham County experienced 32 separate tornado incidents. This correlates to a 49 percent annual probability that the planning area will experience a tornado somewhere in its boundaries. Only five of these past tornado events was a magnitude F2/EF2 or greater; therefore, the annual probability of a significant tornado event is approximately 8 percent.

Probability: 3 – Likely

Climate Change

There presently is not enough data or research to quantify the magnitude of change that climate change may have related to tornado frequency and intensity. NASA's Earth Observatory has conducted studies which aim to understand the interaction between climate change and tornadoes. Based on these studies meteorologists are unsure why some thunderstorms generate tornadoes and others don't, beyond knowing that they require a certain type of wind shear. Tornadoes spawn from approximately one percent of thunderstorms, usually supercell thunderstorms that are in a wind shear environment that promotes rotation. Some studies show a potential for a decrease in wind shear in mid-latitude areas. Because of uncertainty with the influence of climate change on tornadoes, future updates to the mitigation plan should include the latest research on how the tornado hazard frequency and severity could change. The level of significance of this hazard should be revisited over time.

Vulnerability Assessment

People

People and populations exposed to the elements are most vulnerable to tornados. The availability of sheltered locations such as basements, buildings constructed using tornado-resistant materials and methods, and public storm shelters, all reduce the exposure of the population. According to the 2017 American Community Survey (ACS) 5-Year Estimates, 4,675 occupied housing units (4.4 percent) in Chatham County are classified as "mobile homes or other types of housing." Using the 2017 ACS persons per household estimate of 2.54, the population at risk due to their housing type was estimated at 11,874 residents. Individual who work outdoors may also face increased risk.

Since 1955, the NCEI database records no fatalities and 27 injuries attributed to tornadoes in Chatham County.

Property

General damages to property are both direct (what the tornado physically destroys) and indirect, which focuses on additional costs, damages and losses attributed to secondary hazards spawned by the tornado, or due to the damages caused by the tornado. Depending on the size of the tornado and its path, a tornado is capable of damaging and eventually destroying almost anything. Construction practices and building codes can help maximize the resistance of the structures to damage.

Secondary impacts of tornado damage often result from damage to infrastructure. Downed power and communications transmission lines, coupled with disruptions to transportation, create difficulties in reporting and responding to emergencies. These indirect impacts of a tornado put tremendous strain on a community. In the immediate aftermath, the focus is on emergency services.

Since 1955, damaging tornadoes in the County are directly responsible for $7.06 million worth of damage to property according to NCEI data. This equates to an annualized loss of $108,616.

Aside from an overall increase in exposure due to development throughout the planning area, there have been no significant changes in development in the planning area that would affect vulnerability to tornado in Chatham County.

Environment

Tornadoes can cause massive damage to the natural environment, uprooting trees and other debris within the tornado's path. This is part of a natural process, however, and the environment will return to its original state in time.

Consequence Analysis

Table 2.73 summarizes the potential negative consequences of tornado.

Table 2.73 – Consequence Analysis - Tornado

Category	Consequences
Public	Injuries; fatalities
Responders	Injuries; fatalities; potential impacts to response capabilities due to storm impacts
Continuity of Operations (including Continued Delivery of Services)	Potential impacts to continuity of operations due to storm impacts; delays in providing services
Property, Facilities and Infrastructure	The weakest tornadoes, EF0, can cause minor roof damage, while strong tornadoes can destroy frame buildings and even badly damage steel reinforced concrete structures. Buildings are vulnerable to direct impact from tornadoes and also from wind borne debris. Mobile homes are particularly susceptible to damage during tornadoes.
Environment	Potential devastating impacts in storm's path
Economic Condition of the Jurisdiction	Contingent on tornado's path; can severely impact/destroy critical infrastructure and other economic drivers
Public Confidence in the Jurisdiction's Governance	Public confidence in the jurisdiction's governance may be influenced by severe tornado events if response and recovery are not timely and effective.

Hazard Summary by Jurisdiction

The following table summarizes tornado hazard risk by jurisdiction. Tornado hazard risk does not vary substantially by jurisdiction.

Jurisdiction	Probability	Impact	Spatial Extent	Warning Time	Duration	Score	Priority
Chatham County	3	3	2	4	1	2.7	H
Bloomingdale	3	3	2	4	1	2.7	H
Garden City	3	3	2	4	1	2.7	H
Pooler	3	3	2	4	1	2.7	H
Port Wentworth	3	3	2	4	1	2.7	H
Savannah	3	3	2	4	1	2.7	H
Thunderbolt	3	3	2	4	1	2.7	H
Tybee Island	3	3	2	4	1	2.7	H
Vernonburg	3	3	2	4	1	2.7	H

2.5.12 Wildfire

Hazard Background

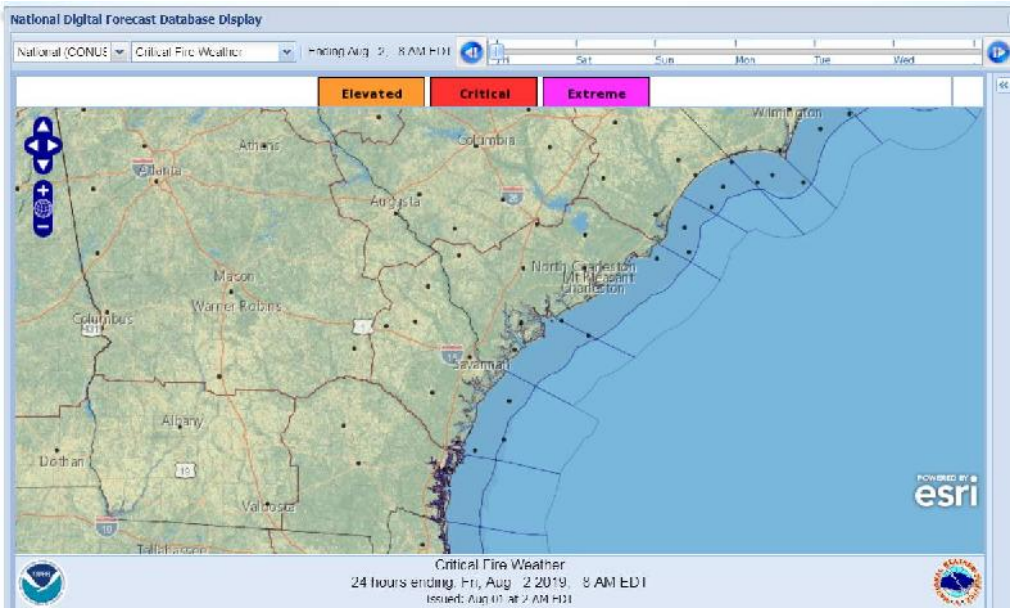
A wildfire is an uncontained fire that spreads through the environment. Wildfires have the ability to consume large areas, including infrastructure, property, and resources. When massive fires, or conflagrations, develop near populated areas, evacuations possibly ensue. Not only do the flames impact the environment, but the massive volumes of smoke spread by certain atmospheric conditions also impact the health of nearby populations. There are three general types of fire spread that are recognized.

- **Ground fires** – burn organic matter in the soil beneath surface litter and are sustained by glowing combustion.
- **Surface fires** – spread with a flaming front and burn leaf litter, fallen branches and other fuels located at ground level.
- **Crown fires** – burn through the top layer of foliage on a tree, known as the canopy or crown fires. Crown fires, the most intense type of fire and often the most difficult to contain, need strong winds, steep slopes and a heavy fuel load to continue burning.

Generally, wildfires are started by humans, either through arson or carelessness. Fire intensity is controlled by both short-term weather conditions and longer-term vegetation conditions. During intense fires, understory vegetation, such as leaves, small branches, and other organic materials that accumulate on the ground, can become additional fuel for the fire. The most explosive conditions occur when dry, gusty winds blow across dry vegetation.

Weather plays a major role in the birth, growth and death of a wildfire. In support of forecasting for fire weather, the National Weather Service Fire Weather Program emerged in response to a need for weather support to large and dangerous wildfires. This service is provided to federal and state land management agencies for the prevention, suppression, and management of forest and rangeland fires. As shown in Figure 2.40, the National Weather Service Charleston Forecast Office provides year-round fire weather forecasts for the region.

Figure 2.40 – Fire Weather Forecast, Chatham County



Source: National Weather Service

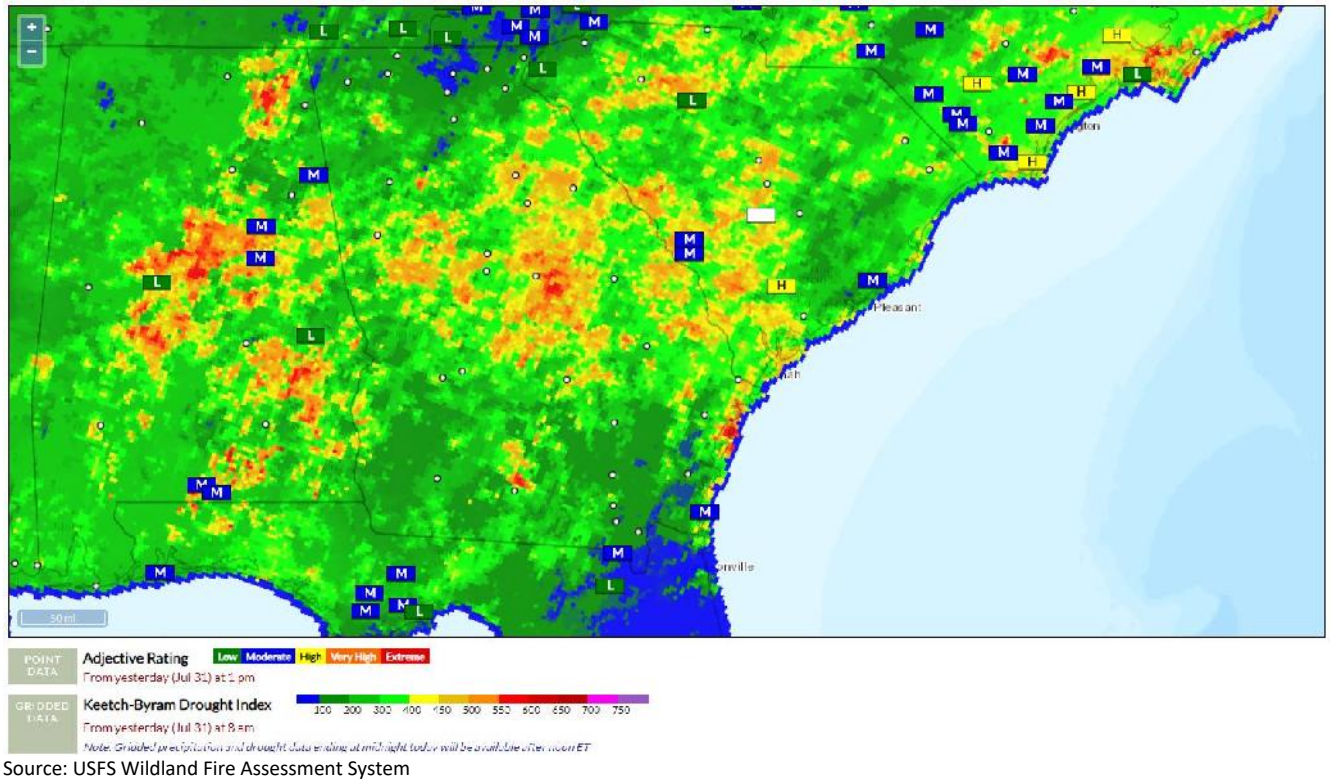
Weather conditions favorable to wildfire include drought, which increases flammability of surface fuels, and winds, which aid a wildfire's progress. The combination of wind, temperature, and humidity affects how fast wildland fires can spread. Rapid response can contain wildfires and limit their threat to property.

Chatham County experiences a variety of wildfire conditions found in the Keetch-Byram Drought Index, which is described in Table 2.74. The Keetch-Byram Drought Index (KBDI) for July 31, 2019 is shown in Figure 2.41 along with a Daily Fire Danger Estimate Adjective Rating for certain points across the state. The KBDI for Chatham County and the surrounding areas at this time was between 100 and 600.

Table 2.74 – Keetch-Byram Drought Index Fire Danger Rating System

KBDI	Description
0-200	Soil and fuel moisture are high. Most fuels will not readily ignite or burn. However, with sufficient sunlight and wind, cured grasses and some light surface fuels will burn in sports and patches.
200-400	Fires more readily burn and will carry across an area with no gaps. Heavier fuels will still not readily ignite and burn. Also, expect smoldering and the resulting smoke to carry into and possibly through the night.
400-600	Fire intensity begins to significantly increase. Fires will readily burn in all directions exposing mineral soils in some locations. Larger fuels may burn or smolder for several days creating possible smoke and control problems.
600-800	Fires will burn to mineral soil. Stumps will burn to the end of underground roots and spotting will be a major problem. Fires will burn through the night and heavier fuels will actively burn and contribute to fire intensity.

Figure 2.41 – Keetch-Byram Drought Index, July 2019



Source: USFS Wildland Fire Assessment System

Warning Time: 4 – Less than six hours

Duration: 3 – Less than one week

Location

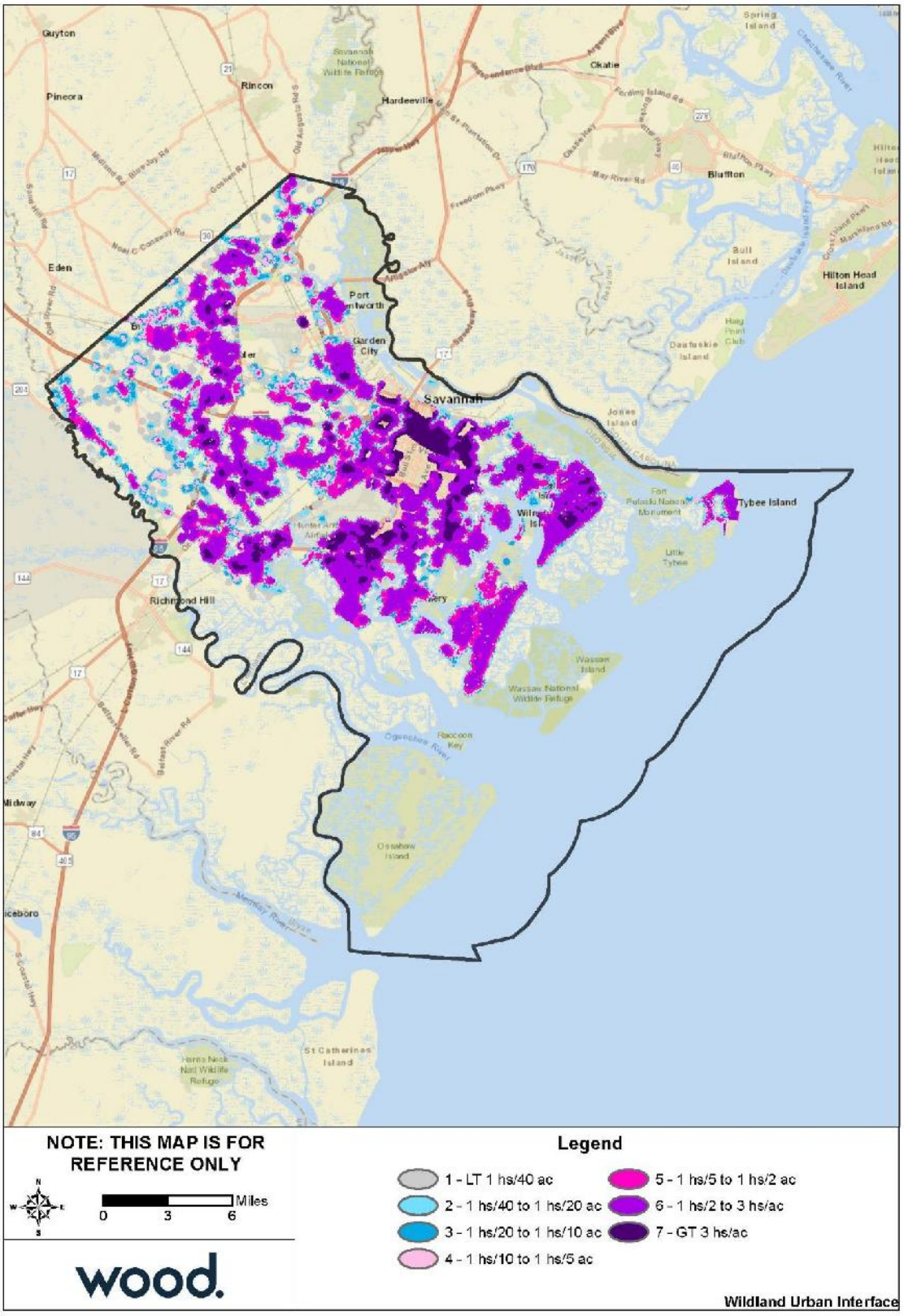
The location of wildfire risk can be defined by the acreage of Wildland Urban Interface (WUI). The WUI is described as the area where structures and other human improvements meet and intermingle with undeveloped wildland or vegetative fuels, and thus demarcates the spatial extent of wildfire risk. The WUI is essentially all the land in the county that is not heavily urbanized. The Southern Wildfire Risk Assessment (SWRA) estimates that 88.5 percent of the Chatham County population lives within the WUI. The expansion of residential development from urban centers out into rural landscapes increases the potential for wildland fire threat to public safety and the potential for damage to forest resources and dependent industries. Population growth within the WUI substantially increases the risk of wildfire. Table 2.75 details the extent of the WUI in Chatham County, and Figure 2.42 maps the WUI.

Table 2.75 – Wildland Urban Interface, Population and Acres

	Housing Density	WUI Population	Percent of WUI Population	WUI Acres	Percent of WUI Acres
	LT 1hs/40ac	218	0.1 %	14,579	12.7 %
	1hs/40ac to 1hs/20ac	361	0.2 %	7,798	6.8 %
	1hs/20ac to 1hs/10ac	888	0.4 %	9,703	8.4 %
	1hs/10ac to 1hs/5ac	2,401	1.0 %	12,175	10.6 %
	1hs/5ac to 1hs/2ac	9,605	4.1 %	18,521	16.1 %
	1hs/2ac to 3hs/1ac	124,548	53.1 %	43,687	37.9 %
	GT 3hs/1ac	96,657	41.2 %	8,756	7.6 %
	Total	**234,678**	**100.0 %**	**115,219**	**100.0 %**

Source: Southern Wildfire Risk Assessment

Figure 2.42 – Wildland Urban Interface, Chatham County



Source: Southern Wildfire Risk Assessment

Extent

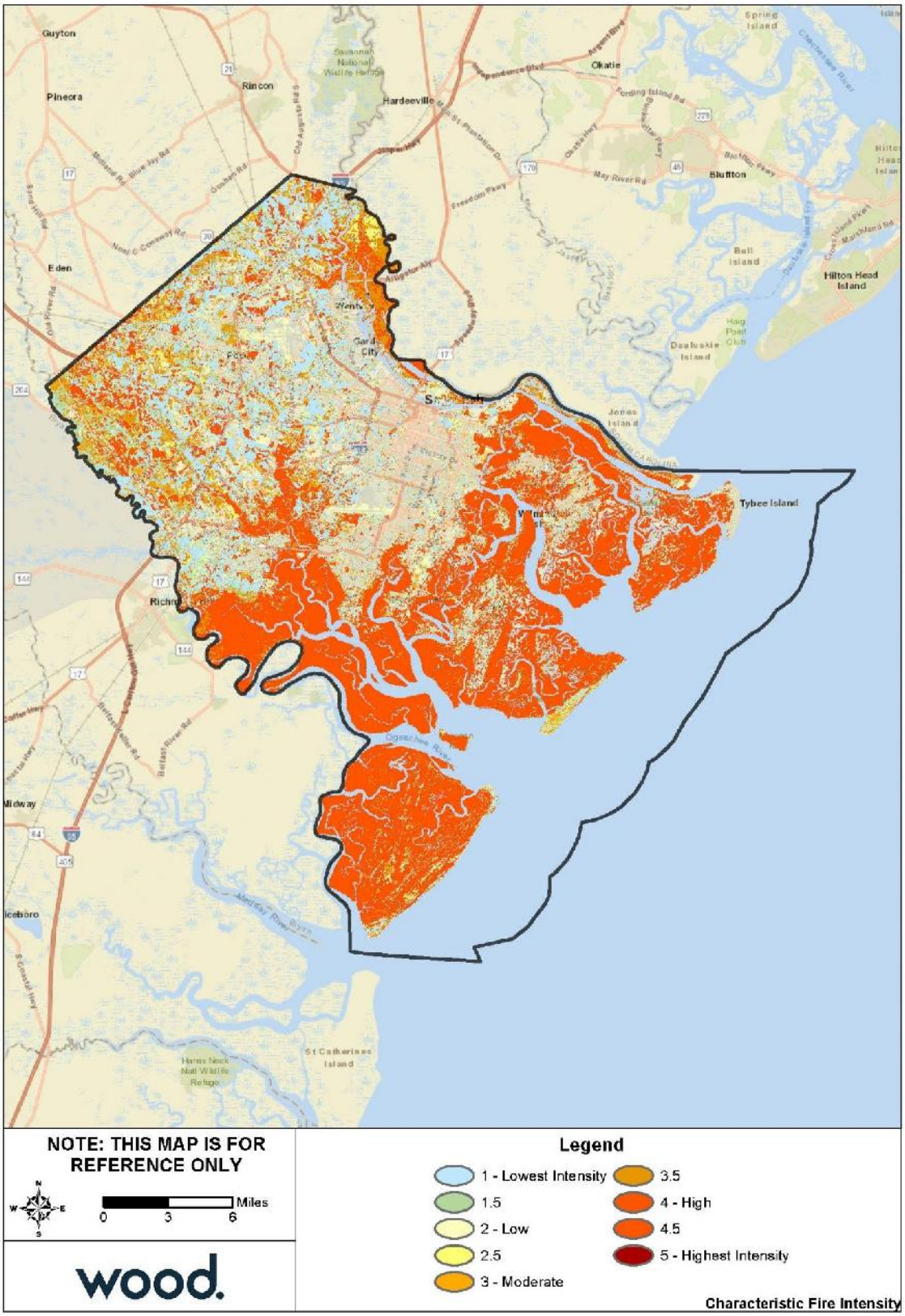
Wildfire extent can be defined by the fire's intensity and measured by the Characteristic Fire Intensity Scale, which identifies areas where significant fuel hazards which could produce dangerous fires exist. Fire Intensity ratings identify where significant fuel hazards and dangerous fire behavior potential exist based on fuels, topography, and a weighted average of four percentile weather categories. The Fire Intensity Scale, shown in Table 2.76, consists of five classes, as defined by Southern Wildfire Risk Assessment. Figure 2.43 shows the potential fire intensity within the WUI across Chatham County.

Table 2.76 – Fire Intensity Scale

Class	Description
1, Very Low	Very small, discontinuous flames, usually less than 1 foot in length; very low rate of spread; no spotting. Fires are typically easy to suppress by firefighters with basic training and non-specialized equipment.
2, Low	Small flames, usually less than two feet long; small amount of very short range spotting possible. Fires are easy to suppress by trained firefighters with protective equipment and specialized tools.
3, Moderate	Flames up to 8 feet in length; short-range spotting is possible. Trained firefighters will find these fires difficult to suppress without support from aircraft or engines, but dozer and plows are generally effective. Increasing potential for harm or damage to life and property.
4, High	Large Flames, up to 30 feet in length; short-range spotting common; medium range spotting possible. Direct attack by trained firefighters, engines, and dozers is generally ineffective, indirect attack may be effective. Significant potential for harm or damage to life and property.
5, Very High	Very large flames up to 150 feet in length; profuse short-range spotting, frequent long-range spotting; strong fire-induced winds. Indirect attack marginally effective at the head of the fire. Great potential for harm or damage to life and property.

Source: Southern Wildfire Risk Assessment

Figure 2.43 – Characteristic Fire Intensity, Chatham County



Source: Southern Wildfire Risk Assessment

A significant portion, approximately 30.6 percent, of Chatham County may experience up to a Class 4 or 4.5 Fire Intensity, which poses significant harm or damage to life and property. However, the areas with greatest potential fire intensity are largely outside the WUI. Over 7 percent of the county may experience Class 3 Fire Intensity, which has potential for harm to life and property but is easier to suppress with dozer and plows. The remainder of the region is either non-burnable (43.1%) or would face a Class 1 or Class 2 Fire Intensity, which are easily suppressed.

Impact: 2 – Limited

Spatial Extent: 3 – Moderate

Historical Occurrences

The Georgia Forestry Commission maintains monthly records of acreage burned and number of fires burned that are accessible to the public under the Georgia Open Records Law. The Commission also created a Community Wildfire Protection Plan for Chatham County in September 2014. The purpose of this plan is to assess wildfire risks in the county and plan to mitigate such risks as funding becomes available.

According to the Community Wildfire Protection Plan, in the 56 years prior to the plans publishing in 2014, the County averaged 73 reported wildland fires per year, burning 475 acres on average per year. In the 20 years prior, the county averaged only 38 fires per year burning 245 acres annually. Table 2.77 summarizes past occurrences of wildfire in Chatham County since 1999 as provided by the Georgia Forestry Commission in August 2019. This is the most current data available. The data is from GFC records only and may not include data on fires burned within jurisdictional limits that did not require GFC assistance to suppress. Actual number of fires and acreage burned may be higher than what is reported here.

Table 2.77 – Records for Wildfire in Chatham County, 1999-2018

Year	Number of Fires	Acreage Burned
1999	77	311.86
2000	49	281.28
2001	52	203.93
2002	40	273.86
2003	5	2.63
2004	38	123.22
2005	32	35.97
2006	39	77.43
2007	51	1,517.68
2008	27	96.79
2009	17	54.10
2010	36	135.06
2011	35	142.46
2012	26	113.30
2013	6	13.30
2014	6	31.24
2015	5	31.01
2016	8	17.89
2017	8	23.58
2018	7	45.70
Total	**564**	**3,532.29**

Source: Georgia Forestry Commission

The region experienced prolonged periods of severe drought in 2002 and 2007, as well as moderate drought in 2007. These periods of drought may explain some of the annual variation in fires and acreage burned.

On average, Chatham County experiences 28.2 fires and 176.6 acres burned annually from fires reported by the Georgia Forestry Commission. Actual number of fires and acreage burned is likely higher because smaller fires within jurisdictional boundaries are managed by local fire departments.

Probability of Future Occurrence

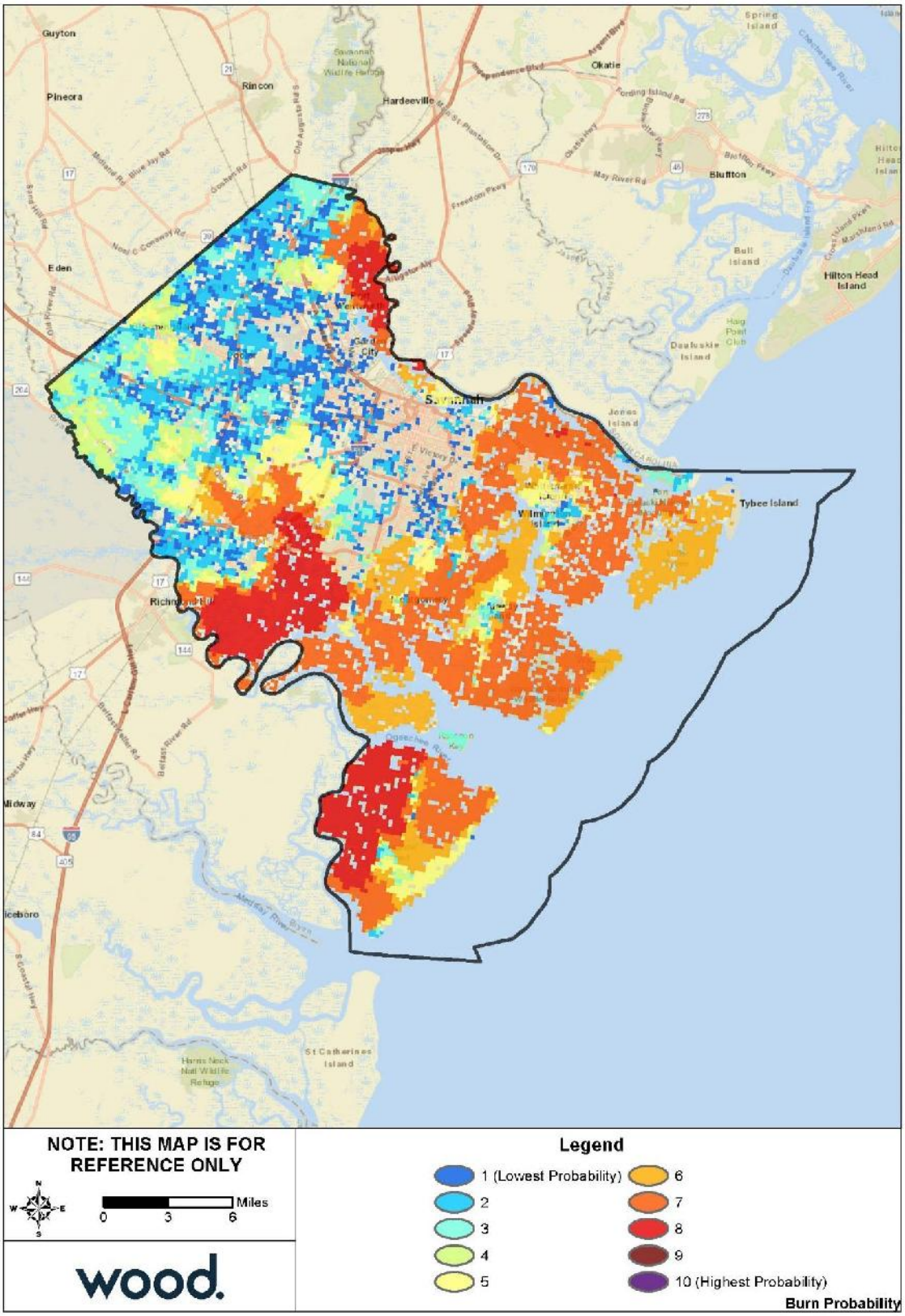
The Southern Wildfire Risk Assessment provides a Burn Probability analysis which predicts the probability of an area burning based on landscape conditions, weather, historical ignition patterns, and historical fire prevention and suppression efforts. Burn Probability data is generated by simulating fires under different weather, fire intensity, and other conditions. Values in the Burn Probability (BP) data layer indicate, for each pixel, the number of times that cell was burned by a modeled fire, divided by the total number of annual weather scenarios simulated. The simulations are calibrated to historical fire size distributions. The Burn Probability for Chatham County is presented in Table 2.78 and illustrated in Figure 2.44

Table 2.78 – Burn Probability, Chatham County

Class	Acres	Percent
1	21,076	9.5 %
2	28,048	12.6 %
3	21,311	9.6 %
4	12,736	5.7 %
5	15,798	7.1 %
6	30,570	13.8 %
7	64,796	29.2 %
8	27,651	12.5 %
9	0	0.0 %
10	0	0.0 %
Total	**221,986**	**100.0 %**

Source: Southern Wildfire Risk Assessment

Figure 2.44 – Burn Probability, Chatham County



Source: Southern Wildfire Risk Assessment

Over 50 percent of Chatham County has a burn probability between 6 and 8. The areas of higher burn probability are located on the coast and on the southwestern border of the county. The northeastern portion of the county has a burn probability of 1 to 5. The probability of wildfire across the county is considered likely, defined as between a 10% and 100% annual chance of occurrence. The communities containing a higher burn probability, as noted, have a comparatively higher probability of occurrence.

Probability: 3 – Likely

Vulnerability Assessment

People

Wildfire can cause fatalities and human health hazards. Ensuring procedures are in place for rapid warning and evacuation are essential to reducing vulnerability.

Based on 2012 housing density data, Southern Wildfire Risk Assessment (SWRA) estimates that 234,678 people or 88.5% of the total planning area population live within the WUI and are therefore at risk to wildfire.

Property

Wildfire can cause direct property losses, including damage to buildings, vehicles, landscaped areas, agricultural lands, and livestock. Construction practices and building codes can increase fire resistance and fire safety of structures. Techniques for reducing vulnerability to wildfire include using street design to ensure accessibility to fire trucks, incorporating fire resistant materials in building construction, and using landscaping practices to reduce flammability and the ability for fire to spread.

Using the Wildland Urban Interface Risk Index (WUIRI) from the Southern Wildfire Risk Assessment, a GIS analysis was used to estimate the exposure of buildings most at risk to loss due to wildfire. The WUIRI shows a rating of the potential impact of wildfire on homes and people. This index ranges from 0 to -9, where lower values are relatively more severe. Table 2.79 summarizes the number of buildings and their total value that fall within areas rated -5 or less on the WUIRI. This table represents potential risks and counts every building within the area rated under -5, actual damages in the event of a wildfire may differ.

Table 2.79 – Building Counts and Values within WUIRI under -5

Jurisdiction	Buildings	Building Value
Bloomingdale	1,332	$85,967,738
Garden City	4,339	$332,892,475
Pooler	7,408	$1,499,232,850
Port Wentworth	3,056	$363,622,304
Savannah	28,744	$4,486,860,578
Thunderbolt	999	$116,766,446
Tybee Island	1,103	$218,845,359
Vernonburg	100	$16,412,767
Unincorporated Chatham County	33,871	$6,226,513,889
Total	**80,982**	**$13,347,114,405**

Source: GIS Analysis, Southern Wildfire Risk Assessment
Note: Analysis on building counts and values by occupancy type was not completed.

Additionally, 179 critical facilities are sited within an area rated as a -5 or lower on the WUIRI.

Compared to the analysis performed in the 2015, there is an increase of $3,988,917,047 in the building value located within areas with WUIRI values below -5. This change reflects that development has occurred in areas with high wildfire risk and/or that development has expanded the area of high wildfire risk to encompass more of the County's asset inventory. If development continues to occur in the WUI, wildfire risk may increase in the future as a result.

Environment

Wildfires have the potential to destroy forest and forage resources and damage natural habitats. Wildfire can also damage agricultural crops on private land. Wildfire is part of a natural process, however, and the environment will return to its original state in time.

Consequence Analysis

Table 2.80 summarizes the potential detrimental consequences of wildfire.

Table 2.80 – Consequence Analysis - Wildfire

Category	Consequences
Public	In addition to the potential for fatalities, wildfire and the resulting diminished air quality pose health risks. Exposure to wildfire smoke can cause serious health problems within a community, including asthma attacks and pneumonia, and can worsen chronic heart and lung diseases. Vulnerable populations include children, the elderly, people with respiratory problems or with heart disease. Even healthy citizens may experience minor symptoms, such as sore throats and itchy eyes.
Responders	Public and firefighter safety is the first priority in all wildland fire management activities. Wildfires are a real threat to the health and safety of the emergency services. Most fire-fighters in rural areas are 'retained'. This means that they are part-time and can be called away from their normal work to attend to fires.
Continuity of Operations (including Continued Delivery of Services)	Wildfire events can result in a loss of power which may impact operations. Downed trees, power lines and damaged road conditions may prevent access to critical facilities and/or emergency equipment.
Property, Facilities and Infrastructure	Wildfires frequently damage community infrastructure, including roadways, communication networks and facilities, power lines, and water distribution systems. Restoring basic services is critical and a top priority. Efforts to restore roadways include the costs of maintenance and damage assessment teams, field data collection, and replacement or repair costs. Direct impacts to municipal water supply may occur through contamination of ash and debris during the fire, destruction of aboveground distribution lines, and soil erosion or debris deposits into waterways after the fire. Utilities and communications repairs are also necessary for equipment damaged by a fire. This includes power lines, transformers, cell phone towers, and phone lines.
Environment	Wildfires cause damage to the natural environment, killing vegetation and animals. The risk of floods and debris flows increases after wildfires due to the exposure of bare ground and the loss of vegetation. In addition, the secondary effects of wildfires, including erosion, landslides, introduction of invasive species, and changes in water quality, are often more disastrous than the fire itself.
Economic Condition of the Jurisdiction	Wildfires can have significant short-term and long-term effects on the local economy. Wildfires, and extreme fire danger, may reduce recreation and tourism in and near the fires. If aesthetics are impaired, local property values can decline. Extensive fire damage to trees can significantly alter the timber supply, both through a short-term surplus from timber salvage and a longer-term decline while the trees regrow. Water supplies can be degraded by post-fire erosion and stream sedimentation.

Category	Consequences
Public Confidence in the Jurisdiction's Governance	Wildfire events may cause issues with public confidence because they have very visible impacts on the community. Public confidence in the jurisdiction's governance may be influenced by actions taken pre-disaster to mitigate and prepare for impacts, including the amount of public education provided; efforts to provide warning to residents; response actions; and speed and effectiveness of recovery.

Hazard Summary by Jurisdiction

The following table summarizes flood hazard risk by jurisdiction. Wildfire warning time and duration do not vary by jurisdiction. Spatial extent ratings were estimated based on the proportion of area within the WUI; all jurisdictions have at least 50% of their area in the WUI and were assigned a rating of 3. Impact ratings were based on fire intensity data from SWRA. Jurisdictions with significant clusters of moderate to high fire intensity were assigned a rating of 3; all other jurisdictions were assigned a rating of 2. Probability ratings were determined based on burn probability data from SWRA. Jurisdictions with clusters of moderate burn probability were assigned a rating of 3; all other jurisdictions were assigned a probability of 2.

Jurisdiction	Probability	Impact	Spatial Extent	Warning Time	Duration	Score	Priority
Chatham County	3	3	3	4	3	3.1	H
Bloomingdale	2	3	3	4	3	2.8	H
Garden City	2	3	3	4	3	2.8	H
Pooler	2	2	3	4	3	2.5	H
Port Wentworth	2	2	3	4	3	2.5	H
Savannah	3	3	3	4	3	3.1	H
Thunderbolt	3	3	3	4	3	3.1	H
Tybee Island	3	3	3	4	3	3.1	H
Vernonburg	3	3	3	4	3	3.1	H

2.5.13 Hazardous Materials Incident

Hazard Background

A hazardous substance is any substance that may cause harm to persons, property, or the environment when released to soil, water, or air. Chemicals are manufactured and used in increasing types and quantities. Each year over 1,000 new synthetic chemicals are introduced and as many as 500,000 products pose physical or health hazards and can be defined as "hazardous chemicals". Hazardous substances are categorized as toxic, corrosive, flammable, irritant, or explosive. Hazardous material incidents generally affect a localized area.

Fixed Hazardous Materials Incident

A fixed hazardous materials incident is the release of chemical substances or mixtures during production or handling at a fixed facility. Hazardous materials releases can be accidental or intentional, as with a terror attack, addressed in Section 2.5.14.

Fixed facilities with hazardous materials can include industrial, commercial, and federal facilities. The Emergency Planning and Community Right-to-Know Act (EPCRA) created several methods for tracking facilities with hazardous materials. Section 313 of the EPCRA created the Toxics Release Inventory (TRI). The TRI tracks toxic chemical releases and pollution prevention activities reported by industrial and federal facilities. TRI data is made publicly available by the U.S. Environmental Protection Agency (EPA). Section 312 of the EPCRA mandated additional reporting of hazard materials by businesses and organizations with quantities of hazardous materials over a certain threshold. Tier II reports must be submitted annually, and help local fire departments, Local Emergency Planning Committees (LEPC) and State Emergency Response Commissions (SERCs) plan for and respond to chemical emergencies. Tier II facility reports are identified and mapped as part of the County's Emergency Operations Plans. These facilities can be viewed at the following link:

https://cccdn.blob.core.windows.net/cdn/Files/CEMA/Plans/APP10-1%20TAB%20C%20TIER%20II%20FACILITY%20MAPS.pdf

Transportation Hazardous Materials Incident

A transportation hazardous materials incident is the accidental release of chemical substances or mixtures during transport. Transportation Hazardous Materials Incidents in the Eno-Haw Region can occur during highway or air transport. Highway accidents involving hazardous materials pose a great potential for public exposures. Both nearby populations and motorists can be impacted and become exposed by accidents and releases. If airplanes carrying hazardous cargo crash, or otherwise leak contaminated cargo, populations and the environment in the impacted area can become exposed.

Pipeline Incident

A pipeline transportation incident occurs when a break in a pipeline creates the potential for an explosion or leak of a dangerous substance (oil, gas, etc.) possibly requiring evacuation. An underground pipeline incident can be caused by environmental disruption, accidental damage, or sabotage. Incidents can range from a small, slow leak to a large rupture where an explosion is possible. Inspection and maintenance of the pipeline system along with marked gas line locations and an early warning and response procedure can lessen the risk to those near the pipelines.

Warning Time: 4 – Less than six hours

Duration: 2 – Less than 24 hours

Location

The Toxics Release Inventory (TRI) Program run by the EPA maintains a database of industrial facilities across the country and the type and quantity of toxic chemicals they release. The program also tracks pollution prevention activities and which facilities are reducing toxic releases. The Toxic Release Inventory reports 24 sites reporting hazardous materials in Chatham County in the last three years. These sites are shown in Figure 2.45 and detailed by location and sector in Table 2.81.

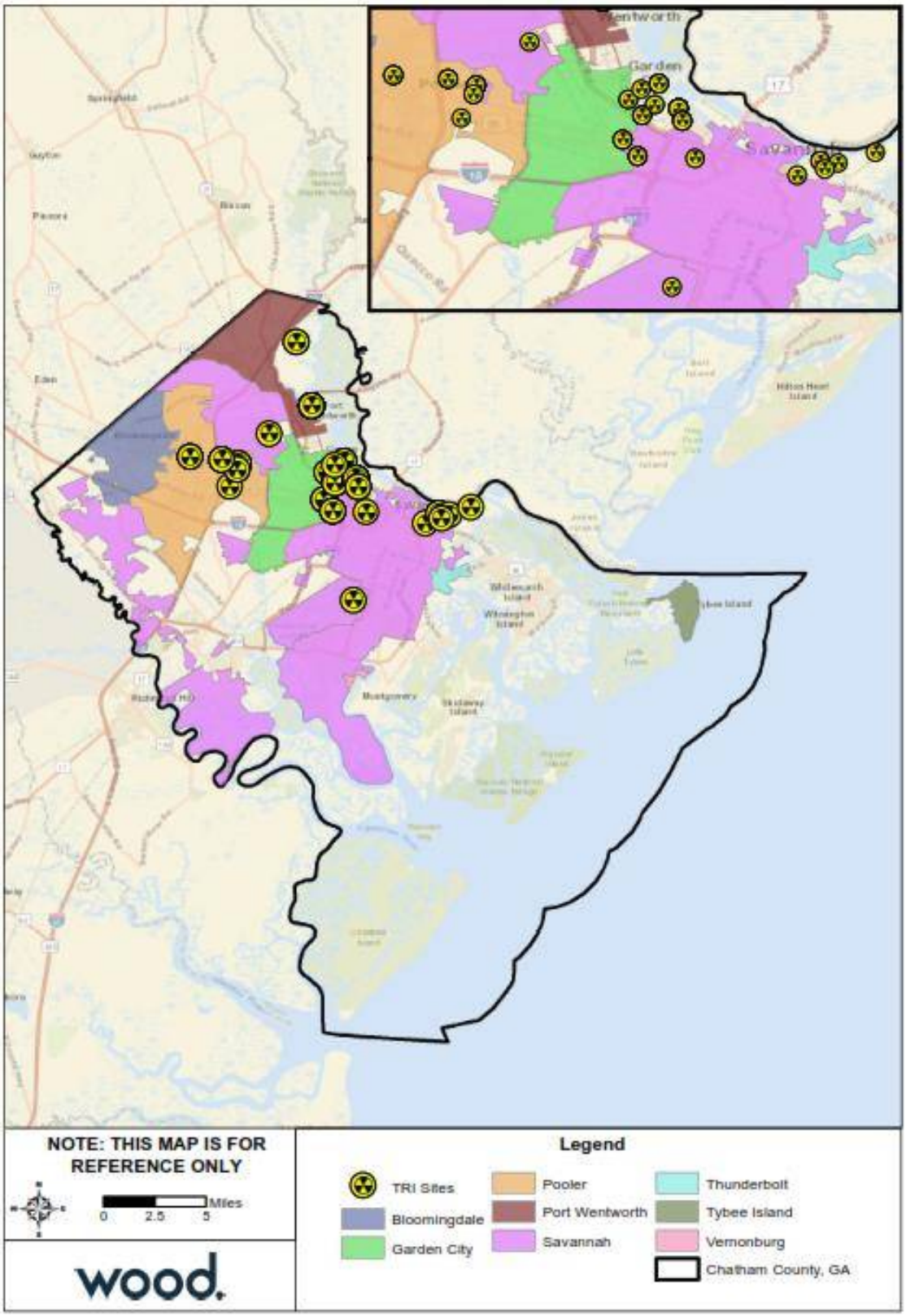
Table 2.81 – Toxic Release Inventory Facilities by Jurisdiction

Facility Name	Sector
Garden City	
NEW NGC INC D/B/A NATIONAL GYPSUM CO	Nonmetallic Mineral Product
Pooler	
ARGOS POOLER CONCRETE PLANT	Nonmetallic Mineral Product
SHEAROUSE LUMBER CO	Wood Products
JCB INC	Machinery
Savannah	
KERRY INGREDIENTS & FLAVOURS	Food
JOHNSON MATTHEY PROCESS TECHNOLOGIES INC	Chemicals
SOLENIS LLC	Chemicals
HUNTER ARMY AIRFIELD FIRING RANGES	Other
COLONIAL CHEMICAL SOLUTIONS INC	Chemical Wholesalers
SAVANNAH CONCRETE PLANT	Nonmetallic Mineral Product
Unincorporated Chatham County	
INTERNATIONAL PAPER CO - PORT WENTWORTH	Paper
INTERNATIONAL PAPER CO - SAVANNAH COMPLEX	Paper
GAF	Petroleum
BASF CORP-SAVANNAH OPERATIONS	Nonmetallic Mineral Product
SEAGATE TERMINALS SAVANNAH LLC	Chemicals
OWENS CORNING ROOFING & ASPHALT LLC	Petroleum
ERGON ASPHALT & EMULSIONS INC - GARDEN CITY	Petroleum
PHILLIPS 66 SAVANNAH LUBRICANTS PLANT	Petroleum
EMD PERFORMANCE MATERIALS CORP	Chemicals
KRATON CHEMICAL CO LLC	Chemicals
SOUTHERN STATES CHEMICAL SEAPOINT	Chemicals
GULFSTREAM AEROSPACE CORP	Transportation Equipment
GEORGIA PACIFIC GYPSUM LLC- SAVANNAH	Nonmetallic Mineral Product
FUJI VEGETABLE OIL INC	Food

Source: EPA Toxic Release Inventory

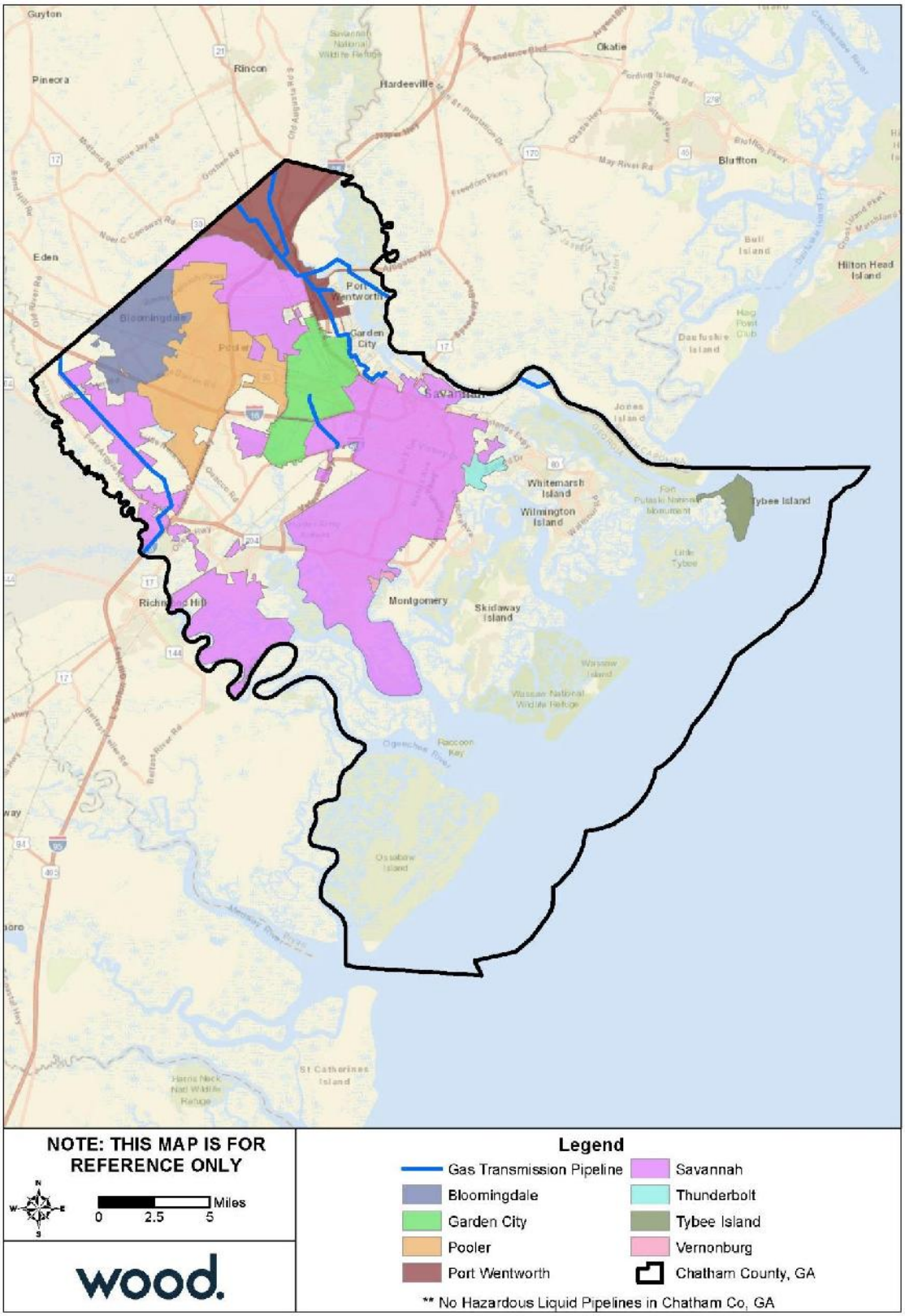
The U.S. Department of Transportation (USDOT) Pipeline and Hazardous Materials Safety Administration (PHMSA) maintains an inventory of the location of all gas transmission and hazardous liquid pipelines as well as liquid natural gas plants and hazardous liquid breakout tanks. The location of gas transmission pipelines in Chatham County are shown in Figure 2.46, as reported in the public viewer of the National Pipeline Mapping System.

Figure 2.45 – Toxics Release Inventory Sites in Chatham County



Source: EPA Toxics Release Inventory

Figure 2.46 – Pipelines and Pipeline Infrastructure in Chatham County



Source: US Department of Transportation, Pipeline and Hazardous Materials Safety Administration, National Pipeline Mapping System

Extent

The magnitude of a hazardous materials incident can be defined by the material type, the amount released, and the location of the release. The U.S. Department of Transportation Pipeline and Hazardous Materials Safety Administration (PHMSA), which records hazardous material incidents across the country, defines a "serious incident" as a hazardous materials incident that involves:

- a fatality or major injury caused by the release of a hazardous material,
- the evacuation of 25 or more persons as a result of release of a hazardous material or exposure to fire,
- a release or exposure to fire which results in the closure of a major transportation artery,
- the alteration of an aircraft flight plan or operation,
- the release of radioactive materials from Type B packaging,
- the release of over 11.9 galls or 88.2 pounds of a severe marine pollutant, or
- the release of a bulk quantity (over 199 gallons or 882 pounds) of a hazardous material.

Prior to 2002, however, a hazardous materials "serious incident" was defined as follows:

- a fatality or major injury due to a hazardous material
- closure of a major transportation artery or facility or evacuation of six or more persons due to the presence of hazardous material, or
- a vehicle accident or derailment resulting in the release of a hazardous material.

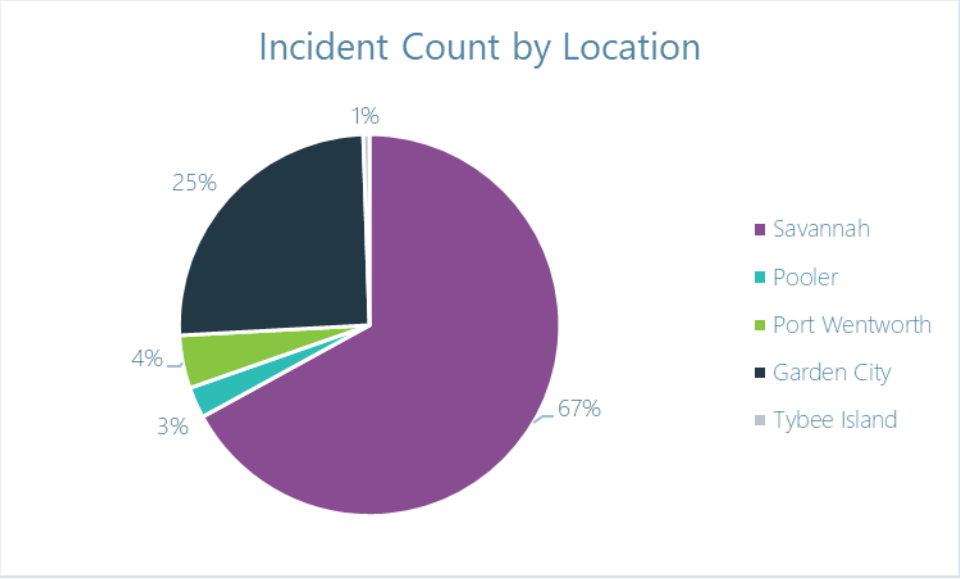
Impact: 3 – Critical

Spatial Extent: 3 – Moderate

Historical Occurrences

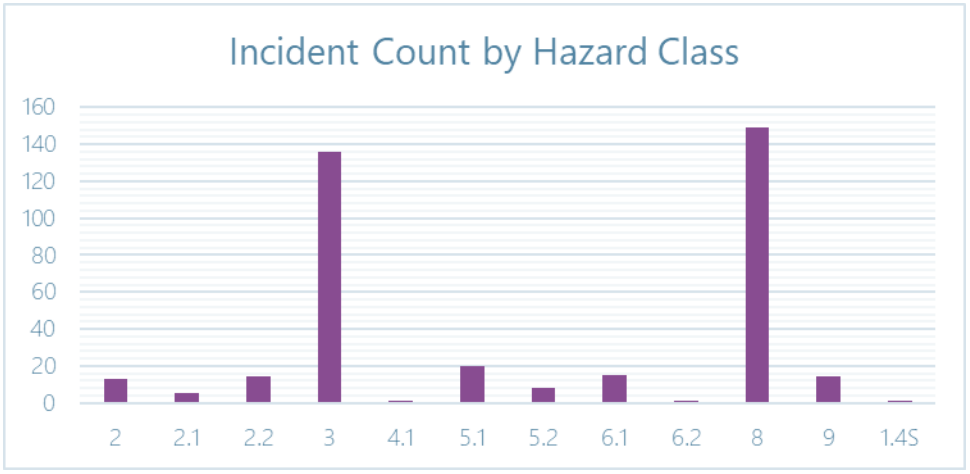
The USDOT's PHMSA maintains a database of reported hazardous materials incidents, which are summarized in Figure 2.47 and Figure 2.48 by location and hazardous material class. According to PHMSA records, there were 379 recorded releases in Chatham County from 1999 through 2018. Nineteen events were considered serious incidents, of which 15 were serious bulk releases; 6 events were flagged for serious evacuation, 2 caused minor injuries, and 5 resulted in the closure of major transportation arteries.

Figure 2.47 – Count of Hazardous Materials Release Incidents by Location, 1999-2018



Source: PHMSA Incident Reports, Office of Hazardous Materials Safety, Incident Reports Database Search, data as of Sept 4, 2019.

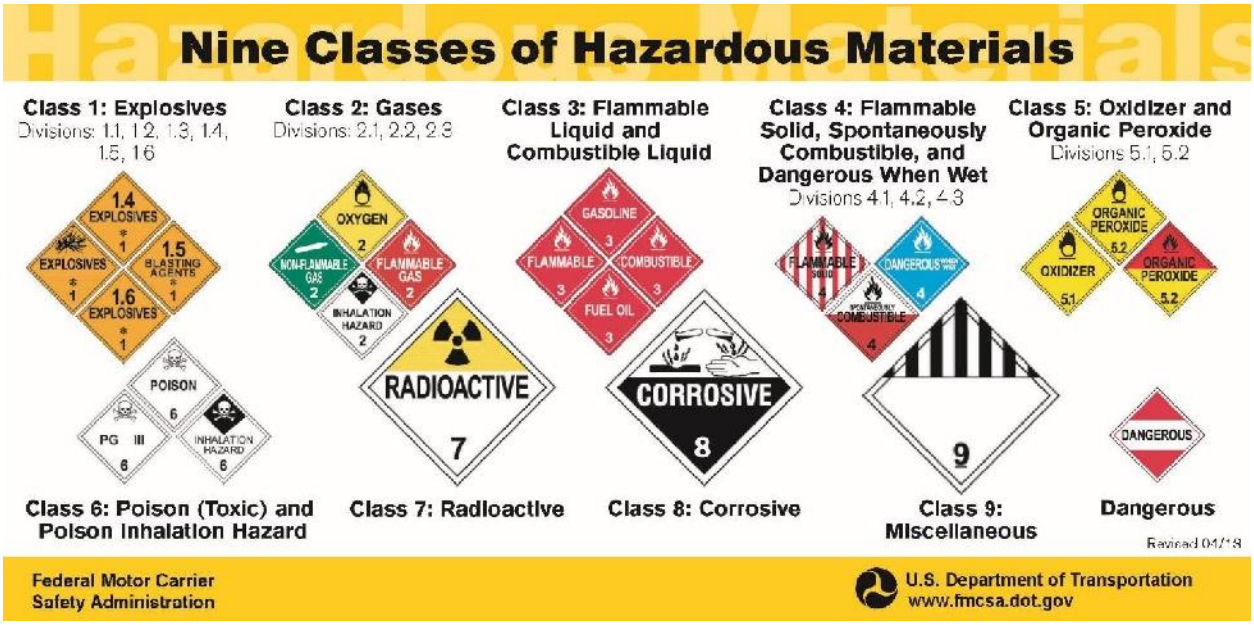
Figure 2.48 – Count of Hazardous Materials Release Incidents by Hazard Class, 1999-2018



Source: PHMSA Incident Reports, Office of Hazardous Materials Safety, Incident Reports Database Search, data as of Sept 4, 2019.

The most common materials spilled in the planning area are Class 3 (Flammable and Combustible Liquids) and Class 8 (Corrosives). Figure 2.49 describes all nine hazard classes.

Figure 2.49 – Hazardous Materials Classes



Source: U.S. Department of Transportation

Probability of Future Occurrence

Based on historical occurrences recorded by PHMSA, there have been 19 serious incidents of hazardous materials release in the 20-year period from 1999 through 2018. Using historical occurrences as an indication of future probability, there is a 95 percent annual probability of a serious incident occurring.

Probability: 3 – Likely

Vulnerability Assessment

People

Hazardous materials incidents can cause injuries, hospitalizations, and even fatalities to people nearby. People living near hazardous facilities and along transportation routes may be at a higher risk of exposure, particularly those living or working downstream and downwind from such facilities. For example, a toxic spill or a release of an airborne chemical near a populated area can lead to significant evacuations and have a high potential for loss of life. Individuals working with or transporting hazardous materials are also at heightened risk.

In addition to the immediate health impacts of releases, a handful of studies have found long term health impacts such as increased incidence of certain cancers and birth defects among people living near certain chemical facilities. However there has not been sufficient research done on the subject to allow detailed analysis.

The primary economic impact of hazardous material incidents results from lost business, delayed deliveries, property damage, and potential contamination. Large and publicized hazardous material-related events can deter tourists and could potentially discourage residents and businesses. Economic effects from major transportation corridor closures can be significant.

Property

The impact of a fixed hazardous facility, such as a chemical processing facility is typically localized to the property where the incident occurs. The impact of a small spill (i.e. liquid spill) may also be limited to the extent of the spill and remediated if needed. While cleanup costs from major spills can be significant, they do not typically cause significant long-term impacts to property.

Impacts of hazardous material incidents on critical facilities are most often limited to the area or facility where they occurred, such as at a transit station, airport, fire station, hospital, or railroad. However, they can cause long-term traffic delays and road closures resulting in major delays in the movement of goods and services. These impacts can spread beyond the planning area to affect neighboring counties, or vice-versa. While cleanup costs from major spills can be significant, they do not typically cause significant long-term impacts to critical facilities, but there is a chance they may be impacted.

Environment

Hazardous material incidents may affect a small area at a regulated facility or cover a large area outside such a facility. Widespread effects occur when hazards contaminate the groundwater and eventually the municipal water supply, or they migrate to a major waterway or aquifer. Impacts on wildlife and natural resources can also be significant.

Consequence Analysis

Table 2.82 summarizes the potential detrimental consequences of hazardous materials incident.

Table 2.82 – Consequence Analysis – Hazardous Materials Incident

Category	Consequences
Public	Contact with hazardous materials could cause serious illness or death. Those living and working closest to hazardous materials sites face the greatest risk of exposure. Exposure may also occur through contamination of food or water supplies.
Responders	Responders face similar risks as the general public but a heightened potential for exposure to hazardous materials.

Category	Consequences
Continuity of Operations (including Continued Delivery of Services)	A hazardous materials incident may cause temporary road closures or other localized impacts but is unlikely to affect continuity of operations.
Property, Facilities and Infrastructure	Some hazardous materials are flammable, explosive, and/or corrosive, which could result in structural damages to property. Impacts would be highly localized.
Environment	Consequences depend on the type of material released. Possible ecological impacts include loss of wildlife, loss of habitat, and degradation of air and/or water quality.
Economic Condition of the Jurisdiction	Clean up, remediation, and/or litigation costs may apply. Long-term economic damage is unlikely.
Public Confidence in the Jurisdiction's Governance	A hazardous materials incident may affect public confidence if the environmental or health impacts are enduring.

2.5.14 Terror Threat

Hazard Background

There is no universal globally agreed-upon definition of terrorism. In a broad sense, terrorism is the use of violence and threats to intimidate or coerce, especially against civilians, in the pursuit of political aims. Terrorism is defined in the United States by the Code of Federal Regulations as "the unlawful use of force or violence against persons or property to intimidate or coerce a government, civilian population, or any segment thereof, in furtherance of political or social objectives."

For this analysis, this hazard encompasses the following sub-hazards: enemy attack, biological terrorism, chemical terrorism, conventional terrorism, cyber-attack, radiological terrorism, and public disorder. These hazards can occur anywhere and demonstrate unlawful force, violence, and/or threat against persons or property causing intentional harm for purposes of intimidation, coercion or ransom in violation of the criminal laws of the United States. These actions may cause massive destruction and/or extensive casualties. The threat of terrorism, both international and domestic, is ever present, and an attack can occur when least expected.

Enemy attack is an incident that could cause massive destruction and extensive casualties throughout the world. Some areas could experience direct weapons' effects: blast and heat; others could experience indirect weapons' effect. International political and military activities of other nations are closely monitored by the federal government and the State of Georgia would be notified of any escalating military threats.

The use of biological agents against persons or property in violation of the criminal laws of the United States for purposes of intimidation, coercion or ransom can be described as biological terrorism. Liquid or solid contaminants can be dispersed using sprayers/aerosol generators or by point of line sources such as munitions, covert deposits and moving sprayers. Biological agents vary in the amount of time they pose a threat. They can be a threat for hours to years depending upon the agent and the conditions in which it exists.

Chemical terrorism involves the use or threat of chemical agents against persons or property in violation of the criminal laws of the United States for purposes of intimidation, coercion or ransom. Effects of chemical contaminants are similar to biological agents.

Use of conventional weapons and explosives against persons or property in violation of the criminal laws of the United States for purposes of intimidations, coercion, or ransom is conventional terrorism. Hazard effects are instantaneous; additional secondary devices may be used, lengthening the time duration of the hazard until the attack site is determined to be clear. The extent of damage is determined by the type and quantity of explosive. Effects are generally static other than cascading consequences and incremental structural failures. Conventional terrorism can also include tactical assault or sniping from remote locations.

Electronic attack using one computer system against another in order to intimidate people or disrupt other systems is a cyber-attack. All governments, businesses and citizens that conduct business utilizing computers face these threats. Cyber-security and critical infrastructure protection are among the most important national security issues facing our country today. The Georgia Cyber Crime Center (G3C) was created through a cooperative effort by the Office of the Governor, the Georgia Bureau of Investigation, the Georgia Technology Authority, and Augusta University to provide specialized investigative assistance on cyber-related crime. G3C helps local and state law enforcement agencies across Georgia solve sophisticated crimes involving cyber-related criminal activity, including computer and network intrusion.

Radiological terrorism is the use of radiological materials against persons or property in violation of the criminal laws of the United States for purposes of intimidation, coercion or ransom. Radioactive contaminants can be dispersed using sprayers/aerosol generators, or by point of line sources such as munitions, covert deposits and moving sprayers or by the detonation of a nuclear device underground, at the surface, in the air or at high altitude.

Mass demonstrations, or direct conflict by large groups of citizens, as in riots and non-peaceful strikes, are examples of public disorder. These are assembling of people together in a manner to substantially interfere with public peace to constitute a threat, and with use of unlawful force or violence against another person, or causing property damage or attempting to interfere with, disrupting, or destroying the government, political subdivision, or group of people. Labor strikes and work stoppages are not considered in this hazard unless they escalate into a threat to the community. Vandalism is usually initiated by a small number of individuals and limited to a small target or institution. Most events are within the capacity of local law enforcement.

The Southern Poverty Law Center (SPLC) reports 41 active hate groups in Georgia, shown in Table 2.83. The SPLC defines a hate group as any group with "beliefs or practices that attack or malign an entire class of people – particularly when the characteristics being maligned are immutable." It is important to note that inclusion on the SPLC list is not meant to imply that a group advocates or engages in violence or other criminal activity.

Table 2.83 – Hate Groups Active in Georgia

Group	Type	Location
The United Nuwaupians Worldwide/All Eyes on Egipt	Black Nationalist	Athens
Great Millstone	Black Nationalist	Atlanta
House of Israel	Black Nationalist	Atlanta
Israel United in Christ	Black Nationalist	Atlanta
Israelite School of Universal Practical Knowledge	Black Nationalist	Atlanta
Luxor Couture	Black Nationalist	Atlanta
Nation of Islam	Black Nationalist	Atlanta
New Black Panther Party	Black Nationalist	Atlanta
New Black Panther Party for Self Defense	Black Nationalist	Atlanta
Sicarii 1715	Black Nationalist	Atlanta
Proud Boys	General Hate	Atlanta
Affirmative Right	White Nationalist	Atlanta
Identity Evropa	White Nationalist	Atlanta
Occidental Quarterly/Charles Martel Society	White Nationalist	Atlanta
Nation of Islam	Black Nationalist	Augusta
Nationalist Liberty Union	General Hate	Augusta
Covenant People's Ministry	Christian Identity	Brooks
Nation of Islam	Black Nationalist	Brunswick
League of the South	Neo-Confederate	Cartersville
International Keystone Knights of the Ku Klux Klan	Ku Klux Klan	Cedartown
United Northern and Southern Knights of the Ku Klux Klan	Ku Klux Klan	Ellijay
Proud Boys	General Hate	Gainesville
Wildman's Civil War Surplus and Herb Shop	Neo-Confederate	Kennesaw
The United Nuwaupians Worldwide/All Eyes on Egipt	Black Nationalist	Lithonia
All Eyes on Egypt Bookstore	Black Nationalist	Macon
Dustin Inman Society, The	Anti-Immigrant	Marietta
Sunshine on Government (SONG) Alliance	Anti-Muslim	Newton

Group	Type	Location
American Vision	Anti-LGBT	Powder Springs
League of the South	Neo-Confederate	Powder Springs
Israel United in Christ	Black Nationalist	Savannah
Israelites Saints of Christ	Black Nationalist	Savannah
Identity Evropa	White Nationalist	Savannah
Asatru Folk Assembly	General Hate	Statewide
American White Knights of the Ku Klux Klan	Ku Klux Klan	Statewide
Identity Dixie	Neo-Confederate	Statewide
Atomwaffen Division	Neo-Nazi	Statewide
Traditionalist Worker Party	Neo-Nazi	Statewide
Blood and Honour Social Club	Racist Skinhead	Statewide
Confederate Hammerskins	Racist Skinhead	Statewide
Crew 38	Racist Skinhead	Statewide
Patriot Front	White Nationalist	Statewide

Source: Southern Poverty Law Center, https://www.splcenter.org/hate-map

Three hate groups identified by the SPLC have a footprint in Chatham County – Israel United in Christ, Israelites Saints of Christ, and Identity Evropa, all in Savannah.

Warning Time: 4 – Less than six hours

Duration: 4 – More than one week

Generally, no warning is given for specific acts of terrorism. Duration is dependent on the vehicle used during the terrorist attack. This score takes into account a prolonged scenario with continuous impacts.

Location

A terror threat could occur at any location in the County, but are more likely to target highly populated areas, critical infrastructure, or symbolic locations. Any of the critical facilities identified by the HMPC could be targeted; however, per the 2015 planning effort, the HMPC identified the following facilities with potentially elevated risk of terror threat:

- St. Joseph's Hospital
- Memorial Hospital, Savannah
- Federal Courthouse
- Chatham County Courthouse
- World Trade Center Savannah
- Georgia Port Authority
- Natural Gas Pressure Center
- County Emergency Operations Center
- Fort Pulaski National Monument
- County and Municipal Police/Sheriff's Offices
- Grayson Stadium
- Savannah/Hilton Head International Airport
- Savannah Civic Center

In terms of cyber-attack, our society is highly networked and interconnected. An attack could be launched from anywhere on earth and could range in impacts from small and localized to a far-reaching global scale. Depending on the attack vector and parameters, a cyber-attack could impact all of Chatham County and its associated municipal jurisdictions.

Extent

The extent of a terrorist incident is tied to many factors, including the attack vector, location, time of day, and other circumstances; for this reason, it is difficult to put assess a single definition or conclusion of the extent of "terrorism." As a general rule, terrorism incidents are targeted to where they can do the most damage and have the maximum impact possible, though this impact is tempered by the weapon used in the attack itself.

Impact: 4 – Catastrophic

Spatial Extent: 1 – Negligible

Historical Occurrences

As noted in the previous Chatham County Hazard Mitigation Plan, there have been no major terror events in the County. There is still, however, some possibility that one could occur in the future given the incidents that have occurred in the United States in the past and the facilities and locations in the county that could be potential targets.

Local news reports have documented threats and possible targets during the last five years. Per WSAV News, in March 2018, a woman in Savannah was arrested for posting a video on YouTube depicting a shooting threat at Godley Station Elementary School. In July 2019 Savannah Now reported that the FBI warned local governments of the potential for attacks during Fourth of July festivities.

Probability of Future Occurrence

While difficult to estimate when a deliberate act like terrorism may occur, it can be inferred that the probability of a terrorism attack in any one area in the County is very low at any given time. When identified, credible threats may increase the probability of an incident; these threats are generally tracked by law enforcement.

Probability: 1 – Unlikely

Vulnerability Assessment

Methodologies and Assumptions

Vulnerability to terrorism was assessed through hypothetical scenarios. These scenarios were modeled using the Electronic Mass Casualty Assessment and Planning Scenarios (EMCAPS) tool developed by the Johns Hopkins Office of Critical Event Preparedness and Response, Johns Hopkins Applied Physics Laboratory, the U.S. Department of Homeland Security, and the National Center for the Study of Preparedness and Catastrophic Event Response.

People

People can suffer death or illness as a result of a terrorist attack. Symptoms of illness from a biological or chemical attack may go undetected for days or even weeks. Local healthcare workers may observe a pattern of unusual illness or early warning monitoring systems may detect airborne pathogens. People will face increased risk if a biological or chemical agent is released indoors, as this may result in exposure to a higher concentration of pathogens, whereas agents that are released outdoors would disperse in the direction of the wind. Physical harm from a weapons attack or explosive device is not dependent on location, but risk is greater in areas where higher numbers of people may gather. People could also be affected by an attack on food and water supply. In addition to impacts on physical health, any terrorist attack could cause significant stress and anxiety.

The following hypothetical scenarios illustrate the potential impacts of a chlorine gas release and an improvised explosive device (IED) attack on a location in the City of Savannah, chosen due to its relatively high population density as well as the presence of multiple government buildings, culturally significant sites, and critical facilities and infrastructure. These scenarios were modeled using the Electronic Mass Casualty Assessment and Planning Scenarios (EMCAPS) tool developed by the Johns Hopkins Office of Critical Event Preparedness and Response, Johns Hopkins Applied Physics Laboratory, the U.S. Department of Homeland Security, and the National Center for the Study of Preparedness and Catastrophic Event Response.

Scenario #1 – Chemical Attack: Toxic Gas – Chlorine Release

Scenario Overview: A bomb is attached to a tractor trailer tanker carrying compressed chlorine. The entire contents of the tank escape to the atmosphere and the plume spreads to the surrounding area. The plume spreading and the effect on the population are calculated according to the following input variables: outdoor temperature is 85°F, wind speed is 9 mph, the setting is urban, and the population density is 1,300 persons per square mile. The following assumptions apply:

- 4,850-gallon tank, all contents released through 3-ft hole
- Partly cloudy, no precipitation
- 50% of people in plume area are indoors
- Effects of chlorine on population determined through evaluation of chlorine gas concentration zones, which were determined using ALOHA plume modeling software
- First effects on humans at concentration = 10 ppm
- Minimum lethal dose = 430 ppm for 30 min
- Median lethal dose (short-term exposure) = 1,000 ppm

Table 2.84 outlines the expected losses based on the above parameters.

Table 2.84 – Estimated Casualties from Chlorine Attack

Injury Description	Population affected
Fatality	28 persons
Eye pain & swelling, headache, restricted airflow – difficulty breathing, coughing, chest pain, lung inflammation and edema, bloody sputum, vomiting, skin irritation, possible chemical burns	43 persons
Eye pain & swelling, headache, throat irritation, rapid breathing, coughing, chest pain, lung inflammation and edema, bloody sputum, vomiting, skin irritation	96 persons
Eye pain & swelling, headache, throat irritation, rapid breathing, coughing, chest pain, skin irritation	194 persons
Eye irritation, headache, throat irritation, coughing, skin irritation	238 persons
Eye irritation, headache, coughing, skin irritation	226 persons
Total impacted population	825 persons
"Worried Well" Cases (assumed to be 9x affected population)	7,425 persons
Cost of Decontamination @ $12/person (assumes all persons with skin injuries will require decontamination and approximately 1/10 of the worried well will demand to be decontaminated). Total persons treated = 1,568	$18,816

Source: EMCAPS tool

Scenario #2 – IED: Truck Bomb

Scenario Overview: An Improvised Explosive Device (IED) utilizing an ammonium nitrate/fuel oil (ANFO) mixture is carried in a cargo truck to a populated area and detonated. The bomb size is assumed to be 1000 lbs ANFO and the population density is 1 person per 50 square feet, equivalent to a moderately

crowded pedestrian area as might be found in an average large city or outside a stadium. It is assumed that the explosion takes place in a relatively open area (e.g. stadium parking lot, park, etc). The following assumptions apply:

- ANFO - TNT equivalence = 0.82
- Blast pressure damage impact taken from National Fire Protection Association (NFPA) 921 Guide for Fire and Explosion Investigations - 2001 Edition, Table 18.13.3.1[b]
- Buildings and other physical structures are not considered in these calculations

Table 2.85 outlines the expected losses based on the above parameters.

Table 2.85 – Estimated Casualties from IED Attack

Injury Description	Population affected
Total Dead	173 persons
Total Traumatic Injuries	303 persons
Total Urgent Care Injuries	1,491 persons
Injuries not Requiring Hospitalization	558 persons

Source: EMCAPS tool

Expected symptoms and injuries would include impact injuries (pulmonary blast), pulmonary contusion, barotrauma, fractures (internal, compound, spinal), smoke inhalation, GI blast injury (edema, hemorrhage, rupture), auditory blast injury (partial or total loss of hearing), lacerations, shrapnel, debris penetrations (glass, metal, etc.) and burns. Transportation would be limited or inaccessible near the blast, and services and utilities could be unavailable.

Property

The potential for damage to property is highly dependent on the type of attack. Buildings and infrastructure may be damaged by an explosive device or by contamination from a biological or chemical attack. Impacts are generally highly localized to the target of the attack.

To put the above scenarios into perspective, the HMPC identified several locations and events that could be targeted by similar attacks. The HMPC noted that the Port of Savannah, which is a major economic hub, and the annual St. Patrick's Day celebration in Savannah, which draws approximately 500,000 tourists to the area, could be targeted. During the planning process for the 2015 plan, the HMPC also identified the following critical facilities as having elevated risk to terror threat:

- St. Joseph's Hospital
- Memorial Hospital, Savannah
- Federal Courthouse
- Chatham County Courthouse
- World Trade Center Savannah
- Georgia Port Authority
- Natural Gas Pressure Center
- County Emergency Operations Center
- Fort Pulaski National Monument
- County and Municipal Police/Sheriff's Offices
- Grayson Stadium
- Savannah/Hilton Head International Airport
- Savannah Civic Center

Environment

Environmental impacts are also dependent on the type of attack. Impacts could be negligible or could require major clean-up and remediation.

Consequence Analysis

Table 2.86 summarizes the potential detrimental consequences of a terror threat.

Table 2.86 – Consequence Analysis – Terrorism

Category	Consequences
Public	Illness, injury, or fatality are possible; these impacts would be highly localized to the attack. Widespread stress and psychological suffering may occur.
Responders	Responders face increased risks during an effort to stop an attack or rescue others while an attack is underway.
Continuity of Operations (including Continued Delivery of Services)	Critical infrastructure may be targeted by an attack; therefore, continuity of operations may be affected. Long-term issues may arise if transportation or utility infrastructure is severely damaged.
Property, Facilities and Infrastructure	Impacts depend of the type of attack. Buildings and infrastructure could be unaffected or completely destroyed.
Environment	Water and food supply could be contaminated by a biological or chemical attack. Remediation could be required.
Economic Condition of the Jurisdiction	The local economy could be disrupted, depending on the location and scale of an attack.
Public Confidence in the Jurisdiction's Governance	Loss of public confidence likely should an attack be carried out; additional loss of confidence and trust may result if response and recovery are not swift and effective

2.6 CONCLUSIONS ON HAZARD RISK

Priority Risk Index

As discussed in Section 2.3 Risk Assessment Methodology and Assumptions, the Priority Risk Index was used to rate each hazard on a set of risk criteria and determine an overall standardized score for each hazard. The conclusions drawn from this process are summarized below.

Table 2.87 summarizes the degree of risk assigned to each identified hazard using the PRI method.

Table 2.87 – Summary of PRI Results

Hazard	Probability	Impact	Spatial Extent	Warning Time	Duration	PRI Score
Dam Failure	Unlikely	Limited	Negligible	Less than 6 hrs	Less than 1 week	1.8
Drought	Likely	Minor	Large	More than 24 hrs	More than 1 week	2.5
Earthquake	Possible	Limited	Moderate	Less than 6 hrs	Less than 6 hrs	2.3
Erosion	Likely	Limited	Small	More than 24 hrs	Less than 1 week	2.3
Extreme Heat	Highly Likely	Critical	Large	More than 24 hrs	Less than 1 week	3.3
Flood	Highly Likely	Critical	Moderate	6 to 12 hours	Less than 1 week	3.3
Hurricane	Likely	Catastrophic	Large	More than 24 hrs	Less than 1 week	3.3
Sea Level Rise	Likely	Critical	Moderate	More than 24 hrs	More than 1 week	2.9
Severe Weather (Hail)[1]	Highly Likely	Minor	Small	Less than 6 hrs	Less than 6 hrs	2.4
Severe Weather (Lightning)[1]	Highly Likely	Minor	Negligible	Less than 6 hrs	Less than 6 hrs	2.2
Severe Weather (Winds)[1]	Highly Likely	Limited	Large	Less than 6 hrs	Less than 6 hrs	3.1
Severe Winter Weather	Likely	Limited	Large	More than 24 hrs	Less than 1 week	2.7
Tornado	Likely	Critical	Small	Less than 6 hrs	Less than 6 hrs	2.7
Wildfire	Likely	Limited	Moderate	Less than 6 hrs	Less than 1 week	2.8
Hazardous Materials	Likely	Critical	Moderate	Less than 6 hrs	Less than 24 hrs	3.0
Terror Threat	Unlikely	Catastrophic	Negligible	Less than 6 hrs	More than 1 week	2.2

[1]Note: Severe Weather hazards average to a score of 2.6 and are therefore considered together as a high-risk hazard.

The results from the PRI have been classified into three categories based on the assigned risk value which are summarized in Table 2.88:

- **High Risk** – Widespread potential impact. This ranking carries a high threat to the general population and/or built environment. The potential for damage is widespread.
- **Moderate Risk** – 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.
- **Low Risk** – Minimal potential impact. The occurrence and potential cost of damage to life and property is minimal. This is not a priority hazard.

Table 2.88 – Summary of Hazard Risk Classification

High Risk (> 2.4)	Extreme Heat Hurricane Flood Hazardous Materials Incident Sea Level Rise Wildfire Severe Winter Weather Tornado Severe Weather (Thunderstorm Wind, Lightning, Hail) Drought
Moderate Risk (2.0 – 2.4)	Earthquake Erosion Terror Threat
Low Risk (< 2.0)	Dam Failure

3 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 Chatham County Hazard Mitigation Plan. It describes how the County met Step 6: Set Goals, Step 7: Review Possible Activities, and Step 8: Draft an Action Plan from the 10-step planning process. This section contains the following subsections:

- 3.1 Goals and Objectives
- 3.2 Identification and Analysis of Mitigation Activities
- 3.3 Mitigation Action Plans

Table 3.1 – Section 3 Summary of Updates

2015 Plan Section Number	2020 Plan Section and Description of Changes
Section 4 – Overall Community Mitigation Goals and Mitigation Actions	**Section 3 – Mitigation Strategy**
I. Mitigation Goals	3.1 Goals and Objectives – This section was updated to reflect the discussion of the plan goals and the development of objectives.
II. Identification and Analysis of Mitigation Techniques	3.2 Identification and Analysis of Mitigation Activities – This section was simplified to summarize the mitigation categories considered by the HMPC. A full detailed review of mitigation alternatives is provided in Appendix C. A description of the prioritization criteria used to prioritize mitigation actions was added to this section.
III. Mitigation Action Plan	3.3 Mitigation Action Plans – This section presents the updated Mitigation Action Plans for each jurisdiction.

3.1 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 2 documents the hazards and associated risks that threaten Chatham County, including the vulnerability of structures, infrastructure, and critical facilities. Based on this understanding of risks, the HMPC must identify mitigation actions to reduce exposure, vulnerability, and overall risk. The intent of goal setting is to guide the review of possible mitigation actions. This Plan needs to make sure that recommended actions are consistent with what is appropriate for the County. Mitigation goals should reflect community priorities and should be consistent with other plans in the County.

- **Goals** are general guidelines that explain what is to be achieved. They are usually broad-based, long-term policy type statements that represent global visions. Goals help define the benefits that the plan is trying to achieve.
- **Objectives** are short term aims which, when combined, form a strategy or course of action to meet a goal. Objectives provide more specific methods for achieving goals.

3.1.1 Goal Setting

At the second planning meeting, held on June 18, 2019, the HMPC reviewed and discussed the goals from the 2015 Plan. One key consideration in evaluating these goals was to ensure that the goals of the Hazard Mitigation Plan align with other community planning efforts such as comprehensive and land use plans. These documents are important guides for future growth within the community. Therefore, the HMPC should strive to achieve consistency in the plans' goals.

Minor changes were proposed to the previous goals in effort to simplify their wording but maintain their intent. These updates were validated by the committee. The HMPC then reviewed, discussed, and revised a set of objectives recommended by the planning consultant to further guide the creation of mitigation actions. The goals and objectives approved by the HMPC are presented below.

3.1.2 Resulting Goals and Objectives

Goal 1: Protect people in Chatham County as well as existing and future structures and resources, particularly critical facilities, from hazards.

Objective 1.1: Retrofit or otherwise protect critical facilities and infrastructure.

Objective 1.2: Regulate development in known hazard areas.

Objective 1.3: Protect natural and beneficial floodplain functions and key natural resources.

Goal 2: Improve education and outreach efforts regarding potential impacts from hazards as well as specific mitigation measures that can be undertaken.

Objective 2.1: Encourage personal responsibility for hazard mitigation and preparedness.

Objective 2.2: Expand outreach methods to reach more audiences.

Goal 3: Improve capabilities and coordination to plan and implement hazard mitigation projects, programs and activities.

Objective 3.1: Promote resiliency and addressing the impacts of climate change on natural hazards.

Objective 3.2: Use GIS and other technologies to improve capabilities.

Objective 3.3: Identify new mitigation measures, technologies and practices.

Goal 4: Improve data collection, dissemination, and redundancy use to reduce hazard impacts.

Objective 4.1: Increase redundancy of critical systems and services.

Objective 4.2: Encourage data and resource sharing across jurisdictions.

3.2 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.

To identify and select mitigation projects, the HMPC targeted those hazards considered high and moderate priorities for the planning area, based on the analysis provided in Section 2 Hazard Identification

& Risk Assessment. The following hazards were determined based on the Priority Risk Index scores to be high and moderate priority hazards:

- Drought
- Earthquake
- Erosion
- Extreme Heat
- Flood
- Hurricane
- Sea Level Rise
- Severe Weather
- Severe Winter Weather
- Tornado
- Wildfire
- Hazardous Materials Incident
- Terror Threat

Once it was determined which hazards warranted the development of specific mitigation actions, the HMPC analyzed viable mitigation options that supported the identified goals and objectives. The HMPC was provided with the following list of mitigation categories which are utilized as part of the CRS planning process but are also applicable to multi-hazard mitigation.

- Prevention
- Property Protection
- Natural Resource Protection
- Emergency Services
- Structural Projects
- Public Information and Outreach

More detail on the range of mitigation alternatives considered by the HMPC are provided in Appendix C.

The HMPC was also provided with examples of potential mitigation actions for each of the above categories. The HMPC was instructed to consider both future and existing buildings in evaluating possible mitigation actions. The HMPC also considered which incomplete actions from the previous plan should be continued in this action plan.

3.2.1 Prioritization Process

In the process of identifying continuing and new mitigation actions, the HMPC was provided with a set of criteria to assist in deciding why one action might be more important, more effective, or more likely to be implemented than another. HMPC members were asked to rate each action with an approach modified from the FEMA STAPLEE criteria. The considerations for action prioritization were as follows:

- **Socially Acceptable:** Is the action acceptable to the community? Does it have a greater impact on a certain segment of the population? Are the benefits fair?
- **Technically Feasible:** Is the action technically feasibly? Is it a long-term solution to the problem? Does it capitalize on existing planning mechanisms for implementation?
- **Administrative Resources:** Are there adequate staffing, funding and other capabilities to implement the project? Is there adequate additional capability to ensure ongoing maintenance?
- **Politically Supported:** Will there be adequate political and public support for the project? Does the project have a local champion to support implementation?
- **Legally Allowable:** Does the community have the legal authority to implement the action?

- **Economically Sound:** Can the action be funded locally? Will the action need to be funded by an outside entity, and has that funding been secured? How much will the project cost? Can the benefits be quantified, and do they outweigh the costs?
- **Environmentally Sound:** Does the action comply with environmental regulations? Does the action meet the community's environmental goals? Does the action impact land, water, endangered species, or other natural assets?

In accordance with the DMA requirements, an emphasis was placed on the importance of a benefit-cost analysis in determining action priority, as reflected in the prioritization criteria above. For each action, the HMPC considered the benefit-cost analysis in terms of:

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

The consideration of these criteria helped to prioritize and refine mitigation actions but did not constitute a full benefit-cost analysis. 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.

The prioritization ranking, simplified as High, Moderate, or Low, for each mitigation action considered by the HMPC is provided in the Mitigation Action Plans below. These priority rankings are relative and assigned by each jurisdiction's representatives on the HMPC but can be generally defined as follows:

- **High**: Project can be implemented quickly and/or easily, provides the best return on investment, and/or addresses a high-priority hazard or significant vulnerability.
- **Moderate**: Project provides a good benefit-cost ration but requires some additional support to implement.
- **Low**: Project requires significant administrative or financial support to implement, is a long-range pursuit, has a low benefit-cost ratio, and/or does not address a high-priority hazard.

Changes in priorities are reflected in the priority rankings of the mitigation actions and in the actions that have been deleted from the mitigation plan (detailed in Section 1.3). Priorities for mitigation were impacted by findings in the updated risk assessment, changes in local capability, and changes in resources available for mitigation.

3.3 MITIGATION ACTION PLANS

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 section provides the mitigation action plans for each participating jurisdiction. The plans are organized as follows:

- Chatham County*
- City of Bloomingdale
- City of Garden City
- City of Pooler
- City of Port Wentworth
- City of Savannah

- Town of Thunderbolt
- City of Tybee Island

*Note: Actions for Chatham County cover the unincorporated areas of the county as well as the recently incorporated Town of Vernonburg, which was also covered by Chatham County actions in the 2015 plan prior to its incorporation.

Each mitigation action recommended for implementation is listed in these tables along with detail on the hazards addressed, the goal and objective addressed, the priority rating, the lead agency responsible for implementation, potential funding sources for the action, a projected implementation timeline, and the 2020 status and comments on this status for actions that were carried forward from the 2015 plan.

Table 3.2 – Mitigation Action Plan, Chatham County

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Lead Agency / Department	Potential Funding Source	Implementation Timeline	2020 Status	2020 Implementation Status Comments
Prevention									
P-1	Relocate fiber cable supporting all county facilities to below ground	All	4.1	Low	CEMA/County Facilities	BRIC, HMGP	2023	Carried Forward	Unable to secure funding
P-2	Prioritize the critical facilities for the purpose of an engineering study. Undertake engineering study to evaluate critical facilities, including cultural and historical facilities, for safe room needs.	All	1.1	Low	CEMA	HMGP; BRIC; Federal Grants	2020	Carry Forward	Unable to implement the engineering study
P-3	Communications Coverage: The radio network has known coverage issues on the southwest side of Wilmington island and the southern end of Tybee island.	All	4.1	High	ICS	HMGP, CIP, BRIC	2022	Carry Forward	Not able to solve the problem including funding to support the project
P-4	Purchase and install Bypass Pumps (estimated cost $1million)	Flooding, Hurricane, Coastal Storm, Severe Weather	1.1	High	Public Works	HMGP, CIP, BRIC	2022	Carry Forward	Revised
P-5	Replace the current tide gate	Flooding, Hurricane, Coastal Storm	1.1	High	Public Works	HMGP, CIP, BRIC	2022	Carry Forward	No funding to replace the tide gate
P-6	Update Canal System	Flooding, Hurricane, Coastal Storm, Severe Weather	1.1	High	Engineering/Public Works	HMGP, CIP, BRIC	2022	Carry Forward	Capital improvement project did not get implemented
P-7	Flood Mitigation for areas with poor drainage	Flooding, Hurricane, Coastal Storm, Severe Weather	1.1	High	Engineering/Public Works	HMGP, CIP, BRIC	2022	Carry Forward	Revised
Property Protection									
PP-1	Harden roof, windows, doors, and rooftop mechanical units at County critical facilities and critical workforce shelters.	All	1.1	Moderate	CEMA	BRIC; HMGP	2022	Carry Forward	No grant funding available
PP-2	Harden doors, windows, skylight, storage buildings and hangers at Chatham County Mosquito Control.	All	1.1	High	County Mosquito Control	BRIC; HMGP CIP	2022	Carry Forward	Pending current HazMit funding right now
PP-3	Anchor membrane roof with mechanical fastening system in order to compartmentalize roof at Chatham County Mosquito Control Building.	All	1.1	Low	County Mosquito Control	BRIC; HMGP; Federal Grants	2022	Carry Forward	No grant funding available
PP-4	Anchor HVAC units	All	1.1	Moderate	County Facilities	BRIC; HMGP; Federal Grants; CIP	2021-2022	Carry Forward	Revised
PP-5	Replace windows (if needed) and install hurricane shutters on critical facilities	All	1.1	Moderate	County Facilities/CEMA	BRIC; HMGP; Federal Grants; Local Funds	2022-2023	Carry Forward	Revised
PP-6	Construct housing to provide wind and debris protection for fuel pumps at Chatham County Mosquito Control Building.	All	1.1	Moderate	County Facilities	BRIC; HMGP	2020-2021	Carry Forward	No grant funding available
PP-7	Cut back trees in close proximity to County Facilities	All	1.1	Low	County Facilities	BRIC; HMGP	2020-2025	Carry Forward	Revised
PP-8	Work with utility departments and companies to inspect and remove trees that, if damaged, would threaten utility infrastructure and critical facilities.	High Winds, Hurricane, Tornado, Thunderstorm	1.1	Low	County Engineering; Public Works; CEMA	Local Staff Time	2021-2022	Carry Forward	Some trees have been removed but others remain
PP-9	Construct safe rooms as recommended by the engineering study on critical facilities.	All	1.1	Moderate	CEMA; Engineering	BRIC; HMGP; Federal Grants	2023-2025	Carry Forward	No grant funding available
PP-10	Elevate lift stations above the base flood elevation (BFE) including electrical components.	Flood	1.1	Moderate	Public Works; County Parks; Engineering	HMP; BRIC; FMA	2023	Carry Forward	No grant funding available

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Lead Agency / Department	Potential Funding Source	Implementation Timeline	2020 Status	2020 Implementation Status Comments
PP-11	Utilize vehicle barriers at the judicial courthouse.	Terrorism	1.1	Low	County Facilities	DHS; Local Funds	2022	Carry Forward	Will work with Sheriff's department to find resources to implement
PP-12	Reinforce cooling tower and roof on the Old County Courthouse located at 124 Bull Street.	Hurricane, High Winds, Thunderstorm, Tornado	1.1	Moderate	County Facilities	Local Funds	2023	Carry Forward	Needs to be added to the operating budget
PP-13	Anchor and harden membrane roof with mechanical fastening system in order to compartmentalize roof at Chatham County Annex, eliminate the vent leak, as well as securing HVAC.	Hurricane, High Winds, Thunderstorm, Tornado	1.1	High	County Facilities	Local Funds / SPLOST	2020	Carry Forward	Needs to be added to the priority list for action
PP-14	Protect generator at CNT Building through construction of housing and/or relocation.	All	1.1	Moderate	County Facilities	Local Funds; CIP	2023-2025	Carry Forward	Reprioritize on CIP list
PP-15	Determine and/or construct safe room in the Administrative Building at the Chatham County Mosquito Control Building.	All	1.1	Low	County Mosquito Control	BRIC; HMGP; Federal Grants	2022-2023	Carry Forward	Not able to secure funding
PP-16	Add HVAC stands at CNT Building.	Flood	1.1	Low	County Facilities; CNT Department	Local Funds	2022	Carry Forward	Prioritize funding to implement
PP-18	Add a vehicle barrier at the CNT Building.	All	1.1	Moderate	County Facilities	DHS; Local Funds	2022	Carry Forward	Will work with Sheriff's department to find resources to implement
PP-19	Institute security measures for exposed pipelines.	All	1.1	Low	County Public Works	Local Funds and Staff Time	2021	Carry Forward	Not able to develop plan for this project
PP-20	Raise the elevation of McQueens Trail.	Flooding, Coastal Storm, Hurricane, High Tides	1.1	Moderate	County Parks and Rec./ Engineering	HMGP, CIP, BRIC	2022	Carry Forward	No funding to accomplish this project
PP-21	Hurricane shutters or window protection at both facilities (St. Joe's/Candler hospital) Replace the existing windows to hurricane rated windows (estimated cost 350,000).	Hurricane, High Winds, Thunderstorm, Tornado	1.1	High	St. Joseph's / Candler Hospital (1st floor windows and 2nd floor outpatient)	HMGP	2023-2024	Carry Forward	Working to secure funding for this project
PP-22	Elevate Facility Electrical Equipment at St. Joseph's Hospital. Elevate facility electrical equipment in the basement to prevent water intrusion during a flood. (estimated cost 850,000)	Flooding	1.1	High	St. Joseph's / Candler Hospital Boiler Room	HMGP	2023-2024	Carry Forward	Working to secure funding for this project
PP-23	Purchase and Install Shutters for Fire Stations	Hurricane, High Winds, Thunderstorm, Tornado	1.1	Moderate	CES	HMGP	2022	Carry Forward	Working to secure funding for this project
PP-24	Replace garage doors that do not currently meet wind code.	Hurricane, High Winds, Thunderstorm, Tornado	1.1	Moderate	CES	HMGP	2022	Carry Forward	Working to secure funding for this project
PP-25	Acquire or elevate or mitigate properties prone to flooding. If properties are acquired, they could be demolished and land preserved as open space.	Flooding, Coastal Storm, Hurricane, High Tides	1.2 & 3.1	High	CC Engineering	HMGP/FMA	2020-2025	Carry Forward	Working to secure funding for this project
PP-26	Replace A/C Louvers in mechanical rooms (Estimated cost 100,000)	Hurricane, High Winds, Thunderstorm, Tornado	1.1	High	Candler Hospital (Plant Operations)	HMGP, BRIC	2023-2024	Carry Forward	Working to secure funding for this project
PP-27	Replace patient tower roofs because current roofs cannot handle the amount of rain and winds a hurricane produces (Estimated cost 400,000)	Hurricane, High Winds, Rainwater Flooding, Storm Surge, Thunderstorm, Tornado	1.1	High	St. Joseph's Hospital (Plant Operations)	HMGP, BRIC	2023-2024	Carry Forward	No grant funding to support this project
PP-28	Replace the windows in the patient tower (Estimated cost 2.1 million)	Hurricane, High Winds, Rainwater Flooding, Storm Surge, Thunderstorm, Tornado	1.1	High	Candler Hospital (Plant Operations)	HMGP, BRIC	2023-2024	Carry Forward	No grant funding to support this project
PP-29	Update lightning protection on the building structure to protect the building electrical systems (estimated cost 308,000).	Severe Weather	1.1	High	Candler Hospital (Plant Operations) Roof Top	HMGP, BRIC	2023-2024	Carry Forward	No grant funding to support this project

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Lead Agency / Department	Potential Funding Source	Implementation Timeline	2020 Status	2020 Implementation Status Comments
PP-30	Conduct and engineering study to determine the actions that would best mitigate the threat of coastal flooding from astronomical and tropical events on the Skidaway Marine Science campus of the University of Georgia on Skidaway Island ($40,000)	Flood	1.1	High	UGA-Skidaway Institute	HMGP	2023	Carry Forward	No grant funding to support this project
PP-31	Add sensors and related equipment to determine vulnerability of areas to flooding and other natural hazards	Flood, Hurricane, Sea Level Rise	3.1	Medium	CEMA, Engineering	Local Funds, State/Federal grants	2020	New	
PP-32	Elevate or dry floodproof components or systems vulnerable to flood damage	Flood	1.1	High	Engineering/Public Works	Local Funds, State grants, HMGP	2020	New	
PP-33	Southeast Quadrant Stormwater Drainage Improvements: Stormwater Mitigation - Develop the SEQ in such a way as to capture stormwater runoff for the developed area, mitigate flooding in low-lying areas of the SEQ, and manage stormwater flow into Pipemakers Canal.	Flood, Hurricane, Sea Level Rise, Severe Weather	3.1	High	Savannah Airport Commission	HMGP	2020-2021	New	
PP-34	Conduct a structural study of critical facilities to assess wind and hurricane rating and identify need, methods and cost to harden facilities.	Hurricane, Severe Weather, Tornado	1.1	High	CES	HMGP	2020	New	
PP-35	Harden critical facilities based on structural study.	Hurricane, Severe Weather, Tornado	1.1	High	CES	HMGP	2020	New	
PP-36	Elevate or dry floodproof components, systems and/or structures vulnerable to flood damage	Flood	1.1	High	SCCPSS	Local Funds, State grants, HMGP	2021	New	
PP-37	Harden roof, windows, doors and rooftop units for critical facilities	All	1.1	Moderate	SCCPSS	Local Funds, State grants, HMGP	2022	New	
Natural Resource Protection									
NRP-1	Promote the acquisition by conservation organizations of flood areas for community green space.	Flood	1.3	Low	CEMA; MPC; County Engineering	Local Staff Time	2023	Carry Forward	No funding to accomplish this project
Emergency Services									
ES-1	Purchase and install generator connections for critical facilities	All	1.1	Low	County Facilities	Local Funds; CIP	2020-2025	Carry Forward	Revised
ES-2	Portable generators for critical facilities	All	4.1	High	County Facilities	Local Funds; CIP	2021	New	
ES-3	Conduct yearly workshops related to FEMA hazard mitigation grant programs, including FMA, HMGP, BRIC, SRL, and RFC.	All	3.1	Moderate	CEMA	HMGP 5%	2023	Carry Forward	Working to secure funding for this project
ES-4	Generators purchased and installed for all critical facilities.	All	1.1	Moderate	CEMA	HMGP 5%	2023	Carry Forward	Working to secure funding for this project
ES-5	Conduct hazardous material transportation accident training, response, and recovery exercises with appropriate agencies.	Hazardous Materials Incident	4.1	Moderate	CEMA	Local Funds; Federal and State Grants	2022	Carry forward	Working to secure funding for this project
ES-6	Replace Generator at Sheriff's Office	All	1.1	High	Sheriff's Office	HMGP, CIP, BRIC	2022	Carry Forward	Working to secure funding for this project
ES-7	Add an emergency generator and all components for the Home Health Building. (estimated cost 142,500).	All	1.1	High	Candler Hospital Home Health Building	HMGP	2023-2024	Carry forward	Working to secure funding for this project
ES-8	Add a second emergency generator and all components including a fuel tank to the data center for redundancy (estimated cost 130,000).	All	1.1	High	Candler Hospital Data Center	HMGP	2023-2024	Carry forward	Working to secure funding for this project
ES-9	Adding emergency generator and all components, including upgrading paralleling gear in order to support one of the existing chillers. (estimated cost 562,000).	All	1.1	High	Candler Hospital Boiler Room	HMGP	2023-2024	Carry forward	Working to secure funding for this project

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Lead Agency / Department	Potential Funding Source	Implementation Timeline	2020 Status	2020 Implementation Status Comments
ES-10	Purchase and Install Generators for 12 Critical Facilities	All	1.1	High	CES	HMGP	2023	Carry Forward	Working to secure funding for this project
ES-11	Replace the existing generator with a 1000KW Diesel Generator	All	1.1	High	Savannah Airport Commission	HMGP	2020-2021	New	
ES-12	Purchase backup portable 1000KW Diesel Generator	All	4.1	Moderate	Savannah Airport Commission	HMGP	2020-2021	New	
ES-13	Purchase and install generator quick connects and transfer switches for critical facilities	All	1.1	Moderate	Savannah Airport Commission	HMGP, General Fund	2021	New	
ES-14	Portable generators for critical facilities	All	4.1	High	SCCPSS	Local Funds; CIP	2021	New	
ES-15	Purchase and install generator quick connects and transfer switches for critical facilities	All	1.1	High	SCCPSS	HMGP, General Fund	2021	New	
ES-16	Generators for critical facilities	All	1.1	Moderate	SCCPSS	HMGP, General Fund	2021	New	
Public Education & Awareness									
PEA-1	Conduct public forums to provide mitigation information and all hazards preparedness information.	All	2.2	Low	CEMA	Local Funds; HMGP 5%	2022	Carry forward	Working to secure funding for this project
PEA-2	Disseminate survey/questionnaire and collect information from business, industry, educational, historical, and cultural institutions regarding their questions and needs. Provide informational brochures for distribution explaining flooding safety and storm surge procedures and mitigation actions that can be undertaken by the institutions.	Flood, Hurricane	2.2	Low	CEMA	Local Funds; HMGP 5%	2023	Carry forward	Working to secure funding for this project
PEA-3	Provide all hazards outreach via various outreach methods (print, tv, radio, social media, etc.)	All	2.2	Low	CEMA	Local Funds; HMGP 5%	2022	Carry forward	Revised
PEA-4	Host/support a hazardous materials clean-up day to appropriately dispose of dangerous household chemicals.	Hazardous Materials Incident	2.2	Moderate	CEMA	Local Funds	2022	Carry forward	Working to secure funding for this project
PEA-5	Provide informational brochures for distribution explaining terrorism and tornado safety procedures and mitigation actions that can be undertaken by business, industry, educational, historical, and cultural institutions.	Terror Threat; Tornado	2.2	Low	CEMA	Local Funds; HMGP 5%	2022	Carry forward	Working to secure funding for this project
PEA-6	Encourage residents to purchase NOAA weather radios and explore opportunities to make weather radios available to low-income residents.	All	2.1	Moderate	CEMA; County Engineering	Local Staff Time	2021	Carry forward	Working to secure funding for this project
PEA-7	Provide outreach to the Hispanic members of the community regarding evacuation.	Hurricane	2.2	Moderate	CEMA	HMGP 5%; Local Staff Time	2022	Carry forward	Working to secure funding for this project

Table 3.3 – Mitigation Action Plan, Bloomingdale

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Lead Agency / Department	Potential Funding Source	Implementation Timeline	2020 Status	2020 Implementation Status Comments
					Property Protection				
PP-1	Harden roof, windows, doors and rooftop units for critical facilities	All	1.1	Moderate	City Administration	BRIC; HMGP	2020	Carry Forward	Revised to include all critical facilities.
PP-2	Anchor HVAC units and Storage Tanks	Flood, Hurricane	1.1	High	City Administration	HMGP, Local Funds	2021	New	
PP-3	Acquire or elevate properties prone to flooding	Flood, Hurricane	1.1	Moderate	City Administration	HMGP, Local Funds	2020	New	
PP-4	Elevate or dry floodproof components or systems vulnerable to flood damage	Flood, Hurricane	1.1	High	City Administration	HMGP, Local Funds	2020	New	
					Structural Projects				
SP-1	Construct and/or improve drainage systems to alleviate drainage issues	Flood, Thunderstorms	1.1	Moderate	City Public Works	Local Funds	2020-2025	New	
					Emergency Services				
ES-1	Fixed site generators for critical facilities	All	1.1	High	City Administration	HMGP, Local Funds	2020-2025	New	
ES-2	Portable generators for critical facilities	All	1.1	High	City Administration	HMGP, Local Funds	2020-2025	Carry Forward	Revised to include all critical facilities. Incomplete due to lack of funding.
ES-3	Purchase and install generator quick connects and transfer switches for critical facilities	All	1.1	High	City Administration	HMGP, Local Funds	2020-2025	New	
					Public Education and Awareness				
PEA-1	Increase public education and awareness utilizing an all-hazards approach in the City via various outreach methods (print, tv, radio, social media, etc.)	All	2.2	High	City Administration	Local Funds	2020	New	

Table 3.4 – Mitigation Action Plan, Garden City

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Lead Agency / Department	Potential Funding Source	Implementation Timeline	2020 Status	2020 Implementation Status Comments
Prevention									
P-1	Revise and adopt Garden City Local Design Manual and flood damage prevention ordinance to higher regulatory and design standards.	Flood	3.1	High	Planning and Zoning Dept.	Local Funds	2021	Carry Forward	Revised. Part of CRS program - mtg in Feb
Property Protection									
PP-1	Harden roof, windows, doors and rooftop units for critical facilities	All	1.1	Moderate	Administration	HMGP; BRIC	2022	Carry Forward	Revised
PP-2	Relocate Fire Station 1 located at 116 Main Street out of susceptible flooding area.	Flood	1.1 & 3.1	High	City Administration	Federal grants	2024	Carry Forward	Revised. Station has been remodeled in 2017
PP-3	Upsize, install and/or raise generator at various critical facilities in the City	All	1.1	High	Water/Sewer	HMGP	2022	Carry Forward	*NEW POST MATTHEW
PP-4	Raise lift stations out of floodplain	Flood	1.1	High	Water/Sewer	HGMP	2022	Carry Forward	*NEW POST MATTHEW
PP-5	Purchase and install bypass pumps	Flood, Hurricane	1.1	Moderate	Public Works	Local Funds	2022	New	
PP-6	Anchor HVAC units and Storage Tanks	All	1.1	Moderate	Public Works	Local Funds	2021	New	
PP-7	Acquire or elevate properties prone to flooding	Flood, Hurricane	1.2 & 3.1	Moderate	Public Works	Local Funds, State grants, HMGP	2025	New	
PP-8	Elevate or dry floodproof components or systems vulnerable to flood damage	Flood, Hurricane	1.1	High	Public Works	Local, State grants, HMGP	2020	New	
PP-9	Install sewer access covers for instances where elevation is not feasible or practical	Flood, Hurricane	1.1	Moderate	Water/Sewer	Local Funds	2022	New	
PP-10	Seal exposed portions of well systems or raise the elevation of the well head to prevent infiltration of flood waters	Flood, Hurricane	1.1	Moderate	Water/Sewer	Local Funds, State grants, HMGP	2022	New	
Structural Projects									
SP-1	Construct and/or improve drainage systems to alleviate drainage issues.	Flood, Hurricane	3.1	Moderate	Public Works	General fund, grants	2021	Carry Forward	Revised
SP-2	Raise all manholes city-wide within the 100-year floodplain	Flood	1.1	High	Public Works	HGMP	2022	Carry Forward	*NEW POST MATTHEW
Emergency Services									
ES-1	Generators for critical facilities	All	1.1	Moderate	City Administration	HMGP, General Fund	2021	New	
ES-2	Portable generators for critical facilities	All	1.1	Moderate	City Administration	HMGP, General Fund	2021	New	
ES-3	Purchase and install generator quick connects and transfer switches for critical facilities	All	1.1	Moderate	City Administration	HMGP, General Fund	2021	New	
ES-4	Conduct hazardous materials training, response and recovery exercises	All	4.1	Moderate	City Administration	General Fund	2020	New	
Public Education and Awareness									
PEA-1	Increase public education and awareness utilizing an all-hazards approach in the City via various outreach methods (print, tv, radio, social media, etc.)	All	2.2	High	City Administration	Local Funds	2020	Carry Forward	Revised. FD has been doing this- recurring outreach
PEA-2	Host/support a hazardous materials clean-up day to appropriately dispose of dangerous household chemicals	Hazardous Materials Incident	2.1	Moderate	City Administration	Local Funds, Grants	2021	New	
PEA-3	Provide outreach to vulnerable populations via various outreach methods (print, tv, radio, social media, etc.)	All	2.2	High	City Administration	Local Funds	2020	New	

Table 3.5 – Mitigation Action Plan, Pooler

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Lead Agency / Department	Potential Funding Source	Implementation Timeline	2020 Status	2020 Implementation Status Comments
Property Protection									
PP-1	Purchase and install bypass pumps	Flood, Hurricane	1.1	Moderate	Public Works	Local Funds	2020	New	
PP-2	Protect sewer infrastructure from infiltration from flood water and related debris.	Flood, Hurricane	1.1	Moderate	City Administration	FMA; HMGP	2023	Carry Forward	No update.
PP-3	Protect primary transportation route and maintain groundwater flow at Canal Bridge.	All	1.1	Moderate	City Administration	HMGP; FMA	2020	Carry Forward	Updated Implementation Date
PP-4	Install safe room in critical facilities in the City's jurisdiction.	Tornado, Severe Weather	1.1	Moderate	City Administration	BRIC	2023	Carry Forward	No update
PP-5	Harden roof, windows, doors and rooftop units for critical facilities	All	1.1	Moderate	City Administration	HMGP; BRIC	2022	New	
PP-6	Anchor HVAC units and Storage Tanks	All	1.1	Moderate	Public Works	Local Funds	2020	New	
PP-7	Acquire or elevate properties prone to flooding	Flood, Hurricane	1.2 & 3.1	Moderate	Public Works	HMGP	2025	New	
PP-8	Elevate or dry floodproof components or systems vulnerable to flood damage	Flood, Hurricane	1.1	Moderate	Public Works	Local funds, State grants, HMGP	2020	New	
Structural Projects									
SP-1	Construct and/or improve drainage systems to alleviate drainage issues.	Flood, Hurricane, Sea Level Rise	3.1	Moderate	Public Works	General fund, grants	2023	New	
Emergency Services									
ES-1	Generators for critical facilities	All	1.1	Moderate	City Administration	HMGP, General Fund	2022	New	
ES-2	Portable generators for critical facilities	All	1.1	Moderate	City Administration	HMGP, General Fund	2022	New	
ES-3	Purchase and install generator quick connects and transfer switches for critical facilities	All	1.1	Moderate	City Administration	HMGP, General Fund	2022	New	

Table 3.6 – Mitigation Action Plan, Port Wentworth

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Lead Agency / Department	Potential Funding Source	Implementation Timeline	2020 Status	2020 Implementation Status Comments
Property Protection									
PP-1	Elevate Lift Stations	Flood, Hurricane, Sea Level Rise	1.1	Moderate	City Administration / Public Works	HMGP	2022	Carried Forward	Revised. Evaluating remaining 16 lift stations for upgrades
PP-2	Structural Hardening for Critical Facilities	All	1.1	Moderate	City Administration	HMGP, General Fund, SPLOST	2021	New	
Structural Projects									
SP-1	Drainage projects for stormwater runoff	Flood, Hurricane, Sea Level Rise	1.1 & 3.1	Moderate	City Administration / Public Works	SPLOST	2020-2024	Carried Forward	Revised.
SP-2	Renovate the sanitary sewage system on the south end of Port Wentworth	Flood	1.1	Moderate	City Administration / Public Works	SPLOST	2023	Carried Forward	Drainage projects Mobley Park I, II, & III and Bonney Bridge Drainage Projects I & II. Engineering completed, acquiring right of way
Emergency Services									
ES-1	Generators for critical facilities	All	1.1	Moderate	City Administration	HMGP, General Fund	2021	New	
ES-2	Portable generators for critical facilities	All	1.1	Moderate	City Administration	HMGP, General Fund	2021	New	
ES-3	Purchase and install generator quick connects and transfer switches for critical facilities	All	1.1	Moderate	City Administration	HMGP, General Fund	2021	New	
Public Education and Awareness									
PEA-1	Increase public education and awareness within the City by including flyers in the water bills and providing documents in the public buildings	All	2.2	Moderate	City Administration	Local Funds	2020-2025	Carried Forward	Ongoing project, requires constant updating

Table 3.7 – Mitigation Action Plan, Savannah

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Lead Agency / Department	Potential Funding Source	Implementation Timeline	2020 Status	2020 Implementation Status Comments
Prevention									
P-1	Modify Flood Damage Prevention Ordinance (FDPO) to include LiMWA criteria.	Flood	1.2	High	City Development Services	City Operating Budget	2020	Carried Forward	Under review. FDPO has been reviewed by City attorney. Awaiting final Local Flood Study decision
P-2	Study potential storm surge effects on cemeteries	Storm Surge	3.2	Moderate	Cemeteries	Local funds (CIP); estimated cost $30,000	2024	Carried Forward	No progress as funds are not available locally at this time. Funding for this project is expected to be available in 2024.
P-3	2019: Update the CRS Flood Mitigation Plan (FMP 510), Repetitive Loss Area Analysis (RLAA) and Natural Floodplain Functions Plan	Flood	1.3 & 3.1	High	City Development Services	FEMA Pre-Disaster Mitigation Grant; estimated cost $50,000	2020	New	Sending out a RFP to complete the work.
P-4	Acquire, elevate or mitigate properties prone to flooding	Flood	3.1	High	City Development Services	HMGP	2025	New	
P-5	Relocate fiber cable supporting all City facilities to below ground	All	1.1	Moderate	Public Works	Local, State grant, HMGP	2025	New	
Property Protection									
PP-1	Coordinate with the Chatham County Resource Protection Commission (RPC) to acquire lands vulnerable to flooding through SPLOST funds and other grant opportunities.	Flood	1.2 & 3.1	Moderate	Development Services	SPLOST Funding	2023	Carried Forward	Waiting for info from Tom McDonald
PP-2	Harden roof, windows, doors, and/or rooftop units for critical facilities	Tornado, Thunderstorm, Hurricane, High Winds	1.1	Low	Civic Center	BRIC, HMGP	2025	Carried Forward	Revised. Mitigation actions for the Civic Center should remain on the list as the new arena isn't built yet. This should not be addressed until the City decides what the fate of the Civic Center is. Low priority.
PP-3	Install signage in train trestle area at Anderson Street to indicate water depth	Flood	3.1	Moderate	Mobility Services	HMGP	2021-2022	Carried Forward	This needs to be amended to Henry Street, not Anderson Street per Stephen Henry at Mobility Services and Tom McDonald at Development Services. Need to identify a more appropriate lead agency for signage.
PP-4	Elevate or dry flood proof components or systems vulnerable to flood damage	Flood	1.1	High	Public Works	Local, State grant, HMGP	2020	New	
Structural Projects									
SP-1	Construct and/or improve drainage systems to alleviate drainage issues	Flood	3.1	Moderate	Stormwater Department	City SPLOST funding	2023	Carried Forward	Revised from: Drainage Project at Luisville Road and Hwy 17. 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, and Placentia basin. Notes from existing list: "Let's plan to add the following in accordance with the information provided by Roger and the request by the CM for projects in the 5th District: 51st between Hopkins and Edwin St, Champion St and Tumor St, Upson and Vassar St, Springfield South Basin Hydraulic Modeling, Widening of the Springfield Canal and expansion of the existing Pump Station in Springfield North Basin (existing Springfield Stormwater pump station under the Talmadge Bridge)."
Emergency Services									
ES-1	Emergency power to Wells, Lift Stations and Pumps (portable generators). Estimated size ranges from 60 kw and 100 kw	All	1.1	High	Public Works	HMGP, General Fund	2022	Carried Forward	NEW POST-MATTHEW: Various sites across the city to include both water wells and lift stations. Citywide implementation approx. 240 lift stations and 50 water wells. Approximate down time due to Matthew was 96 hours.
ES-2	Portable generators for fixed critical facilities	All	4.1	High	Public Works	HMGP, General Fund	2022	New	
ES-3	Purchase and install generator quick connects and transfer switches for critical facilities	All	1.1	High	Public Works	HMGP, General Fund	2022	New	

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Lead Agency / Department	Potential Funding Source	Implementation Timeline	2020 Status	2020 Implementation Status Comments
Public Education and Awareness									
PEA-1	Remove building code/insurance disconnect through education of builders/realtors and modification of technical review checklist (cross-check NFIP/Insurance/Ordinance/IBC). Provide documents that clearly display the difference with the 2018 International Building Codes, NFIP 44 CFR, and Local Flood Damage Prevention Ordnance.	Flood	2.2 & 3.1	High	City Development Services	City Operating Budget	2021	Carried Forward	Revised. Need to continue to have open communications with the Development community. Need to ensure smart floodplain construction is relayed to the development community through workshops and information fliers.
PEA-2	Implement FEMA's High Water Mark Initiative	Flood	2.2	Moderate	City Development Services	City Operating Budget	2023	Carried Forward	On 1/10/2016 at the Coastal Georgia CRS User Group meeting in City of Savannah conference room, Lynn Keating of FEMA presented a webinar of FEMA's High Water Mark Initiative. (HWMI). Waiting on personal and funds
PEA-3	Purchase a Ward's® Stormwater Floodplain Simulation System and cargo case.	Flood	2.2	Moderate	City Development Services	BRIC; estimated cost $3,000	2021	New	This system helps students understand the critical role that floodplains play in the life of a watershed and the impact of unplanned development and human activity in key areas through innovative hands-on simulations. The City will have the model in the school system and at neighborhood or other community meetings
PEA-4	Provide outreach to vulnerable populations via various outreach methods (print, tv, radio, social media, etc.)	All	2.1 & 2.2	High	City Development Services	Local funds	2020	New	

Table 3.8 – Mitigation Action Plan, Thunderbolt

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Lead Agency / Department	Potential Funding Source	Implementation Timeline	2020 Status	2020 Implementation Status Comments
Prevention									
P-1	Increase the area for debris following a storm with an MOU with the Board of Education to use the fields at Johnson High School as an additional area.	All	3.1	Moderate	Town of Thunderbolt Public Safety and Public Works	Staff time	2022	Carry Forward	New-Currently, the Town only has one location for debris at Cesaroni ball field and this would great expand their capacity.
P-2	Conduct a full inspection of the Thunderbolt bridge to ensure that it will be open during any event or extreme threat.	All	1.1 & 3.1	High	Town of Thunderbolt Public Safety/GA DOT	BRIC; HMGP	2022	Carry Forward	New-If the drawbridge on President Street is unavailable, the Thunderbolt Bridge is the only means of access from the islands to the mainland including access to hospitals and critical care facilities.
P-3	Assist and coordinate with Tara Nursing Home for evacuation of patients in the event of a threat.	All	4.1	Moderate	Town Administration / CEMA	Local Staff Time	2022	Carry Forward	New-The Nursing Home has a plan in place; however, the Town's involvement would be to ensure that the removal and transition of patients would be a smooth as possible.
Property Protection									
PP-1	Upgrade and Elevate Lift Station	Flood	1.1	High	Town of Thunderbolt Public Works	HMGP; CIP	2023	Carried Forward	Revised. *New After Irma - Lift station was inundated with water during hurricane Irma.
PP-2	Purchase and install bypass pumps	Flood, Hurricane	1.1	Moderate	Public Works	Local Funds	2020	New	
PP-3	Purchase Vac Truck for Stormwater	Flooding, Hurricane, Coastal Storm	1.1	Moderate	Town of Thunderbolt Public Works	HMGP 5%	2022	Carried Forward	Revised. *NEW POST MATTHEW: The public works department will utilize the vac truck to mitigate flooding issues.
PP-4	Retrofit Community Park Piers, Decks and Pavilions	Flood	1.1	Low	Town of Thunderbolt Public Works	HMGP; CIP	2022	Carried Forward	Revised. *New After Irma Thomson Park was inundated with water during Hurricane Irma; would like to retrofit the pier, deck and pavilion with higher impact/flood resistant materials.
PP-5	Anchor HVAC units and Storage Tanks	All	1.1	Moderate	Town of Thunderbolt Public Works	Local funds	2020	New	
PP-6	Acquire or elevate properties prone to flooding	Flood	1.2 & 3.1	Moderate	Town of Thunderbolt Public Works	HMGP	2025	New	
PP-7	Elevate or dry floodproof components or systems vulnerable to flood damage	Flood	1.1	High	Town of Thunderbolt Public Works	Local funds, State grants, HMGP	2020	New	
Structural Projects									
SP-1	Construct and/or improve drainage systems to alleviate drainage issues.	Flood	3.1	Moderate	Public Works	HMGP	2021	New	
Emergency Services									
ES-1	Generators for critical facilities	All	1.1	Moderate	Town of Thunderbolt Public Works	HMGP, General Fund	2021	New	
ES-2	Portable generators for critical facilities	All	1.1	Moderate	Town of Thunderbolt Public Works	HMGP, General Fund	2021	New	
ES-3	Purchase and install generator quick connects and transfer switches for critical facilities	All	1.1	Moderate	Town of Thunderbolt Public Works	HMGP, General Fund	2021	New	

Table 3.9 – Mitigation Action Plan, Tybee Island

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Lead Agency / Department	Potential Funding Source	Implementation Timeline	2020 Status	2020 Implementation Status Comments
Property Protection									
PP-1	Acquire or elevate or mitigate repetitive loss and other flood properties.	Flood	1.2 & 3.1	Moderate	City Administration	HMGP; BRIC; SRL; FMA	2020	Carried Forward	Revised
PP-2	Purchase and install generators at 12 sewer lift stations (1609 Strand Ave., 1664 2nd Avenue, 407 14th Street, 1002 2nd Avenue, 300 4th Avenue, 101 Jones Avenue, 102 S. Campbell, 1275 Soloman Avenue, 101 Fort Street, 25 Gulick Street, 8 Rosewood Avenue and 111 Lewis Avenue. .)	All	1.1	High	City Water and Sewer Department	Existing Budget; HMGP	2020	Carried Forward	
PP-3	Purchase and Install Stabilizers for the water and sewer department.	All	1.1	High	City Water and Sewer Department	Existing Budget; HMGP	2020	Carried Forward	
PP-4	Purchase and Install storm shutters for the Old Marine Science Center	Tornado, Storm Surge, Hurricane, Severe Weather	1.1	High	City Water and Sewer Department	Existing Budget; HMGP	2020	Carried Forward	Revised
PP-5	Purchase and Install Shutters for the Guard House.	Tornado, Storm Surge, Hurricane, Severe Weather	1.1	High	City Water and Sewer Department	Existing Budget; HMGP	2020	Carried Forward	
PP-6	Construct community safe room	Tornado, Severe Weather	1.1	Low	City Administration	HMGP	2025	New	
PP-7	Anchor HVAC units and Storage Tanks	All	1.1	Moderate	City Water and Sewer Department	Local funds	2020	New	
PP-8	Elevate or dry floodproof components or systems vulnerable to flood damage	All	1.1	High	City Water and Sewer Department	Local funds, State Grants, HMGP	2020	New	
Natural Resource Protection									
NRP-1	Protect existing sand dunes.	Tornado, Storm Surge, Hurricane, Severe Weather, Erosion, Sea Level Rise	1.3 & 3.1	Moderate	City Administration	BRIC; FMA; HMGP	2022	Carried Forward	
NRP-2	Build additional sand dunes.	Tornado, Storm Surge, Hurricane, Severe Weather, Erosion, Sea Level Rise	1.3 & 3.1	Moderate	City Administration	Local Funds	2023	Carried Forward	
Structural Projects									
SP-1	Remove submerged hazards from North Beach (pieces of old jetties protrude at low tide but are covered at high tide creating a safety hazard for swimmers).	Storm Surge, Hurricane	3.1	Moderate	City Administration	Local Funds	2022	Carried Forward	
SP-2	Construct flood prevention barriers	Flood	3.1	Moderate	City Administration	Local Funds	2025	New	
SP-3	Construct and/or improve drainage systems to alleviate drainage issues	Flood, Severe Weather, Hurricane	3.1	Moderate	City Administration	Local Funds	2025	New	
Emergency Services									
ES-1	Fixed site generators for critical facilities	All	1.1	High	City Administration	Local Funds	2021	New	
ES-2	Portable generators for critical facilities	All	1.1	High	City Administration	Local Funds	2021	New	
ES-3	Purchase and install generator quick connects and transfer switches for critical facilities	All	1.1	High	City Administration	Local Funds	2021	New	
Public Education & Awareness									
PEA-1	Increase public education and awareness utilizing an all-hazards approach in the City via various outreach methods (print, tv, radio, social media, etc.)	All	2.2	High	City Administration	Local Funds	2020	New	

4 Capability Assessment

This section discusses the capability of the Chatham County planning area to implement hazard mitigation activities. It consists of the following subsections:

4.1 Overview
4.2 Capability Assessment Findings
4.3 Conclusions on Local Capability

Table 4.1 – Section 4 Summary of Updates

2015 Plan Section Number	2020 Plan Section and Description of Changes
(Annex H)	**Section 4 – Capability Assessment**
	4.1 Overview – This section is a new section that was previously documented as a separate annex to the plan.
	4.2 Capability Assessment Findings – This section includes minor revisions from the previous Capability Annex and was updated with new HMPC input.
	4.3 Conclusions on Local Capability – Scoring was removed to place emphasis on identifying gaps and areas for improvement across all jurisdictions.

4.1 OVERVIEW

The purpose of conducting a capability assessment is to determine the ability of a local jurisdiction to implement a comprehensive mitigation strategy, and to identify potential opportunities for establishing or enhancing specific mitigation policies, programs, or projects. As in any planning process, it is important to try to establish which goals, objectives, and actions are feasible, based on an understanding of the organizational capacity of those agencies or departments tasked with their implementation. A capability assessment helps to determine which mitigation actions are practical and likely to be implemented over time given a local government's planning and regulatory framework, level of administrative and technical support, amount of fiscal resources, and current political climate.

The capability assessment completed for the Chatham County planning area serves as a critical planning step toward developing an effective mitigation strategy. Coupled with the risk assessment, the capability assessment helps identify and target effective goals, objectives, and mitigation actions that are realistically achievable under given local conditions.

To facilitate the inventory and analysis of local government capabilities within the planning area, a detailed Local Capability Self-Assessment worksheet was distributed to members of the HMPC after the first planning committee meeting. The survey questionnaire requested information on a variety of "capability indicators" such as existing local plans, policies, programs, or ordinances that contribute to and/or hinder the region's ability to implement hazard mitigation actions. Other indicators included information related to the region's fiscal, administrative, and technical capabilities, such as access to local budgetary and personnel resources for mitigation purposes, and existing education and outreach programs that can be used to promote mitigation. Communities were also asked to comment on the current political climate with respect to hazard mitigation, an important consideration for any local planning or decision-making process.

At a minimum, the survey results provide an extensive and consolidated inventory of existing local plans, ordinances, programs, and resources in place or under development. With this information, inferences can be made about the overall effect on hazard loss reduction in each community.

4.2 CAPABILITY ASSESSMENT FINDINGS

The findings of the capability assessment are summarized in this plan to provide insight into the relevant capacity of Chatham County and its incorporated municipalities to implement hazard mitigation activities. Information is based upon input provided by community representatives on the HMPC through a local capability self-assessment as well as research conducted by the planning consultant. Some jurisdiction representatives did not provide capability information for their communities; in these cases, information was based on research and on the Chatham County Pre-Disaster Multi-Jurisdictional Hazard Mitigation Plan.

4.2.1 Planning and Regulatory Capability

Planning and regulatory capability is based on the implementation of plans, ordinances, and programs that demonstrate a local jurisdiction's commitment to guiding and managing growth, development, and redevelopment in a responsible manner, while maintaining the general welfare of the community. It includes emergency response and mitigation planning, comprehensive land use planning, and transportation planning. Regulatory capability also includes the enforcement of zoning or subdivision ordinances and building codes that regulate how land is developed and structures are built, as well as protecting environmental, historic, and cultural resources in the community. Although some conflicts can arise, these planning initiatives generally present significant opportunities to integrate hazard mitigation principles and practices into the local decision-making process.

This assessment is designed to provide a general overview of the key planning and regulatory tools or programs in place or under development for the Chatham County planning area, along with their potential effect on loss reduction. This information will help identify opportunities to address gaps, weaknesses, or conflicts with other initiatives and integrate the implementation of this plan with existing planning mechanisms where appropriate.

Table 4.2 provides a summary of the relevant local plans, ordinances, and programs already in place or under development for the Chatham County planning area. A checkmark (✓) indicates that the given item is currently in place and being implemented. An asterisk (*) indicates that the given item is currently being developed for future implementation. A plus sign (+) indicates that a jurisdiction is covered for that item under a county-implemented version. Each of these local plans, ordinances, and programs should be considered available mechanisms for incorporating the requirements of the Hazard Mitigation Plan.

Table 4.2 – Relevant Plans, Ordinances, and Programs

Jurisdiction	Hazard Mitigation Plan	Comprehensive Land Use Plan	Floodplain Management Plan	Open Space Management Plan	Stormwater Management Plan	Emergency Operations Plan	SARA Title III Plan	Radiological Emergency Plan	Continuity of Operations Plan	Evacuation Plan	Disaster Recovery Plan	Capital Improvements Plan	Economic Development Plan	Historic Preservation Plan	Transportation Plan	Flood Damage Prevention Ordinance	Zoning Ordinance	Subdivision Ordinance	Site Plan Review Requirements	Unified Development Ordinance	Post-Disaster Redevelopment Ordinance	Building Code	Fire Code	Community Wildfire Protection Plan	National Flood Insurance Program	Community Rating System
Chatham County	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	*	✓	✓	✓	*	✓	✓	✓	✓			✓	✓	✓	✓	✓
City of Bloomingdale	✓	✓	✓	✓	✓	✓			+	✓	+	✓	✓			✓	✓	✓	✓			✓	✓	+	✓	✓
City of Garden City	✓	✓		✓	✓	✓			✓	+	+	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓	+	✓	✓
City of Pooler	✓	✓		✓	✓	✓			✓	✓	✓	✓	*			✓	✓	✓	✓			✓	✓	+	✓	✓
City of Port Wentworth	✓	✓		✓	✓	✓			✓	✓	✓					✓	✓	✓	✓			✓	✓	+	✓	
City of Savannah	✓	✓	✓	✓	*	✓	*	*	✓	+	*		✓	✓	✓	✓	✓	✓	✓	*		✓	✓	+	✓	✓
Town of Thunderbolt	✓	✓	✓	✓	✓	✓			+	✓	✓	✓				✓	✓	✓	✓			✓	✓	+	✓	✓
City of Tybee Island	✓	✓		✓	✓	+			+	✓	+			✓	✓	✓	✓	✓	✓			✓	✓	+	✓	✓
Town of Vernonburg	✓	+	+	+	+	+			+	+	+					+						+		+	✓	✓

Source: Data provided by HMPC

4.2.1.1 Emergency Management

Hazard mitigation is widely recognized as one of the four primary phases of emergency management, as is shown in Figure 4.1. Mitigation is interconnected with all other phases and is an essential component of effective preparedness, response, and recovery. Opportunities to reduce potential losses through mitigation practices are most often implemented before a disaster event, such as through the elevation of flood-prone structures or by regular enforcement of policies that regulate development. However, mitigation opportunities can also be identified during immediate preparedness or response activities, such as installing storm shutters in advance of a hurricane. Furthermore, incorporating mitigation during the long-term recovery and redevelopment process following a disaster event is what enables a community to become more resilient.

Figure 4.1 – The Four Phases of Emergency Management

Planning for each phase is a critical part of a comprehensive emergency management program and a key to the successful implementation of hazard mitigation actions.

Hazard Mitigation Plan

A hazard mitigation plan is a community's blueprint for how it intends to reduce the impact of natural, and in some cases human-caused, hazards on people and the built environment. The essential elements of a hazard mitigation plan include a risk assessment, capability assessment, and mitigation strategy.

All participating jurisdictions in this regional planning effort have previously been covered by the 2015 Chatham County Pre-Disaster Multi-Jurisdictional Hazard Mitigation Plan.

Disaster Recovery Plan

A disaster recovery plan serves to guide the physical, social, environmental, and economic recovery and reconstruction process following a disaster event. In many instances, hazard mitigation principles and practices are incorporated into local disaster recovery plans with the intent of capitalizing on opportunities to break the cycle of repetitive disaster losses. Disaster recovery plans can also lead to the preparation of disaster redevelopment policies and ordinances to be enacted following a hazard event. Based on the 2015 capability findings and current HMPC input, all jurisdictions have a disaster recovery plan, are currently writing one, or are covered under the County's plan.

Emergency Operations Plan

An emergency operations plan outlines the responsibilities of different departments and how resources will be deployed during and following an emergency or disaster. All jurisdictions have an emergency operation plan or are covered under the County's plan.

Continuity of Operations Plan

A continuity of operations plan establishes a chain of command, line of succession, and plans for backup or alternate emergency facilities in case of an extreme emergency or disaster event. Per the 2015 capability findings, all jurisdictions have a continuity of operations plan or are covered under the County's plan.

4.2.1.2 General Planning

The implementation of hazard mitigation activities often involves agencies and individuals beyond the emergency management profession. Stakeholders may include local planners, public works officials, economic development specialists, and others. In many instances, concurrent local planning efforts will help to achieve or complement hazard mitigation goals, even though they may not be designed as such.

Comprehensive/General Plan

A comprehensive land use plan, or general plan, establishes the overall vision for what a community wants to be and serves as a guide for future governmental decision making. Typically, a comprehensive plan contains sections on demographic conditions, land use, transportation elements, and community facilities. Given the broad nature of the plan and its regulatory standing in many communities, the integration of hazard mitigation measures into the comprehensive plan can enhance the likelihood of achieving risk reduction goals, objectives, and actions. All jurisdictions have a comprehensive or general plan.

Capital Improvements Plan

A Capital Improvements Plan (CIP) guides the scheduling of spending on public improvements. A CIP can serve as an important mechanism for guiding future development away from identified hazard areas. Limiting public spending in hazardous areas is one of the most effective long-term mitigation actions available to local governments. The majority of the participating jurisdictions have a CIP. However, for those without a CIP, this may be a gap to address in support of future mitigation efforts.

Historic Preservation Plan

A historic preservation plan is intended to preserve historic structures or districts within a community. An often-overlooked aspect of the historic preservation plan is the assessment of buildings and sites located in areas subject to natural hazards, and the identification of ways to reduce future damages. This may involve retrofitting or relocation techniques that account for the need to protect buildings that do not meet current building standards or are within a historic district that cannot easily be relocated out of harm's way. Though a specific document has not been developed, several jurisdictions plan for historic preservation, including efforts undertaken by the MPC for Chatham County and Savannah.

Zoning Ordinance

Zoning represents the primary means by which land use is controlled by local governments. As part of a community's police power, zoning is used to protect the public health, safety, and welfare of those in a given jurisdiction that maintains zoning authority. A zoning ordinance is the mechanism through which zoning is typically implemented. Since zoning regulations enable municipal governments to limit the type

and density of development, a zoning ordinance can serve as a powerful tool when applied in identified hazard areas. All jurisdictions have a zoning ordinance or are covered under the County's ordinance.

Subdivision Ordinance

A subdivision ordinance is intended to regulate the development of residential, commercial, industrial, or other uses, including associated public infrastructure, as land is subdivided into buildable lots for sale or future development. Subdivision design that accounts for natural hazards can dramatically reduce the exposure of future development. Most of the jurisdictions have a subdivision ordinance.

Building Codes, Permitting, and Inspections

Building codes regulate construction standards. In many communities, permits and inspections are required for new construction. Decisions regarding the adoption of building codes (that account for hazard risk), the type of permitting process required both before and after a disaster, and the enforcement of inspection protocols all affect the level of hazard risk faced by a community. All of the jurisdictions have a building code or are covered under the County's ordinance.

The adoption and enforcement of building codes by local jurisdictions is routinely assessed through the Building Code Effectiveness Grading Schedule (BCEGS) program, developed by the Insurance Services Office, Inc. (ISO). The results of BCEGS assessments are routinely provided to ISO's member private insurance companies, which in turn may offer ratings credits for new buildings constructed in communities with strong BCEGS classifications. The expectation is that communities with well-enforced, up-to-date codes should experience fewer disaster-related losses, and as a result should have lower insurance rates.

4.2.1.3 Floodplain Management

Flooding represents the greatest natural hazard facing the nation, yet the tools available to reduce the impacts associated with flooding are among the most developed when compared to other hazard-specific mitigation techniques. In addition to approaches that cut across hazards such as education, outreach, and the training of local officials, the National Flood Insurance Program (NFIP) contains specific regulatory measures that enable government officials to determine where and how growth occurs relative to flood hazards. Participation in the NFIP is voluntary for local governments; however, program participation is strongly encouraged by FEMA as a first step for implementing and sustaining an effective hazard mitigation program.

In order for a county or municipality to participate in the NFIP, they must adopt a local flood damage prevention ordinance that requires jurisdictions to follow established minimum building standards in the floodplain. These standards require that all new buildings and substantial improvements to existing buildings be protected from damage by a 100-year flood event, and that new development in the floodplain not exacerbate existing flood problems or increase damage to other properties.

A key service provided by the NFIP is the mapping of identified flood hazard areas. Once completed, the Flood Insurance Rate Maps (FIRMs) are used to assess flood hazard risk, regulate construction practices, and set flood insurance rates. FIRMs are an important source of information to educate residents, government officials, and the private sector about the likelihood of flooding in their community.

Table 4.3 provides NFIP policy and claim information for each participating jurisdiction in the Chatham County planning area.

All jurisdictions in the region participate in the NFIP and will continue to comply with all required provisions of the program. Floodplain management is managed through zoning ordinances, building code restrictions, and the county building inspection program. The jurisdictions will coordinate with NCEM and

FEMA to develop maps and regulations related to Special Flood Hazard Areas within their jurisdictional boundaries and, through a consistent monitoring process, will design and improve their floodplain management program in a way that reduces the risk of flooding to people and property.

Community Rating System

An additional indicator of floodplain management capability is active participation in the Community Rating System (CRS). The CRS is an incentive-based program that encourages communities to undertake defined flood mitigation activities that go beyond the minimum requirements of the NFIP. Each of the CRS mitigation activities is assigned a point value. As a community earns points and reaches identified thresholds, they can apply for an improved CRS class. Class ratings, which range from 10 to 1 and increase on 500-point increments, are tied to flood insurance premium reductions. Every class improvement earns an additional 5 percent discount for NFIP policyholders, with a starting discount of 5 percent for Class 9 communities and a maximum possible discount of 45 percent for Class 1 communities.

Community participation in the CRS is voluntary. Any community that is in full compliance with the rules and regulations of the NFIP may apply to FEMA for a CRS classification better than class 10. The CRS application process has been greatly simplified over the past several years, based on community comments intended to make the CRS more user friendly, and extensive technical assistance available for communities who request it. Chatham County, Bloomingdale, Garden City, Pooler, Savannah, Thunderbolt, and Tybee Island participate in the CRS.

Table 4.3 – NFIP Policy and Claim Information

Jurisdiction	Date Joined NFIP	Current Effective Map Date	NFIP Policies in Force	Insurance in Force	Written Premium in Force	Closed Losses	Total Payments
Chatham County	08/01/80	08/16/18	16,348	$4,866,344,100	$8,738,380	1,324	$26,795,459
City of Bloomingdale	07/02/81	08/16/18	192	$43,618,500	$149,732	21	$293,341
City of Garden City	03/16/73	08/16/18	274	$80,711,900	$290,852	35	$1,421,876
City of Pooler	09/30/81	08/16/18	1,779	$542,758,500	$942,009	50	$770,223
City of Port Wentworth	03/16/73	08/16/18	228	$60,057,100	$124,186	36	$316,325
City of Savannah	05/21/71	08/16/18	6,848	$1,918,808,900	$4,146,973	1,764	$32,565,277
Town of Thunderbolt	07/02/87	08/16/18	333	$87,580,900	$278,414	28	$888,072
City of Tybee Island	01/14/72	08/16/18	2,721	$678,482,800	$2,315,050	532	$14,059,650
Town of Vernonburg	07/27/73	08/16/18	34	$10,678,000	$22,327	5	$570,683
TOTAL PLAN	-	-	**28,757**	**$8,289,040,700**	**$17,007,923**	**3,790**	**$77,680,906**

Source: FEMA NFIP Policy Statistics, NCEM Risk Management Tool

Floodplain Management Plan

A floodplain management plan (or a flood mitigation plan) provides a framework for action regarding corrective and preventative measures to reduce flood-related impacts. Several jurisdictions have a floodplain management plan or are included under the County's plan.

Open Space Management Plan

An open space management plan is designed to preserve, protect, and restore largely undeveloped lands in their natural state, and to expand or connect areas in the public domain such as parks, greenways, and other outdoor recreation areas. In many instances open space management practices are consistent with the goals of reducing hazard losses, such as the preservation of wetlands or other flood-prone areas in their natural state in perpetuity. All the jurisdictions have an open space plan or are covered under the County's plan.

Stormwater Management Plan

A stormwater management plan is designed to address flooding associated with stormwater runoff. The stormwater management plan is typically focused on design and construction measures that are intended to reduce the impact of more frequently occurring minor urban flooding. All the jurisdictions have a stormwater management plan or are covered under the County's plan.

4.2.2 Administrative and Technical Capability

The ability of a local government to develop and implement mitigation projects, policies, and programs is directly tied to its ability to direct staff time and resources for that purpose. Administrative capability can be evaluated by determining how mitigation-related activities are assigned to local departments and if there are adequate personnel resources to complete these activities. The degree of intergovernmental coordination among departments will also affect administrative capability for the implementation and success of proposed mitigation activities.

Technical capability can generally be evaluated by assessing the level of knowledge and technical expertise of local government employees, such as personnel skilled in using geographic information systems (GIS) to analyze and assess community hazard vulnerability. The Local Capability Self-Assessment was used to capture information on administrative and technical capability through the identification of available staff and personnel resources.

Table 4.4 provides a summary of the Local Capability Self-Assessment results for the region regarding relevant staff and personnel resources. A checkmark (✓) indicates the presence of a staff member(s) in that jurisdiction with the specified knowledge or skill.

Table 4.4 – Relevant Staff/Personnel Resources

Jurisdiction	Planners with knowledge of land development and land management practices	Engineers or professionals trained in construction practices related to buildings and/or infrastructure	Planners or engineers with an understanding of natural and/or human-caused hazards	Building Official	Emergency manager	Floodplain manager	Land surveyors	Scientist familiar with the hazards of the community	Staff with education or expertise to assess the community vulnerability to hazards	Personnel skilled in Geographic Information Systems (GIS) and/or HAZUS	Resource development staff or grant writers	Maintenance programs to reduce risk	Warning systems/services	Mutual Aid Agreements
Chatham County	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓
City of Bloomingdale	✓	✓	✓	✓	✓	✓			✓	✓		✓	✓	✓
City of Garden City	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓
City of Pooler		✓		✓	✓	✓			✓	✓			✓	
City of Port Wentworth		✓		✓	✓	✓			✓	✓			✓	
City of Savannah	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓
Town of Thunderbolt	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓
City of Tybee Island		✓		✓	✓	✓			✓	✓	✓		✓	
Town of Vernonburg		✓		✓	✓	✓			✓	✓			✓	

Source: Local Capability Assessment Survey

4.2.3 Fiscal Capability

The ability of a local government to implement mitigation actions is often dependent on the amount of money available. This may take the form of outside grant funding awards or locally based revenue and financing. The costs associated with mitigation policy and project implementation vary widely. In some cases, policies are tied primarily to staff time or administrative costs associated with the creation and monitoring of a given program. In other cases, direct expenses are linked to an actual project such as the acquisition of flood-prone houses, which can require a substantial commitment from local, state, and federal funding sources.

Many participating jurisdictions have access to capital improvement programing, community development block grants, special purpose taxes, or fees. Additionally, general obligation, revenue, or special tax bonds may be available. Jurisdictions with limited fiscal capability should seek opportunities to hire grant writers or resource development staff, create local funding sources such as stormwater utility fees, or seek alternate funding sources.

4.2.4 Education and Outreach Capability

This type of local capability refers to education and outreach programs and methods already in place that could be used to implement mitigation activities and communicate hazard-related information.

All jurisdictions have ongoing public education or information programs. These could include but are not limited to responsible water use, fire safety, household preparedness, and environmental education. Additionally, some jurisdictions have school programs, StormReady certification, and local groups or non-profit organizations that focus on environmental protection or emergency preparedness.

4.2.5 Mitigation Capability

This type of local capability refers to ongoing property mitigation and efforts to acquire and implement mitigation projects with federal funding by the communities in this plan.

All participating jurisdictions apply for mitigation grant funding but only a few jurisdictions perform reconstruction projects, perform building elevations, or perform acquisitions.

4.2.6 Political Capability

One of the most difficult capabilities to evaluate involves the political will of a jurisdiction to enact meaningful policies and projects designed to reduce the impact of future hazard events. Hazard mitigation may not be a local priority, or it may conflict with or impede other goals of the community, such as growth and economic development. Therefore, the local political climate must be considered in designing mitigation strategies, as it could be the most difficult hurdle to overcome in accomplishing their adoption and implementation.

Most participating jurisdictions indicated that political leaders are willing to implement mitigation measures. However, fiscal limitations were noted as a limitation for garnering political support.

4.3 CONCLUSIONS ON LOCAL CAPABILITY

As previously discussed, one of the reasons for conducting a capability assessment is to examine local capabilities to detect any existing gaps or weaknesses within ongoing government activities that could hinder proposed mitigation activities and possibly exacerbate community hazard vulnerability. These gaps or weaknesses have been identified. The participating jurisdictions used the capability assessment as part of the basis for the mitigation actions where each jurisdiction addresses their ability to expand on and improve their existing capabilities.

All of the jurisdictions are capable of implementing hazard mitigation efforts to varying degrees. Participating communities may refer to this assessment to identify gaps and opportunities for improvement in order to increase local capability to implement mitigation projects.

The conclusions of the Risk Assessment and Capability Assessment serve as the foundation for the development of a meaningful hazard mitigation strategy. During the process of identifying specific mitigation actions to pursue, the HMPC considered not only each jurisdiction's level of hazard risk, but also their existing capability to minimize or eliminate that risk.

5 Plan Implementation and Maintenance

This section outlines the process for adoption, implementation, monitoring, and maintenance of the plan. This section contains the following subsections:

- 5.1 Adoption
- 5.2 Implementation
- 5.3 Monitoring and Maintenance

Table 5.1 – Section 5 Summary of Updates

2015 Plan Section Number	2020 Plan Section and Description of Changes
Section 5 – Executing the Plan	**Section 5 – Plan Implementation and Maintenance**
I. Implementation Action Plan	5.1 Adoption – This section has been added to document adoption resolutions within the plan.
II. Evaluation, Monitoring, Updating	5.2 Implementation – Revisions have been made but the original intent has been maintained.
III. Plan Update and Maintenance	5.3 Monitoring and Maintenance – Revisions have been made but the original intent has been maintained.

5.1 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 all participating jurisdictions, 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. Each participating jurisdiction will adopt the Hazard Mitigation Plan by passing a resolution. Copies of these adoption resolutions will be provided on the following pages.

Placeholder for Chatham County adoption

Placeholder for Bloomingdale adoption

Placeholder for Garden City adoption

Placeholder for Pooler adoption

Placeholder for Port Wentworth adoption

Placeholder for Savannah adoption

Placeholder for Thunderbolt adoption

Placeholder for Tybee Island adoption

Placeholder for Vernonburg adoption

5.2 IMPLEMENTATION

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.

Once adopted, the plan must be implemented to be effective. While this plan contains many worthwhile actions, each participating jurisdiction will need to decide which action(s) to undertake first. The priority assigned to the actions in the planning process and funding availability will affect that decision. Low or no-cost actions are often the easiest way to demonstrate progress toward successful plan implementation.

An important implementation mechanism that is highly effective and low-cost is incorporation of the Hazard Mitigation Plan recommendations and their underlying principles into other plans and mechanisms, such as the jurisdictions' comprehensive plans. The participating jurisdictions already implement policies and programs to reduce losses to life and property from hazards. This plan builds upon the momentum developed through previous planning efforts 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 costlier 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 County and participating jurisdictions will be positioned 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

The Georgia Emergency Management Act of 1981 authorizes local emergency management agencies such as CEMA to conduct emergency management activities for the County. CEMA was authorized to develop and implement a plan for mitigation actions by Local Government Resolution for Emergency Management executed by the Chatham County Commission and local municipalities on 25 April 2000.

Each jurisdiction participating in this plan (Chatham County, Bloomingdale, Garden City, Pooler, Port Wentworth, Savannah, Thunderbolt, Tybee Island, and Vernonburg) is responsible for plan implementation within their jurisdiction. Elected officials, officials appointed to head County, City, and Town departments, and community staff are charged with leading 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.

Role of HMPC in Implementation, Monitoring and Maintenance

With adoption of this plan, each jurisdiction, in coordination with CEMA, will be responsible for the plan implementation and maintenance. As such, each jurisdiction agrees to continue its relationship with the HMPC and:

- Act as a forum for mitigation issues;
- Disseminate mitigation ideas and activities to all participants;
- Pursue the implementation of high-priority, low/no-cost recommended actions;
- Ensure 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 local governing body; and
- Inform and solicit input from the public.

The HMPC's primary duty moving forward is to see the plan successfully carried out and report to each local governing body, CEMA, GEMA, and the public on the status of plan implementation and mitigation opportunities. Other duties include reviewing and promoting mitigation proposals, considering stakeholder concerns about mitigation, passing concerns on to appropriate entities, and posting relevant information on local websites (and others as appropriate).

5.3 MONITORING AND 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.

Maintenance Schedule

CEMA is responsible for initiating plan reviews. In order to monitor progress and update the mitigation strategies identified in the action plan, the HMPC will revisit this plan annually and following a hazard event. CEMA 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 2020, the next plan update for Chatham County will occur in 2025.

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.

To best evaluate any changes in vulnerability as a result of plan implementation, CEMA will review this plan annually and reach out to the municipalities bi-annually to determine changes in their implementation progress and results from implementation. CEMA will regularly review the status of implementation of action items in the plan. Monitoring activities will consist of:

- Soliciting and reviewing reports every other year from participating municipalities and the County regarding status of implementation of action items from the plan.
- Tracking progress of sources of improved or revised data for use in subsequent plan updates no less frequently than biennially.
- Preparing a report of the status of implementation of action items from the plan and the availability of improved or revised data.

At the jurisdictional level, a representative from the responsible office identified in each mitigation action will be responsible for tracking and reporting on an annual basis to the jurisdictional lead on action status and providing input on whether the action as implemented meets the defined objectives and is likely to be successful in reducing vulnerabilities. If the action does not meet identified objectives, the jurisdictional lead will determine what additional measures may be implemented, and an assigned individual will be responsible for defining action scope, implementing the action, monitoring success of the action, and documenting any required modifications for the plan. An annual mitigation action status report should be prepared indicating if projects have been:

- Scoped and/or documented for FEMA or other grant applications;
- Submitted for FEMA or other funding programs;
- Approved or denied for FEMA or other funding;
- Documented for funding by other means (e.g. municipal capital improvement plans);
- Under construction or in-progress; or
- Completed, and if so, whether hazard conditions have occurred such that avoided losses can be documented.

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 local governing bodies. In keeping with the five-year update process, the HMPC or similar committee will convene public meetings to solicit public input on the plan and its routine maintenance and the final product will be adopted by local governing bodies.

Maintenance Criteria

The criteria recommended in 44 CFR 201 and 206 will be utilized in reviewing and updating the plan during annual reviews in preparation for the five-year update. More specifically, annual reviews will monitor changes to 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 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 Hazard 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.

Incorporation into Existing Planning Mechanisms

Another important implementation mechanism that is highly effective and low-cost is incorporation of the goals, objectives, and recommendations of this plan into other plans and policies. 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. The 2015 plan was made available to county, municipal, and area planning organizations, including the Chatham County-Savannah Metropolitan Planning Commission (MPC) to serve as a foundation for planning and mitigation efforts. Most notably, the 2015 plan was reviewed and referenced during the development of the 2016 update of the Chatham County-Savannah Comprehensive Plan. This plan update will be presented to the agencies, writers, consultants and/or committees responsible for comprehensive and land use planning, capital improvements planning, emergency operations planning, and other related documents for their use in integrating this plan into future planning, preparedness, and mitigation efforts.

This plan update 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 such as, comprehensive plans, floodplain management ordinances, emergency operations plans, and building codes and other ordinances. Those HMPC members 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 9.1 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 Hazard Mitigation Plan.

Continued Public Involvement

Continued public involvement is imperative to the overall success of the plan's implementation. The annual review process provides an opportunity to solicit participation from new and existing stakeholders, 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 invitation to designated committee meetings, web postings, press releases to local media, and gathering of public comment, similar to the process used in the development of this plan.

When the HMPC reconvenes for the five-year 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 HMPC will be responsible for coordinating the activities necessary to involve the greater public, including 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.

Annex A Chatham County Unincorporated Areas

A.1 PLANNING PROCESS

The table below lists the HMPC members who represented Chatham County unincorporated areas and the Town of Vernonburg.

Table A.1 – HMPC Members

Member Name	Title	Agency/Department
Randall Mathews	Emergency Preparedness Manager	Chatham Emergency Management Agency
Michael Whiteaker	Emergency Management Coordinator	Chatham Emergency Management Agency
Chuck Kearns	Chief Executive Officer	Chatham Emergency Services
Wayne Noha	Chief of Engagement and Development	Chatham Emergency Services
Bengie Cowart	Chief of EMS	Chatham Emergency Services
James Vickers	Chief of Fire	Chatham Emergency Services
Phil Coster	Chief Operating Officer	Chatham Emergency Services
Suzanne Cooler	County Engineer	Department of Engineering
Anthony Stephens	Director	Facilities Maintenance
Nick Batey	Director	Department of Information and Communication Services
William Wright	Director	Department of Public Works
Bob Staples	Safety, Security, and Emergency Manager	St. Joseph's Hospital
Melanie Wilson	Executive Director	Metropolitan Planning Commission
Kelly Nilsson	Emergency Management Director	Georgia Southern University
Ulyssess Bryant	Interim Chief of Police	Savannah State University
Justin Pratt	Emergency Management Coordinator	Savannah-Chatham County Public School System
Dustin Hetzel	Emergency Management Coordinator	Savannah Airport Commission
Jimmy Hungerpiller	Superintendent	Vernonburg

A.2 COMMUNITY PROFILE

A.2.1 Overview of the Community

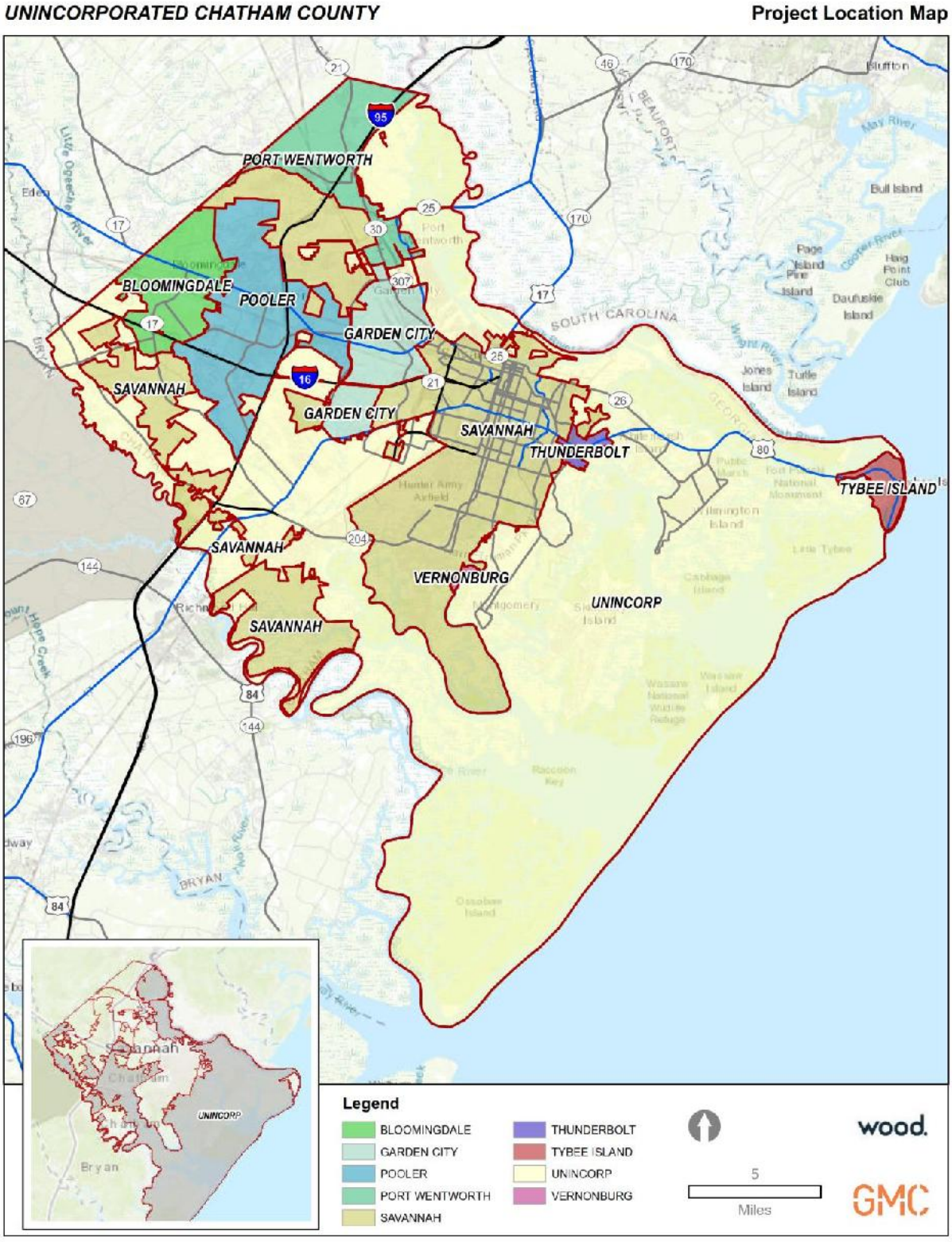
Chatham County is a county in the U.S. state of Georgia and is located on the state's Atlantic coast. The county seat and largest city is Savannah. One of the original counties of Georgia, Chatham County was created February 5, 1777, and is named after William Pitt, 1st Earl of Chatham. Chatham County is the northernmost of Georgia's coastal counties and is bounded by the Savannah River to the north and the Ogeechee River to the south.

Chatham County has a total area of 632 square miles of which 426 square miles are land (67.4%) and 206 square miles (32.6%) are water. Unincorporated Chatham County has a total area of 335 square miles or 214,400 acres.

According to the Chatham County – Savannah Comprehensive Plan (1733-2040) 2016 Update, the unincorporated County had a total population of 92,118 in 2015. Therefore, the Unincorporated County's average population density is approximately 275 people per square mile.

The Location Map below reflects the boundaries of the unincorporated portions of the County and shows its location within the county and in relation to surrounding municipalities.

Figure A.1 – Location Map, Chatham County



A.2.2 Geography and Climate

Please refer to Chatham County Community Profile for a summary of climate for the County.

Portions of Unincorporated Chatham County lie within ten (10) different HUC 12 watersheds as summarized in Table A.2.

Table A.2 – HUC 12 Watersheds

HUC 12 Watershed Name	HUC 12 #
Sterling Creek - Ogeechee River	030602040301
Salt Creek – Little Ogeechee River	030602040203
Vernon River	030602040303
Hardin Canal – Little Ogeechee River	030602040201
Ossabaw Sound – Frontal Atlantic Ocean	030602040304
Wilmington River	030602040101
Casey Canal – Haneys Creek	030602040302
Morgans Bridge – Ogeechee River	030602020605
Outlet Savannah River	030601090307
Pipemakers Canal	030302040202
Ossabow Sound – Atlantic Ocean	030602040305
Wassaw Sound – Atlantic Ocean	030602040103
Wassaw Sound-Frontal Atlantic Ocean	030602040102

Figure A.2 illustrates the HUC-12 drainage basins and drainage features in and around unincorporated Chatham County.

Figure A.2 – HUC12 Drainage Basins, Chatham County

A.2.3 Cultural, Historic and Natural Resources

A.2.3.1 Cultural and Historic Resources

Community Centers in unincorporated Chatham County include:

- Frank G. Murray Community Center at 125 Wilmington Island Road, Savannah, GA 31410
- Lake Mayer Community Center at 1850 Montgomery Crossroads, Savannah, GA 31406
- Tom Triplett Park at 100 Tom Triplett Road, Pooler, GA 31322

A.2.3.2 Chatham County Aquatic Center at 7240 Sallie Mood Drive, Savannah, GA 31406Parks, Preserves, and Conservation

Community Parks in the unincorporated County include

- L Scott Stell at 195 Scott Stell Community Park Savannah, GA 31419
- Lake Mayer at 1850 E. Montgomery Crossroads Savannah, GA 31406
- Mother Mathilda Beasley at 500 E. Broad Street Savannah, GA 31401
- Retha Mae McCoy at 240 Riverview Rd Savannah, GA 31404
- Tom Triplett at 100 Tom Triplett Rd Pooler, GA 31322
- Wilmington Island at Cohen Ave at Walthour Rd Savannah, GA 31410

Nature preserves include:

- Bungard Conservation Area at Basin Rd. Savannah, GA 31419
- Whitemarsh Preserve on Wilmington Island, Savannah, GA 31419
- Frank O Williamson Lake on Sallie Mood Drive Savannah, GA 31406
- Ogeechee Trail on Fort Argyle Road Savannah GA 31419

Multipurpose Trails include:

- McQueen Island Rails to Trails along Hwy. 80 East Savannah, GA 31410
- Robert McCorkle Bike Trail on Wilmington Island, Savannah, GA 31419

A.2.3.3 Natural Resources

Floodplains and Flood Zones

FEMA flood zone designations within the Unincorporated Chatham County are identified in the figure below. The flood hazard areas shown are designated by the Federal Emergency Management Agency (FEMA) and include: Zone A (subject to inundation by the 1% annual-chance flood event with no base flood elevation (BFE) determined), Zone AE (subject to inundation by the 1% annual-chance flood event with BFE determined), Zone VE (subject to inundation by the 1% annual-chance flood event with additional hazards due to storm waves with BFE determined), and Zone X (Moderate Risk areas outside the 1% and inside the 0.2% annual-chance floodplains with no BFE or base flood depths determined and Minimal Risk areas outside the 0.2% annual chance floodplain).

Table A.3 – Flood Zones

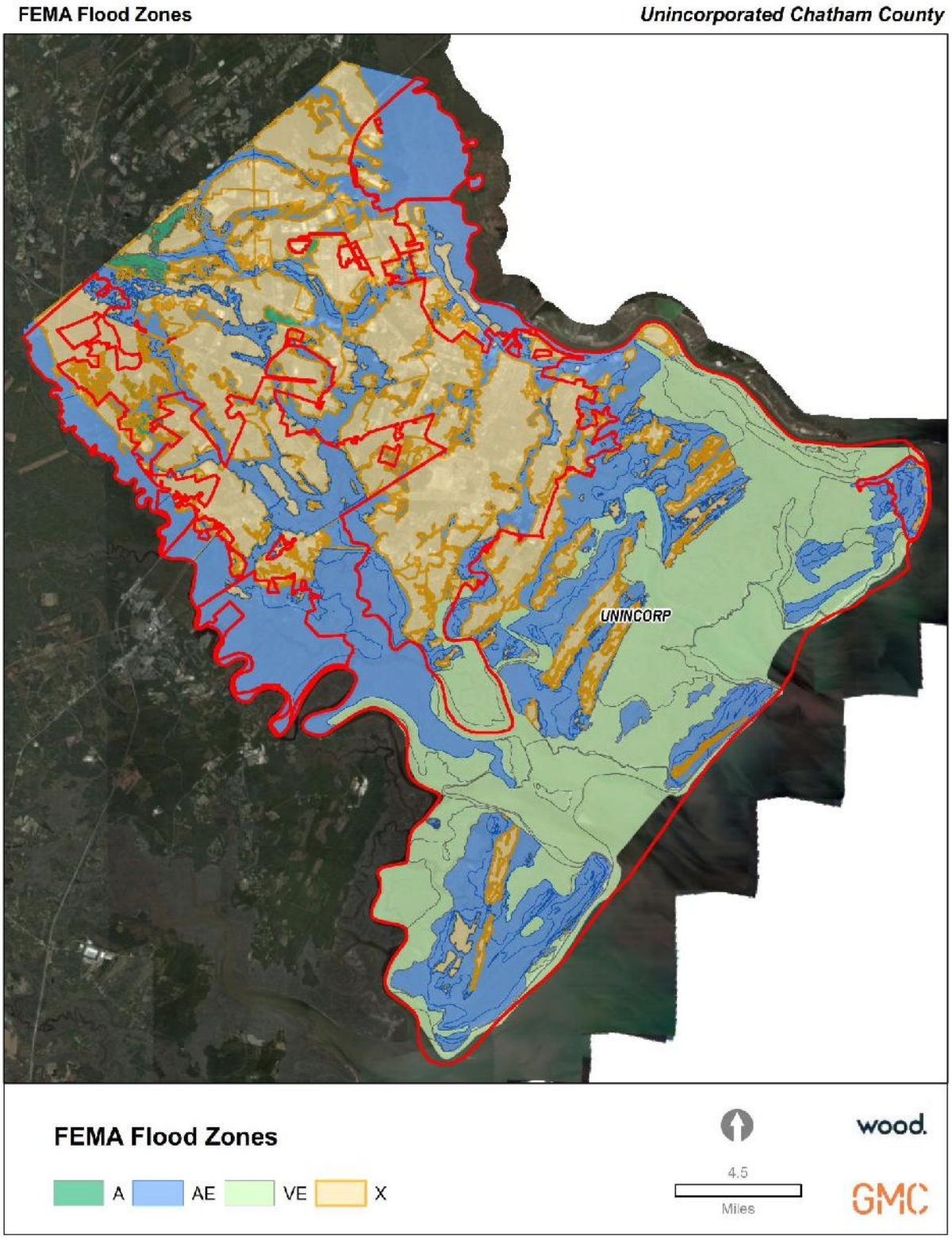
Flood Zone	Area (Acres)	Area (Square Miles)	Percent of County (%)
Outside of Flood Zones / Ocean	4,632	7.24	2.2
AE	85,962	134.3	40.1
A	62	0.10	0.03
VE	81,906	127.9	38.2
X	41,838	65.4	19.5
TOTAL	**214,400**	**335**	**100.0**

Source: FEMA, 2018

According to the 2018 FEMA data, 141.6 square miles of the unincorporated County is located within a 100-year floodplain (Zone AE, A, and VE) which equals about 42 percent of the unincorporated area. An additional 65 square miles are located within moderate or minimal flood hazard areas (19.5 percent). With nearly 42 percent of the area at high risk to flooding in the Special Flood Hazard Area (SFHA), the County should seek ways to balance future development with strategies to preserve sensitive lands and natural drainage features.

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, and the vegetation stabilizes soils during flooding. Natural floodplains in the County include wetland areas and low-lying land along the major rivers in and around the unincorporated County including the Ogeechee River, Little Ogeechee River, Vernon River, Wilmington River, South Channel of the Savannah River, and the Atlantic Ocean. Natural floodplains reduce damage by allowing flood waters to spread out over large areas, aiding infiltration into the ground, reducing flow rates and acting as a flood storage area to reduce downstream peaks. The County should strive to keep floodplain and floodplain waters free of contaminants such as oil, paint, anti-freeze, pesticides, and plastics and other trash. These chemicals and waste materials pollute local waterways, decreasing the water quality that local wildlife and plants depend upon.

Figure A.3 – FEMA Flood Zones, 2018, Chatham County



Source: FEMA 2018 DFIRM

Wetlands

Wetlands benefit the ecosystem by storing, changing, and transmitting surface water and groundwater. Through these processes pollution is removed, nutrients are recycled, groundwater is recharged, and biodiversity is enhanced. Wetland composition varies extensively, with five distinct categories for classification: Estuarine, Lacustrine, Marine, Palustrine, and Riverine systems Based on data from the National Wetland Inventory (NWI) wetlands throughout unincorporated Chatham County are summarized in Table A.4 and Figure A.4.

Table A.4 – Wetland Type

Wetland Type	Area (Acres)	Area (Sq. Miles)	Percent of City
Non-Wetland	86,710	135.5	40.4
Estuarine	101,601	158.8	47.4
Palustrine	23,488	36.7	11.0
Lacustrine	388	0.6	0.2
Marine	188	0.3	0.1
Riverine	2,026	3.2	0.9
TOTAL	**214,400**	**335.0**	**100.0**

Source: National Wetland Inventory

The Palustrine System

The Palustrine (freshwater) system includes all non-tidal wetlands dominated by trees, shrubs, persistent emergent plants, emergent mosses or lichens, and all such wetlands that occur in areas where salinity due to ocean-derived salts is below 0.5%. The Palustrine system is bounded by upland.

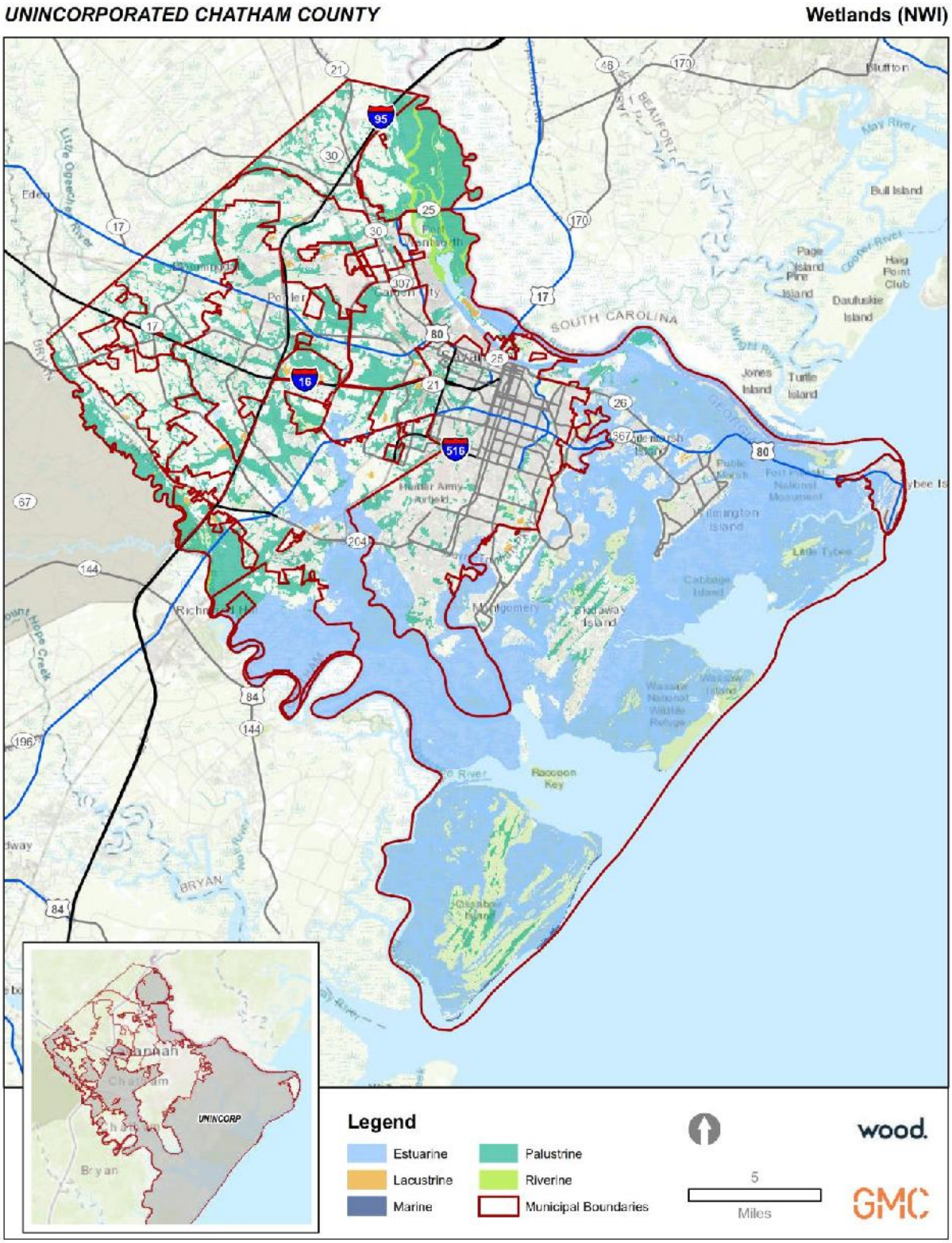
The Estuarine System

The Estuarine system consists of deep-water tidal habitat and adjacent tidal wetlands that are usually semi-enclosed by land but have open, partly obstructed, or sporadic access to the open ocean, and in which ocean water is at least occasionally diluted by freshwater runoff from the land. The Estuarine system extends (1) upstream and landward to where ocean-derived salts measure less than 0.5% during the period of average annual low flow; (2) to an imaginary line closing the mouth of a river, bay, or sound; and (3) to the seaward limit of emergent wetlands, shrubs, or trees where they are not included in (2). It also includes offshore areas of continuously diluted sea water. It contains two sub-systems: subtidal (where the substrate is continuously submerged) and intertidal (where the substrate is exposed and flooded by tides including the associated splash zone).

The Riverine System

The Riverine system includes all wetlands and deep-water habitats contained within a channel with two exceptions: (1) wetlands dominated by trees, shrubs, emergent vegetation, emergent mosses, or lichens, and (2) habitats with water containing ocean-derived salts in excess of 0.5%. The Riverine system is bounded on the landward side by upland, by the channel bank (including natural and man-made levees), or by wetlands dominated by trees, shrubs, emergent vegetation, emergent mosses, or lichens. In braided streams, the system is bounded by the banks forming the outer limits of the depression within which the braiding occurs.

Figure A.4 – Wetland Types, Chatham County



Lacustrine Wetlands

Lacustrine wetlands are large, open, water-dominated systems (e.g. lakes). This definition also applies to modified systems which possess characteristics similar to lacustrine systems (e.g. deep standing or slow-moving waters).

Marine Wetlands

Marine Wetlands are areas exposed to the open ocean. The Marine System consists of the open ocean overlying the continental shelf and the coastline.

A.2.4 History

History for Chatham County is discussed in the Chatham County Community Profile as well as the Community Profiles for other jurisdictions.

A.2.5 Economy

Wages, employment, and major employers are discussed in the Chatham County Community Profile.

A.2.6 Housing

According to the 2013-2017 ACS 5-Year Estimates, there are 39,235 housing units in unincorporated Chatham County, of which 91 percent (35,686) are occupied. Approximately 68.5% (24,448) of occupied units are owner-occupied (31.5% / 11,241 occupied by renters). A high percentage of renters is an indicator of higher pre- and post-disaster vulnerability because, according to Cutter, et al. (2003), renters often do not have the financial resources of homeowners, are more transient, are less likely to have information about or access to recovery aid following a disaster, and are more likely to require temporary shelter following a disaster. Therefore, higher rates of home rentals in the County may indicate that residents are not able to implement certain types of mitigation in their homes.

Of the unincorporated County's owner-occupied housing units, 64.9 percent (15,883) have a mortgage. Most householders (74.6 percent / 26,605) moved into their current homes since the year 2000; 28.7 percent (10,257) moved in between 2000 and 2009, and 34.8 percent (12,401) moved in between 2010 and 2014. 2.3 percent (826) of occupied housing units have no vehicle available to them, which suggests these residents may have difficulty in the event of an evacuation.

The majority (79.4% / 28,359) of housing units in the unincorporated County are detached single family homes. However, 8.0 percent (2,864) of units are mobile homes which can be more vulnerable to certain hazards, such as tornadoes and wind storms, especially if they aren't secured with tie downs.

The County's housing stock is aging, with the majority (77.2% / 27,567) of occupied housing built before 2000. Table H.7 details housing age in the town.

Table A.5 – Housing Age, Chatham County

Year Structure Built	Percent of Occupied Housing	Number of Structures
2014 or later	0.7	239
2010 to 2013	0.1	51
2000 to 2009	26.1	9,303
1980 to 1999	52.7	18,824
1960 to 1979	20.5	7,319
1940 to 1959	5.8	2,053
1939 or earlier	2.4	869

Source: U.S. Census Bureau, American Community Survey 2013-2017 5-Year Estimates

Age can indicate the potential vulnerability of a structure to certain hazards. For example, Chatham County first entered the National Flood Insurance Program in 1980. Therefore, based on housing age estimates at least 26.9 percent of housing in the unincorporated County was built before any floodplain development restrictions were required.

A.2.7 Population

According to the U.S. Census Bureau, the unincorporated County had an estimated population of 96,627 residents in 2017. As of 2017, the unincorporated County's population density was 288 persons per square mile. The table below provides demographic profile data from the 2017 American Community Survey 5-Year Estimates.

Table A.6 – Unincorporated Chatham County Demographic Profile Data, 2017

Demographic	Unincorporated County
Gender/Age	
Male	45,696
Female	47,369
Under 5 Years	5,803
65 Years and Over	15,765
Race/Ethnicity (One Race)	
White	65,546
Black or African American	20,541
American Indian/Alaska Native	247
Asian	2,903
Two or More Races	2,511
Hispanic or Latino[1]	6,187
Education	
High School Graduate or Higher	12,841
Bachelor's Degree or Higher	16,003

Source: U.S. Census Bureau, 2013-2017 American Community Survey 5-Year Estimates
[1]Hispanics may be of any race, so also are included in applicable race categories.

A.2.8 Land Use

Land use data was obtained from the 2016 Update to the Chatham County – Savannah Comprehensive Plan (Comp Plan). The intent of the Comp Plan is to serve as a comprehensive planning document that guides Chatham County's and Savannah's collective growth and development decisions over the next 20 years. The Comp Plan serves both participating communities as a general statement of intent to promote

local goals related to economic development, land use, transportation, housing, quality of life and other related topics.

A.2.9 Existing Land Use

The Unincorporated County includes a total area of 214,400 acres (335 square miles) as calculated from GIS and obtained from the U.S. Census. According to the Chatham County – Savannah Comp Plan, existing land use is summarized in the table below.

Table A.7 – Existing Land Use

Land Use	Area (Acres)	Percent of Unincorporated County (%)
Residential - Single Family	22,167	7.2%
Residential – Multi Family	474	0.2%
Public / Institutional	1,519	0.5%
Commercial – Office	3,353	1.1%
Commercial – Retail	1,335	0.4%
Trans / Com / Utilities	727	0.2%
Agriculture / Forestry	21,241	6.9%
Industry / Light	7,315	2.4%
Industry / Heavy	224	0.1%
Recreation - Active	498	0.2%
Greenspace	188	0.1%
Right-of-Way	3,760	1.2%
Tidal Marsh	85,666	27.8%
Open Water	47,523	15.4%
Undeveloped Land / Other	112,530	36.5%
TOTAL	***308,520*** [(1)]	***100.0%***

(1) 482 square miles

The Chatham County – Savannah Comprehensive Plan shows the total area for unincorporated Chatham County to be 482 square miles which is higher than the 335 square miles used for this report. The difference is likely due to the Comp Plan using an alternate County boundary that extends further east into the ocean and included in the land use categories for Tidal Marsh, Open Water, and/or Undeveloped Land/Other.

A.2.10 Future Land Use

The 2016 Chatham County – Savannah Comprehensive Plan includes a Future Land Use Map (FLUM) that serves as a guide for zoning decisions. The FLUM represents the City's and County's future development policy and is taken into consideration for all zoning requests, local policy reviews, and land development decisions. The FLUM's Future Land Use Categories include those listed below and shown in the following maps.

Table A.8 – Future Land Use Categories

Future Land Use Category	Definition
Downtown	Traditional Central Business District including retail, office, entertainment, institutional, civic, and residential uses.
Downtown Expansion	Areas in close proximity to the Central Business District that are identified for growth.
Traditional Commercial	Business areas in close proximity to downtown having development patterns characteristic of the Planned Town, Streetcar, and Early Automobile eras.
Traditional Neighborhood	Residential areas in close proximity to downtown or in outlying historically settled areas having development patterns characteristic of the Planned Town, Streetcar, and Early Automobile eras.
Civic / Institutional	Areas identified as employment hubs that may consist of office buildings, medical offices, banks, hospitals, and ancillary commercial uses the support the office economy.
Commercial - Neighborhood	Nodal and strip business areas that are within predominately residential areas and are developed at a scale and intensity compatible with adjacent residential uses.
Commercial - Suburban	Business areas supporting shopping centers and corridor commercial uses at a scale and intensity capable of serving regional markets.
Commercial - Regional	Business areas supporting most retail, service, office, and institutional uses.
Commercial - Marine	Land dedicated to marina operations including those ancillary uses that are both marine-related and an integral part of the marina complex.
Industry - Light	Areas supporting warehouses, wholesale facilities, and the manufacturing, assembly or production of parts and products that may require intensive truck traffic and outdoor storage but that do not produce noise, odor, dust, or waterborne contaminants above ambient levels.
Industry - Heavy	Areas supporting uses that are involved in the large-scale production of finished or semi-finished products from raw materials and that may produce noise, odor, dust, and waterborne contaminants measurably above ambient levels.
Residential - General	Areas with a wide range of residential uses including multi-family dwellings, attached dwellings, small lot single-family dwellings at densities greater than 10 units per gross acre.
Residential – Suburban Single Family	Areas identified for single-family detached residential dwellings at a density not to exceed five (5) units per gross acre.
Planned Development	Master planned areas accommodating cluster development, neotraditional development, or mixed residential, commercial, or civic uses.
Planned Campus	Areas designated for research & development, educational, and business campuses, where landscaping, greenspace, open space, and open water area exceeds impervious areas structures and parking lots.
Agriculture / Forestry	Areas principally used for farming, silviculture, dairy or livestock production, and resources extraction.

Future Land Use Category	Definition
Transportation / Communication / Utility	Areas dedicated principally to railroad facilities, airports and similar uses that produce intensive or obtrusive activities that are not readily assimilated into other districts.
Parks / Recreation	Land dedicated to open space that is accessible to the public or land that is dedicated to sports, exercise, or other types of leisure activities.
Conservation	Land that is publicly or privately held and designated for preservation in a natural state or for use for passive recreation.
Conservation - Residential	This category is for back barrier islands that are in private ownership and have uplands exceeding two acres on a contiguous land mass.
Tidal Marsh	Areas of estuarine influence that are inundated by tidal waters on a daily basis and are characterized by spartina (cord grass) habitat.
Transition	Areas having established residential character that due to their arterial location are confronted with potential commercial intrusion.

Figure A.5 – Future Land Use Map – Northwest Quadrant

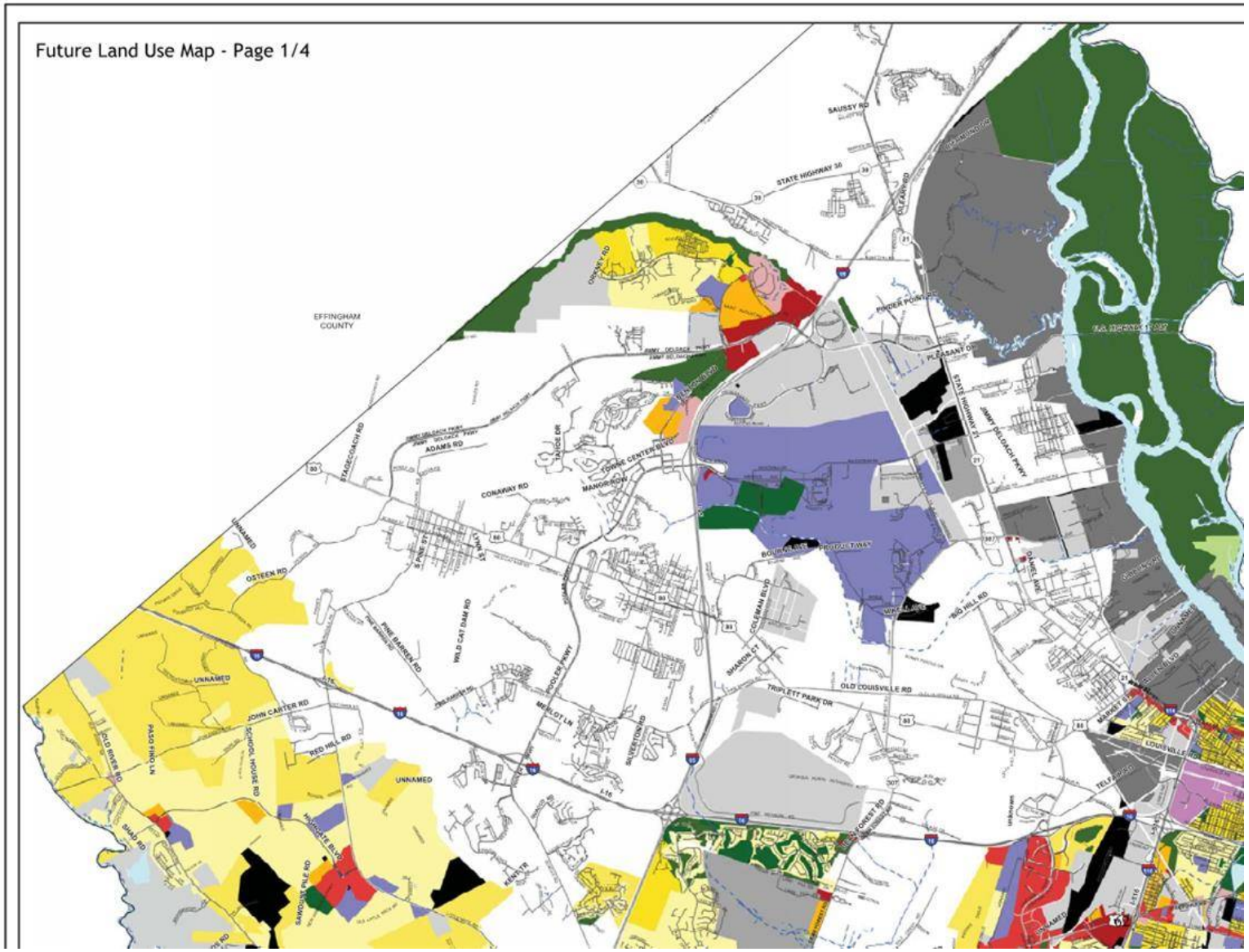


Figure A.6 - Future Land Use Map – Northeast Quadrant

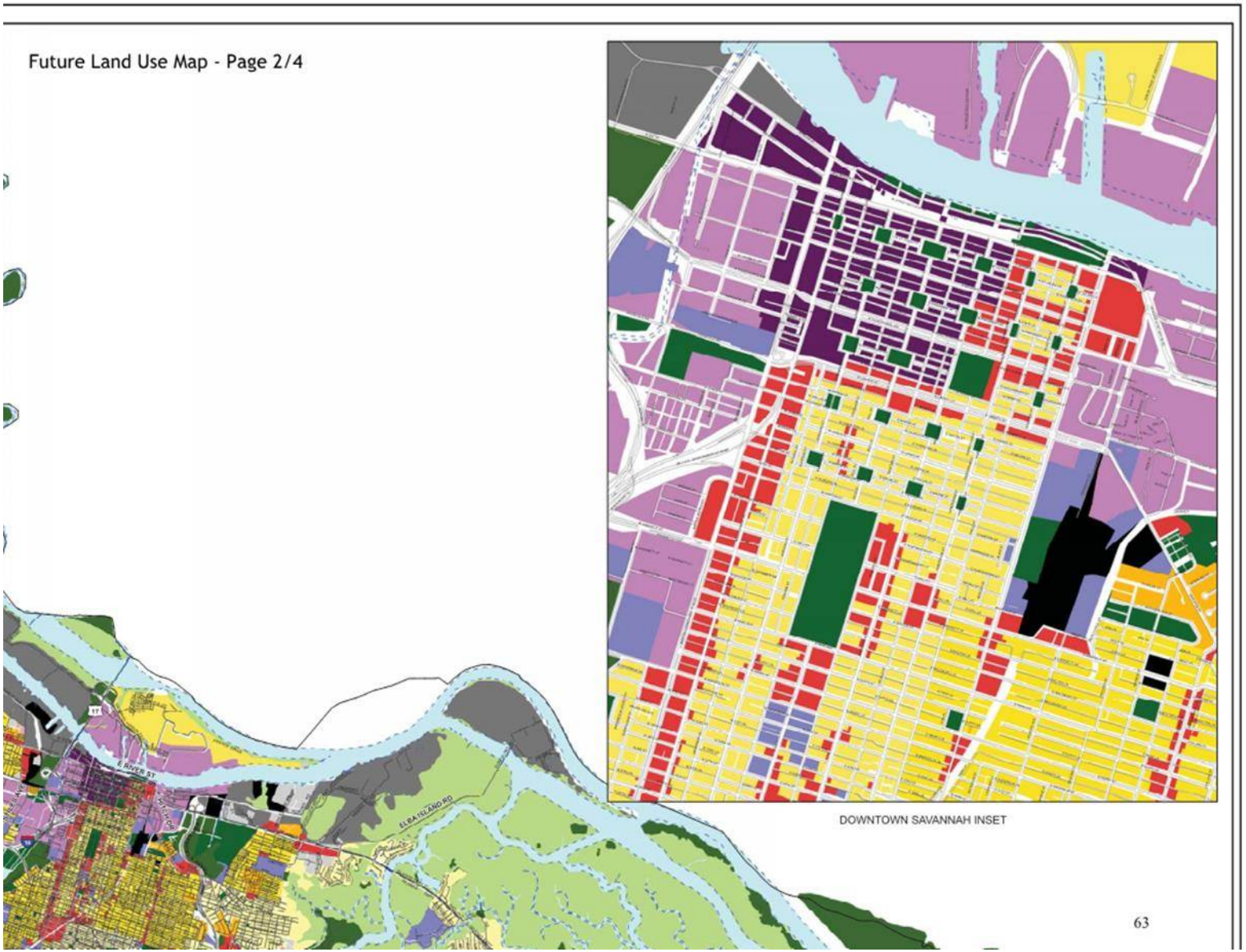


Figure A.7 - Future Land Use Map – Southwest Quadrant

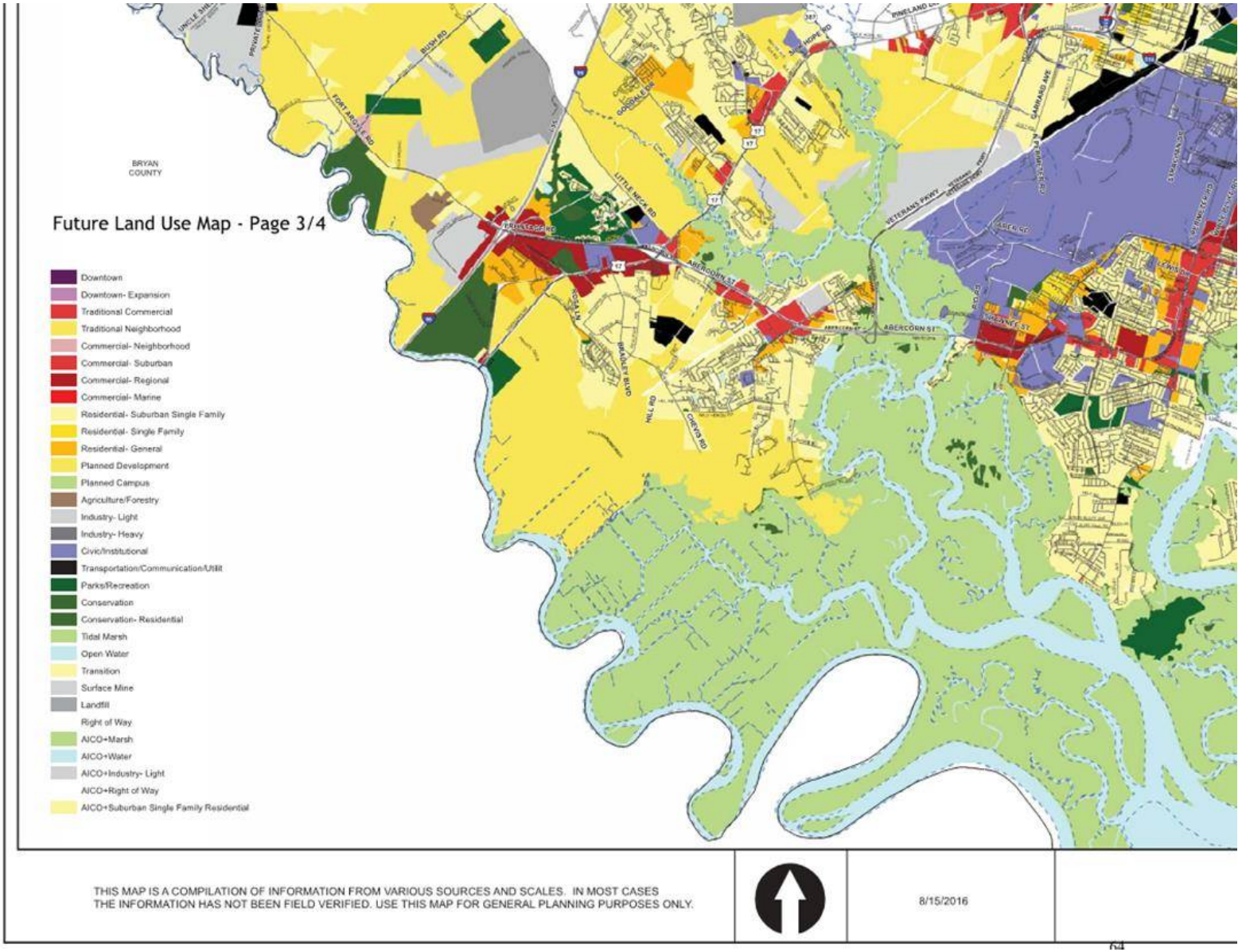
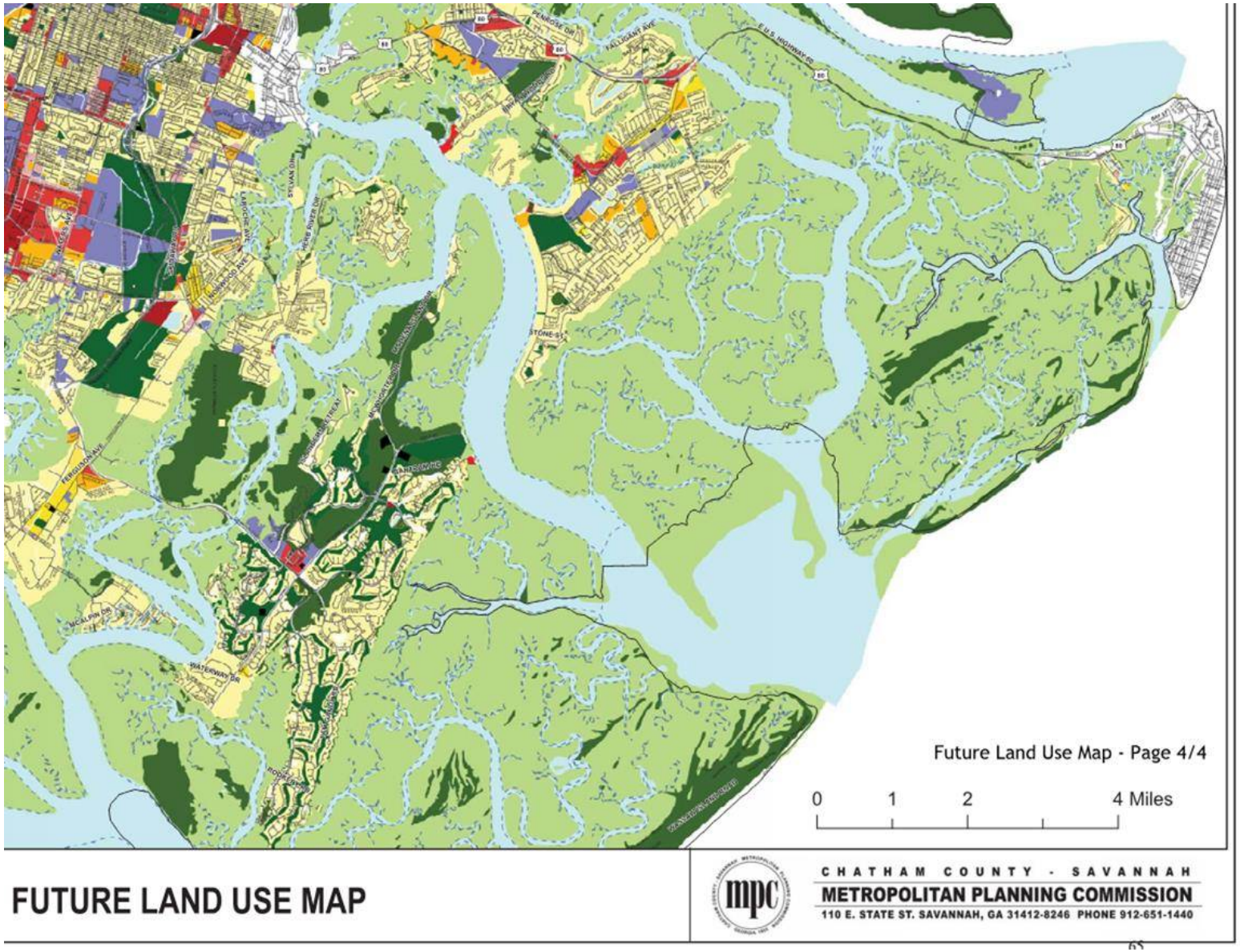


Figure A.8 - Future Land Use Map – Southeast Quadrant

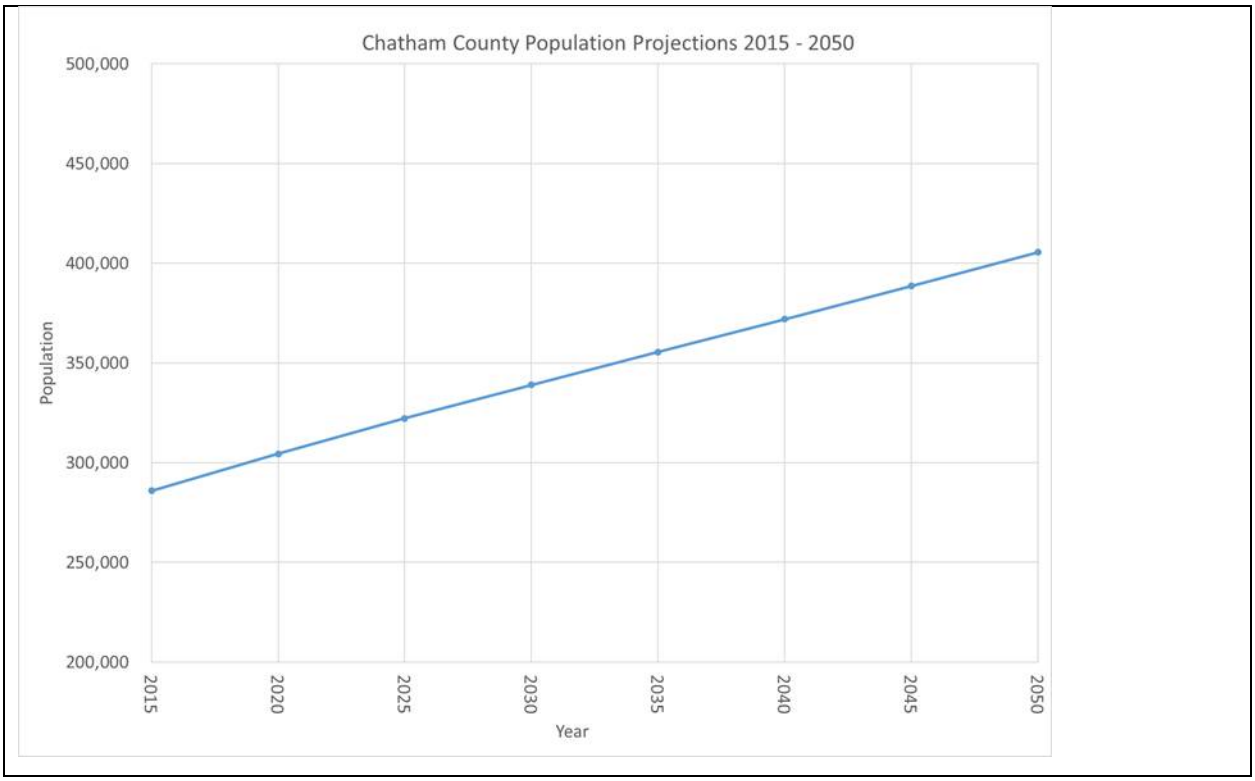


A.2.11 Growth and Development Trends

According to U.S. Census and American Community Survey population estimates, unincorporated Chatham County's population has increased from 87,072 in 2010 to 92,834 in 2017. The total Chatham County population including incorporated areas was 285,506 in 2017.

According to the Georgia Governor's Office of Planning and Budget (GOPB), Chatham County is projected to reach a population of 405,573 by 2050, which represents a 38% increase from the 2017 population. The population projections from the GOPB estimate the annual growth for the County to be about 1.1% through 2050.

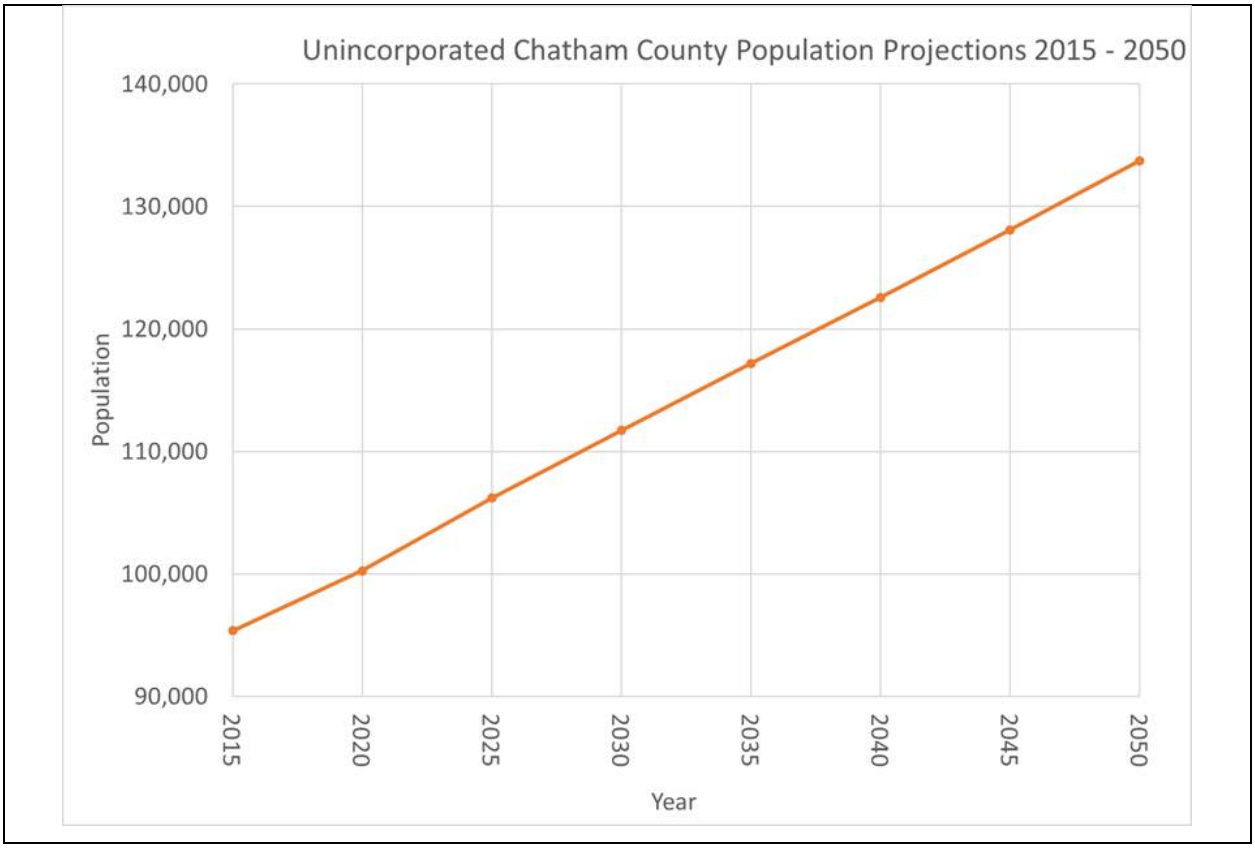
Figure A.9 – Population Projections for Chatham County 2013 - 2050



Source: Georgia Governor's Office of Planning and Budget

Using the projected growth rate for the County, the population of the unincorporated County would increase to 133,737 by 2050 as shown in the graph below.

Figure A.10 – Population Projections for Unincorporated Chatham County 2015 - 2050



A.3 ASSET INVENTORY

A.3.1 Property

Table A.9 – Chatham County Building Exposure

Occupancy Type	Total Number of Buildings	Total Building Value	Estimated Content Value	Total Value
Commercial	3,240	$1,075,268,425.30	$1,075,268,425.30	$2,150,536,850.60
Industrial	1,519	$1,049,600,235.00	$1,574,400,352.50	$2,624,000,587.50
Residential	32,343	$5,583,386,350.30	$2,791,693,175.15	$8,375,079,525.45
Total	**37,102**	**$7,708,255,010.60**	**$5,441,361,952.95**	**$13,149,616,963.55**

Source: Chatham County parcel and building footprint data, 2019

A.3.2 Critical Facilities

Table A.10 – Critical Facilities and Infrastructure at Risk, Chatham County

ID	PRIORITY CRITICAL FACILITY NAME	PHYSICAL ADDRESS	LAT	LONG	REASON				
					COG	Life Safety	Debris	Support	Other
CC-1	Old Courthouse	124 Bull St.	32.0775	-81.0915	X				
CC-2	County EOC	295 Police Memorial Dr.	32.0605	-81.1658	X	X		X	
CC-3	County Jail	Carl Griffin Dr.	32.0606	-81.1658		X		X	X
CC-4	Chatham County Public Works	7226 Varnedoe Drive	31.99739	-81.0821			X	X	
CC-5	Chatham County Fleet	3916 Old Louisville Road	32.0915	-81.1599				X	
CC-6	Montgomery St Courthouse	133 Montgomery St.	32.0792	-81.0971	X				X
CC-7	Mosquito Control	65 Billy B. Hair Dr.	32.118	-81.1922	X			X	
CC-8	Public Works Fuel Site	7226 Varnedoe Drive	31.99739	-81.0821					
CC-9	Citizen's Service Center	1117 Eisenhower Drive	32.0055	-81.0998	X			X	
CC-10	Chatham County DFCS	761 Wheaton St	32.041	-81.0455				X	X
CC-11	Chatham County Health Dept.	1395 Eisenhower Drive	32.0033	-81.0916		X		X	
CC-12	Lake Mayer	1850 W. Montgomery X-Rd.	31.99296	-81.0879	X			X	
CC-13	Juvenile Court	194 Carl Griffin	32.0405	-81.0956	X			X	
CC-14	Colonial Oil Group	101 North Lathrop Ave	32.0511	-81.0641				X	X
CC-15	Chatham County Health Dept.	107 Fahm Street	32.08065	-81.1032		x		x	
CC-16	Chatham County Health Dept.	1602 Drayton Street	32.06026	-81.0995		X		X	
CC-17	Police Precinct	54 Johnny Mercer Blvd	32.0223	-81.0112		X			
CC-18	Police Precinct	9306 Whitefield Ave	31.97182	-81.10419					
CC-19	Liakakis Government Building	222 W Oglethorpe Ave	32.07798	-81.09568					
CC-20 Savannah Hilton-Head International Airport		400 Airways Ave (Terminal)	32.13608	-81.2128				X	
		North Vault – Airfield							
		South Vault - Airfield							
		Gulfstream Road Tunnel Pump Generator							
		Parking # 1							
		Parking # 2							
		Parking # 3							

Source: Chatham County

Table A.11 – Critical Facilities and Infrastructure at Risk, Other

ID	PRIORITY CRITICAL FACILITY NAME	PHYSICAL ADDRESS	LAT	LONG	REASON				
					COG	Life Safety	Debris	Support	Other
O-1	Memorial Hospital	4700 Waters Ave.	32.0304	-81.0891		X			
O-2	Candler Hospital	5353 Reynolds Ave.	32.0282	-81.0994		X			
O-3	St Joe Hospital	11705 Mercy Blvd.	31.9856	-81.1552		X			
O-4	Savannah Morning News	1375 Chatham Parkway	32.0593	-81.1641				X	
O-5	Hunter Army Airfield	314 Billy Mitchell Blvd	32.0288	-81.1302				X	
O-6	Chatham Emer. Services Station #2	1831 E. Montgomery Xrds.	31.98966	-81.087		X			
O-7	Chatham Emer. Services Station #1	10703 White Bluff Road	31.9865	-81.1298		X			
O-8	Chatham Emer. Services Station #3	2009 Grove Point Road	31.98176	-81.2211		X			
O-9	Chatham Emer. Services Station #4	155 Wilmington Isl. Rd	32.0074	-80.9879		X			
O-10	Chatham Emer. Services Station #5	553 McWhorter Drive	31.9527	-81.0332		X			
O-11	Chatham Emer. Services Station #6	214 Shipyard Road	31.9447	-81.1113		X			
O-12	Chatham Emer. Services Station #8	4800 US Hwy 80 East	32.0423	-80.9988		X			
O-13	Chatham Emer. Services Station #9	59 Log Landing Road	31.9246	-81.0604		X			
O-14	Chatham Emer. Services Station #12/HQ	1399 Dean Forrest Rd	32.06127	-81.2091		X			
O-15	Chatham Fire Station #7	1440 Grove Point Road	31.99442	-81.2381		X			
O-16	Chatham Fire Station #10	4501 Ogeechee Road	32.04633	-81.1712		X			
O-17	Chatham Fire Station #11	1615 Ft. Argyle Rd	32.05194	-81.3429		X			
O-18	Chatham Fire Station #15	204 Fifth Street (Tybee)	32.00754	-80.8443		X			
O-19	Chatham EMS Station #19	6781 Hwy 21 (Pt. Wentworth)	32.17771	-188381		X			
O-20	Chatham EMS Station #23	6 Adams Rd (Bloomingdale)	32.13381	-81.3027		X			
O-21	Chatham Fire Station #24	105 Quacco Rd.	32.01448	-81.2334		X			
O-22	Chatham Fire Training Center	1381 Dean Forrest Rd	32.05957	-81.2096		X			
O-23	Chatham Fire Station #14	2606 E. President Street	32.06663	-81.0434		X			
O-24	USACE Facility & Dock	Savannah Harbor Pkwy.	32.0452	-81.0449				X	X
O-25	Juliette Gordon Low Federal Bldg.	100 W. Oglethorpe Ave.	32.0442	-81.0539				X	X
O-26	Jenkins High School	1800 E DeRenne Ave	32.0225	-81.0831				X	X
O-27	Johnson High School	3012 Sunset Blvd	32.03222	-81.0607				X	X
O-28	Savannah High School	400 Pennsylvania Ave	32.0628	-81.0572				X	X
O-29	West Chatham Middle School	800 Pine Barren Rd	32.0937	-81.2589				X	X
O-30	Islands High School	170 Whitemarsh Island Rd	32.0375	-81.0072				X	X
O-31	Southwest Middle School	6030 Ogeechee Rd	31.9982	-81.2635				X	X
O-32	Windsor Forrest Elementary	414 Briarcliff Cir	31.9748	-81.1446				X	X

ID	PRIORITY CRITICAL FACILITY NAME	PHYSICAL ADDRESS	LAT	LONG	REASON				
					COG	Life Safety	Debris	Support	Other
O-33	Groves High School	100 Priscilla D Thomas Way	32.1071	-81.1575				X	X
O-34	Beach High School	3001 Hopkins St	32.0549	-81.1162				X	X
O-35	Hesse Primary School	9116 Whitfield Ave.	31.97756	-81.1068				X	
O-36	Rice Creek School	100 Mulberry Ave.	32.26356	-81.2252				X	
O-37	Georgetown K-8 School	1516 King George Blvd	31.9758	-81.2311				X	

Source: Chatham County

A.4 RISK ASSESSMENT

This section contains a hazard profile and vulnerability assessment for those hazards that were rated with a higher priority for the unincorporated areas than for Chatham County as a whole. Risk and vulnerability findings are also presented here for those hazards that are spatially defined and have variations in risk that could be evaluated quantitatively on a jurisdictional level. The hazards included in this section are: Flood and Wildfire.

A.4.1 Flood

Approximately 80 percent of the unincorporated areas of Chatham County falls within the mapped 1%-annual-chance floodplains. Figure A.11 reflects the mapped flood hazard zones for Unincorporated Chatham County, and Figure A.12 displays the depth of flooding estimated to occur in these areas during the 1%-annual-chance flood. The data in this risk assessment is based off FEMA's 2014 DFIRM. Minor changes have since been made and the updated 2018 DFIRM can be seen in Figure A.3 for comparison.

Properties at risk are detailed by flood zone in Table A.12, below. Parcel data was used to assess how many buildings are located in hazard areas based on each parcel's centroid.

Table A.12 – Properties at Risk by Flood Zone

Flood Zone	Number of Buildings	Total Building Value
A	5	$1,396,600.00
AE	14,114	$3,200,375,055.30
VE	427	$98,421,308.84
0.2% Annual Chance Flood Hazard	8,335	$1,736,863,214.30
X	14,220	$2,671,128,432.10
Total	**37,101**	**$7,708,184,611**
SFHA Total	**14,546**	**$3,300,192,964**

Source: FEMA 2014 DFIRM & Chatham County parcel and building footprint data, 2019

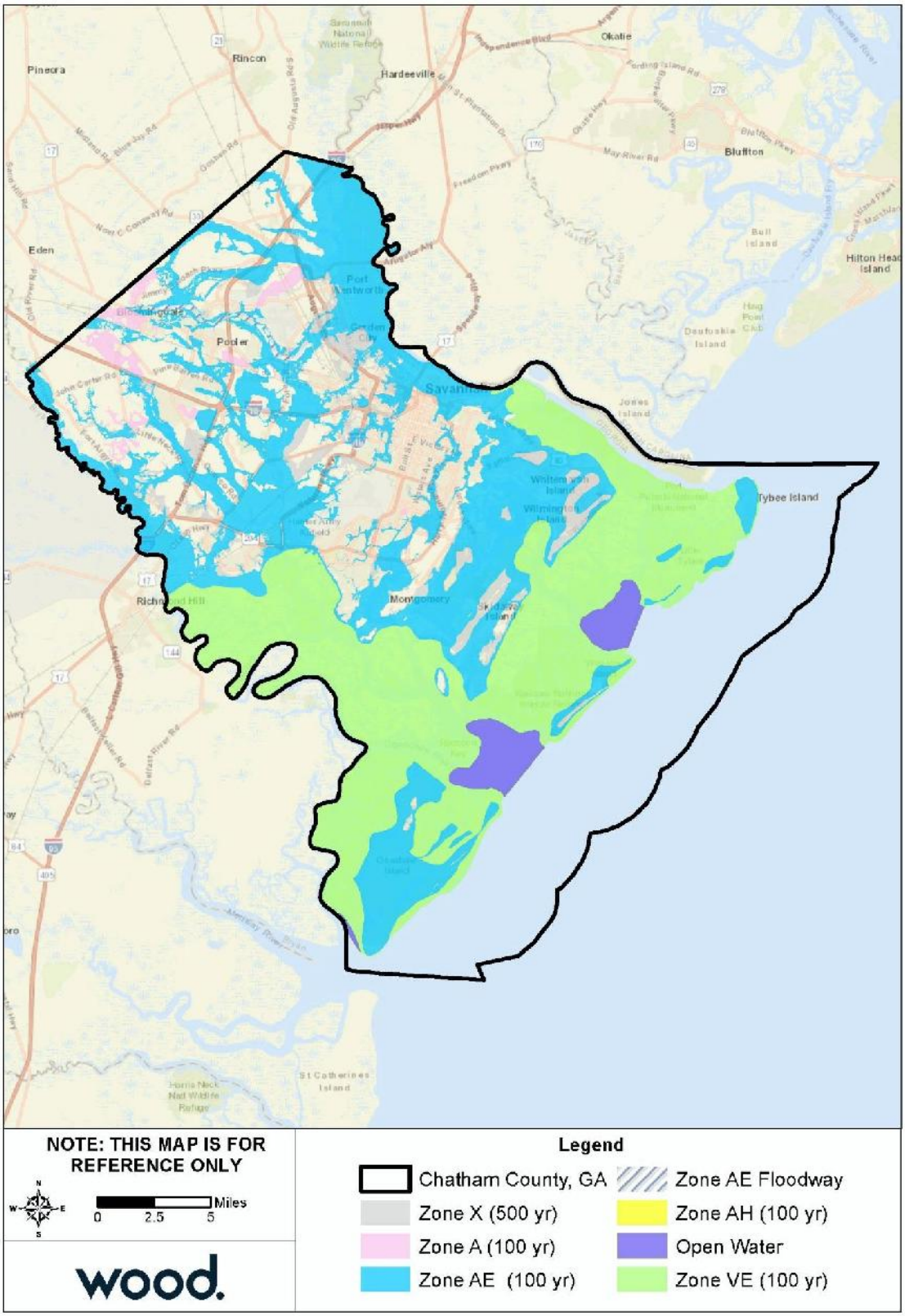
Table A.13 provides building counts and estimated damages by occupancy type for the 1% annual chance flood event.

Table A.13 – Chatham County Estimated Building Damage and Content Loss, 1% Annual Chance Flood

Occupancy	Buildings Impacted	Building and Contents Cost	Estimated Building Damages	Estimated Content Damages	Loss Estimate
Commercial	532	$188,230,794.80	$188,230,794.80	$376,461,589.60	$21,881,237.18
Industrial	561	$149,379,333.97	$224,069,000.95	$373,448,334.92	$14,717,252.91
Residential	9,707	$2,140,128,630.52	$1,070,064,315.26	$3,210,192,945.78	$499,642,804.62
Total	**10,800**	**$2,477,738,759.29**	**$1,482,364,111.01**	**$3,960,102,870.30**	**$536,241,294.71**

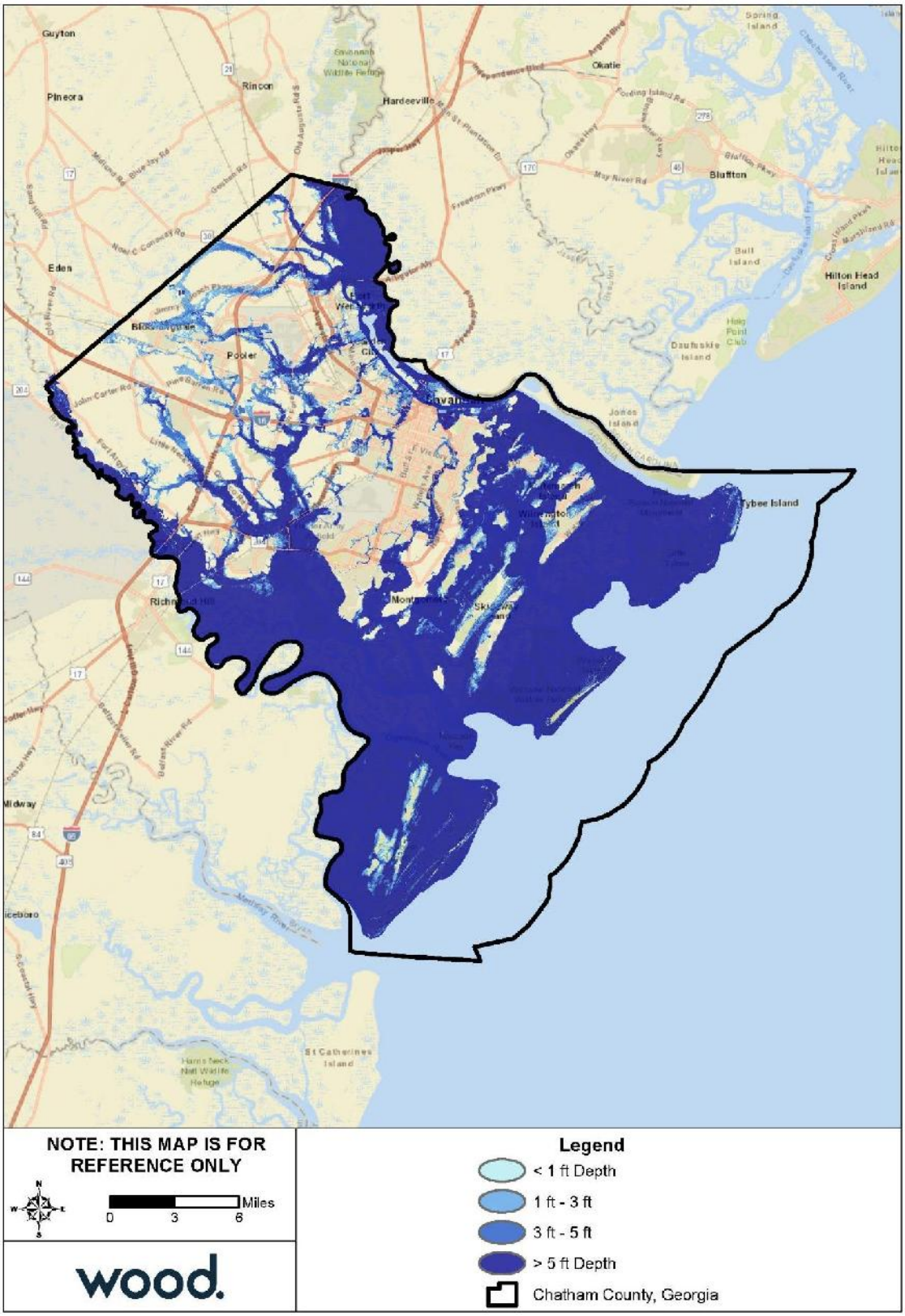
Source: HAZUS

Figure A.11 – FEMA Flood Hazard Areas, Chatham County



Source: FEMA 2014 DFIRM

Figure A.12 – Flood Depth, 1%-Annual-Chance Floodplain, Chatham County



Source: FEMA 2014 DFIRM

A.4.2 Wildfire

Table A.14 summarizes the acreage in Unincorporated Chatham County that falls within the Wildland Urban Interface (WUI), categorized by housing density. Areas in the WUI are those where development may intermix with flammable vegetation. Over 80 percent of Unincorporated Chatham County is not included in the WUI.

Table A.14 – Wildland Urban Interface Acreage, Unincorporated Chatham County

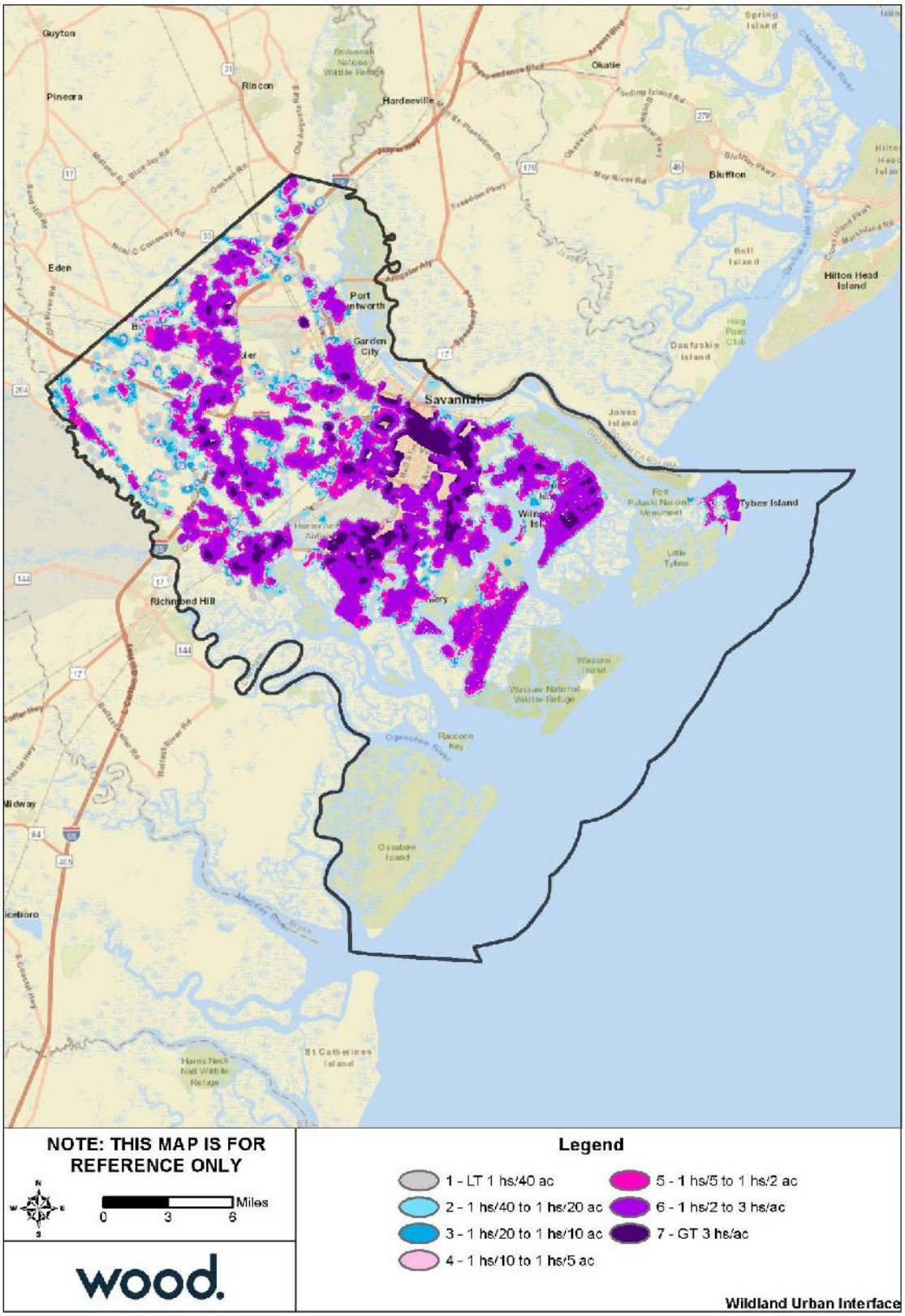
	Housing Density	Total Acreage	Percent of Total Acreage
	Not in WUI	*234762.5*	82.3%
	LT 1hs/40ac	5464.1	1.9%
	1hs/40ac to 1hs/20ac	3500.7	1.2%
	1hs/20ac to 1hs/10ac	4307.8	1.5%
	1hs/10ac to 1hs/5ac	4986.9	1.7%
	1hs/5ac to 1hs/2ac	8794.9	3.1%
	1hs/2ac to 3hs/1ac	21025.6	7.4%
	GT 3hs/1ac	2284.6	0.8%
	Total	**285,127.0**	

Source: Southern Wildfire Risk Assessment

Figure A.13 depicts the WUI for Unincorporated Chatham County. The WUI is the area where housing development is built near or among areas of vegetation that may be prone to wildfire. Figure A.14 depicts the Fire Intensity Scale, which indicates the potential severity of fire based on fuel loads, topography, and other factors. Figure A.15 depicts Burn Probability based on landscape conditions, percentile weather, historical ignition patterns, and historical prevention and suppression efforts.

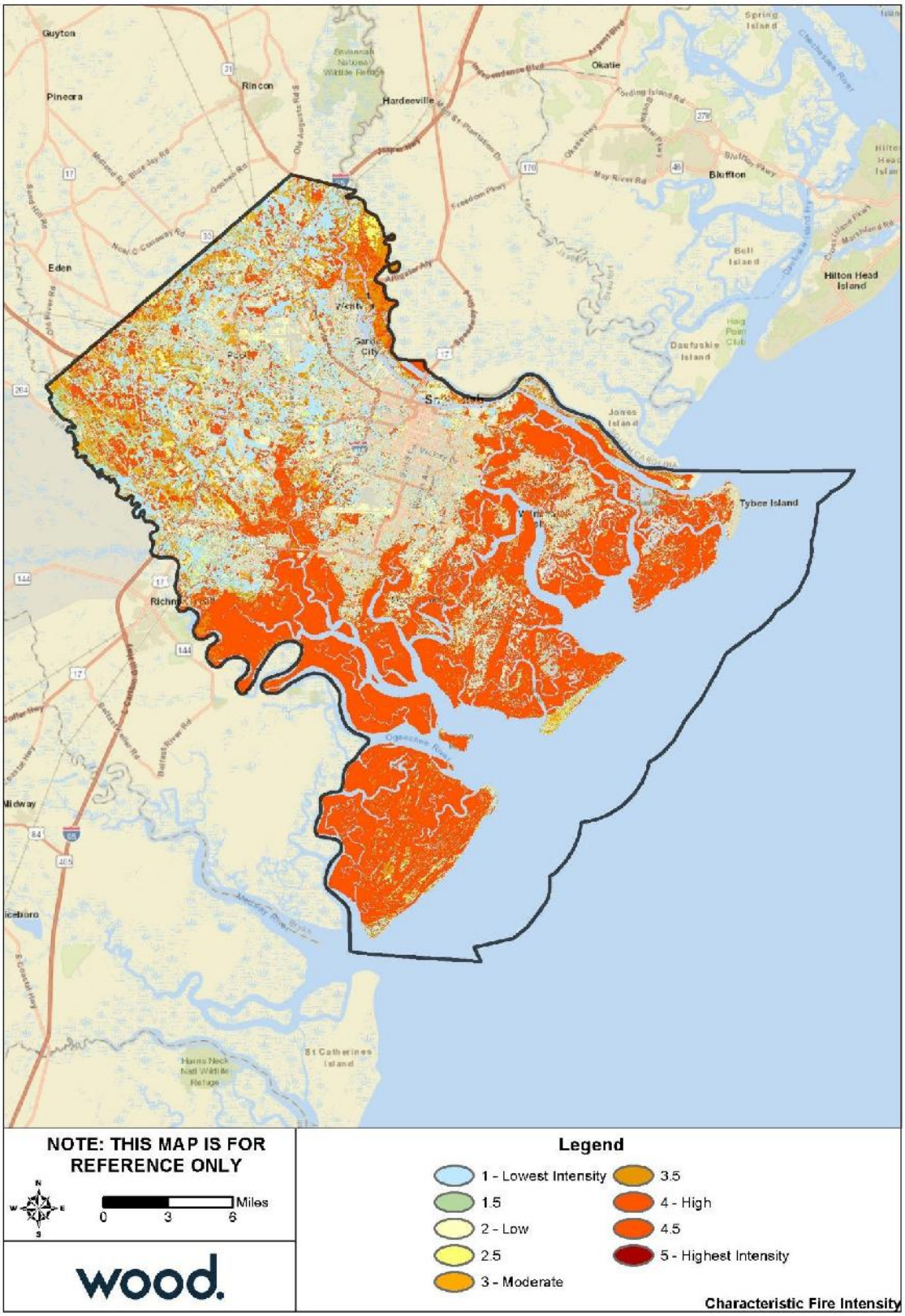
Potential fire intensity is highest in eastern portion of the Unincorporated areas of Chatham County, particularly along the coast. These areas also have relatively higher burn probabilities, especially along the southern border of the county and on Ossabaw Island. However, these areas are largely outside of the WUI, meaning there is little to no development at risk. The area of greatest risk in the County is around Skidaway and Wilmington islands the where WUI overlays with moderate burn probability and higher fire intensity levels.

Figure A.13 – Wildland Urban Interface, Chatham County



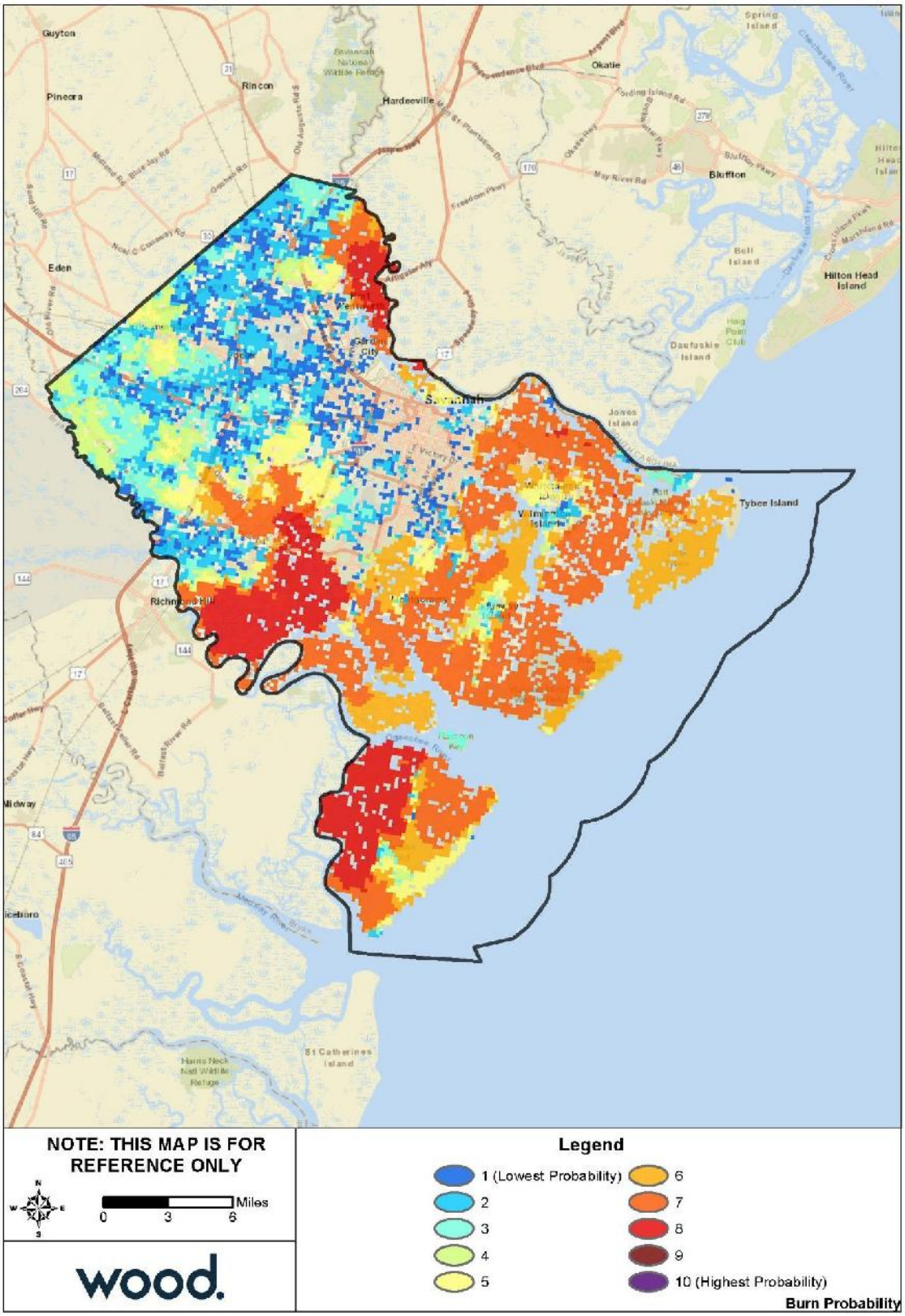
Source: Southern Wildfire Risk Assessment

Figure A.14 – Fire Intensity Scale, Chatham County



Source: Southern Wildfire Risk Assessment

Figure A.15 – Burn Probability, Chatham County



Source: Southern Wildfire Risk Assessment

A.1 FLOODPLAIN MANAGEMENT CAPABILITY ASSESSMENT

Chatham County joined the NFIP emergency program in 1970 and has been a regular participant in the NFIP since August 1980. The following tables reflect NFIP policy and claims data for the County categorized by structure type, flood zone, Pre-FIRM and Post-FIRM. Zones with no policies or closed paid losses were left out of the tables below.

Table A.15 – NFIP Policy and Claims Data by Structure Type

Structure Type	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
Single Family	14,666	$7,930,892	$4,505,310,700	1,248	$24,441,865.36
2-4 Family	187	$71,656	$38,119,700	21	$369,739.42
All Other Residential	1,208	$292,068	$173,675,800	13	$428,844.33
Non Residential	324	$516,364	$153,629,500	42	$1,555,009.56
Total	**16,385**	**$8,810,980**	**$4,870,735,700**	**1,324**	**$26,795,458.67**

Source: FEMA Community Information System, accessed September 2019

Table A.16 – NFIP Policy and Claims Data by Flood Zone

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
AO1-30 & AE Zones	7,839	$5,303,996	$2,154,853,600	965	$21,772,003.91
A Zones	5	$4,368	$1,184,300	20	$312,398.47
V01-30 & VE Zones	17	$51,404	$4,424,400	30	$880,815.65
B, C & X Zone					
Standard	845	$443,677	$214,279,300	64	$870,172.14
Preferred	7,670	$3,002,135	$2,495,680,000	228	$2,846,763.99
Total	**16,376**	**$8,805,580**	**$4,870,421,600**	**1,307**	**$26,682,154.16**

Source: FEMA Community Information System, accessed September 2019

Table A.17 – NFIP Policy and Claims Data Pre-FIRM

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	1,582	$2,174,286	$422,182,900	495	$16,119,942.79
A Zones	0	$0	$0	20	$312,398.47
V01-30 & VE Zones	7	$17,000	$1,361,900	18	$778,889.69
B, C & X Zone	2,369	$998,920	$754,874,100	182	$2,357,171.91
Standard	233	$156,964	$65,901,100	43	$533,957.98
Preferred	2,136	$841,956	$688,973,000	139	$1,823,213.93
Total	**3,958**	**$3,190,206**	**$1,178,418,900**	**715**	**$19,568,402.86**

Source: FEMA Community Information System, accessed September 2019

Table A.18 – NFIP Policy and Claims Data Post-FIRM

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	6,257	$3,129,710	$1,732,670,700	470	$5,652,061.12
A Zones	5	$4,368	$1,184,300	0	$0.00

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
V01-30 & VE Zones	10	$34,404	$3,062,500	12	$101,925.96
B, C & X Zone	6,146	$2,446,892	$1,955,085,200	110	$1,359,764.22
Standard	612	$286,713	$148,378,200	21	$336,214.16
Preferred	5,534	$2,160,179	$1,806,707,000	89	$1,023,550.06
Total	**12,418**	**$5,615,374**	**$3,692,002,700**	**592**	**$7,113,751.30**

Source: FEMA Community Information System, accessed September 2019

A.2 MITIGATION STRATEGY

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Lead Agency / Department	Potential Funding Source	Implementation Timeline	2020 Status	2020 Implementation Status Comments
Prevention									
P-1	Relocate fiber cable supporting all county facilities to below ground	All	4.1	Low	CEMA/County Facilities	PDM, HMGP	2023	Carried Forward	Unable to secure funding
P-2	Prioritize the critical facilities for the purpose of an engineering study. Undertake engineering study to evaluate critical facilities, including cultural and historical facilities, for safe room needs.	All	1.1	Low	CEMA	HMGP; PDM; Federal Grants	2018	Carry Forward	Unable to implement the engineering study
P-3	Communications Coverage: The radio network has known coverage issues on the southwest side of Wilmington island and the southern end of Tybee island.	All	4.1	High	ICS	HMGP, CIP, PDM	2022	Carry Forward	Not able to solve the problem including funding to support the project
P-4	Purchase and install Bypass Pumps (estimated cost $1million)	Flooding, Hurricane, Coastal Storm, Severe Weather	1.1	High	Public Works	HMGP, CIP, PDM	2022	Carry Forward	Revised
P-5	Replace the current tide gate	Flooding, Hurricane, Coastal Storm	1.1	High	Public Works	HMGP, CIP, PDM	2022	Carry Forward	No funding to replace the tide gate
P-6	Update Canal System	Flooding, Hurricane, Coastal Storm, Severe Weather	1.1	High	Engineering/Public Works	HMGP, CIP, PDM	2022	Carry Forward	Capital improvement project did not get implemented
P-7	Flood Mitigation for areas with poor drainage	Flooding, Hurricane, Coastal Storm, Severe Weather	1.1	High	Engineering/Public Works	HMGP, CIP, PDM	2022	Carry Forward	Revised
Property Protection									
PP-1	Harden roof, windows, doors, and rooftop mechanical units at County critical facilities and critical workforce shelters.	All	1.1	Moderate	CEMA	PDM; HMGP	2022	Carry Forward	No grant funding available
PP-2	Harden doors, windows, skylight, storage buildings and hangers at Chatham County Mosquito Control.	All	1.1	High	County Mosquito Control	PDM; HMGP **CIP	2022	Carry Forward	Pending current HazMit funding right now
PP-3	Anchor membrane roof with mechanical fastening system in order to compartmentalize roof at Chatham County Mosquito Control Building.	All	1.1	Low	County Mosquito Control	PDM; HMGP; Federal Grants	2022	Carry Forward	No grant funding available
PP-4	Anchor HVAC units	All	1.1	Moderate	County Facilities	PDM; HMGP; Federal Grants; CIP	2021-2022	Carry Forward	Revised
PP-5	Replace windows (if needed) and install hurricane shutters on critical facilities	All	1.1	Moderate	County Facilities/CEMA	PDM; HMGP; Federal Grants; Local Funds	2022-2023	Carry Forward	Revised
PP-6	Construct housing to provide wind and debris protection for fuel pumps at Chatham County Mosquito Control Building.	All	1.1	Moderate	County Facilities	PDM; HMGP	2020-2021	Carry Forward	No grant funding available
PP-7	Cut back trees in close proximity to County Facilities	All	1.1	Low	County Facilities	PDM; HMGP	2020-2025	Carry Forward	Revised
PP-8	Work with utility departments and companies to inspect and remove trees that, if damaged, would threaten utility infrastructure and critical facilities.	High Winds, Hurricane, Tornado, Thunderstorm	1.1	Low	County Engineering; Public Works; CEMA	Local Staff Time	2021-2022	Carry Forward	Some trees have been removed but others remain
PP-9	Construct safe rooms as recommended by the engineering study on critical facilities.	All	1.1	Moderate	CEMA; Engineering	PDM; HMGP; Federal Grants	2023-2025	Carry Forward	No grant funding available
PP-10	Elevate lift stations above the base flood elevation (BFE) including electrical components.	Flood	1.1	Moderate	Public Works; County Parks; Engineering	HMP; PDM; FMA	2023	Carry Forward	No grant funding available

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Lead Agency / Department	Potential Funding Source	Implementation Timeline	2020 Status	2020 Implementation Status Comments
PP-11	Utilize vehicle barriers at the judicial courthouse.	Terrorism	1.1	Low	County Facilities	DHS; Local Funds	2022	Carry Forward	Will work with Sheriff's department to find resources to implement
PP-12	Reinforce cooling tower and roof on the Old County Courthouse located at 124 Bull Street.	Hurricane, High Winds, Thunderstorm, Tornado	1.1	Moderate	County Facilities	Local Funds	2023	Carry Forward	Needs to be added to the operating budget
PP-13	Anchor and harden membrane roof with mechanical fastening system in order to compartmentalize roof at Chatham County Annex, eliminate the vent leak, as well as securing HVAC.	Hurricane, High Winds, Thunderstorm, Tornado	1.1	High	County Facilities	Local Funds / SPLOST	2020	Carry Forward	Needs to be added to the priority list for action
PP-14	Protect generator at CNT Building through construction of housing and/or relocation.	All	1.1	Moderate	County Facilities	Local Funds; CIP	2023-2025	Carry Forward	Reprioritize on CIP list
PP-15	Determine and/or construct safe room in the Administrative Building at the Chatham County Mosquito Control Building.	All	1.1	Low	County Mosquito Control	PDM; HMGP; Federal Grants	2022-2023	Carry Forward	Not able to secure funding
PP-16	Add HVAC stands at CNT Building.	Flood	1.1	Low	County Facilities; CNT Department	Local Funds	2022	Carry Forward	Prioritize funding to implement
PP-18	Add a vehicle barrier at the CNT Building.	All	1.1	Moderate	County Facilities	DHS; Local Funds	2022	Carry Forward	Will work with Sheriff's department to find resources to implement
PP-19	Institute security measures for exposed pipelines.	All	1.1	Low	County Public Works	Local Funds and Staff Time	2021	Carry Forward	Not able to develop plan for this project
PP-20	Raise the elevation of McQueens Trail.	Flooding, Coastal Storm, Hurricane, High Tides	1.1	Moderate	County Parks and Rec./ Engineering	HMGP, CIP, PDM	2022	Carry Forward	No funding to accomplish this project
PP-21	Hurricane shutters or window protection at both facilities (St. Joe's/Candler hospital) Replace the existing windows to hurricane rated windows (estimated cost 350,000).	Hurricane, High Winds, Thunderstorm, Tornado	1.1	High	St. Joseph's / Candler Hospital (1st floor windows and 2nd floor outpatient)	HMGP	2023-2024	Carry Forward	Working to secure funding for this project
PP-22	Elevate Facility Electrical Equipment at St. Joseph's Hospital. Elevate facility electrical equipment in the basement to prevent water intrusion during a flood. (estimated cost 850,000)	Flooding	1.1	High	St. Joseph's / Candler Hospital Boiler Room	HMGP	2023-2024	Carry Forward	Working to secure funding for this project
PP-23	Purchase and Install Shutters for Fire Stations	Hurricane, High Winds, Thunderstorm, Tornado	1.1	Moderate	CES	HMGP	2022	Carry Forward	Working to secure funding for this project
PP-24	Replace garage doors that do not currently meet wind code.	Hurricane, High Winds, Thunderstorm, Tornado	1.1	Moderate	CES	HMGP	2022	Carry Forward	Working to secure funding for this project
PP-25	Acquire or elevate or mitigate properties prone to flooding. If properties are acquired, they could be demolished and land preserved as open space.	Flooding, Coastal Storm, Hurricane, High Tides	1.2 & 3.1	High	CC Engineering	HMGP/FMA	Ongoing	Carry Forward	Working to secure funding for this project
PP-26	Replace A/C Louvers in mechanical rooms (Estimated cost 100,000)	Hurricane, High Winds, Thunderstorm, Tornado	1.1	High	Candler Hospital (Plant Operations)	HMGP, PDM	2023-2024	Carry Forward	Working to secure funding for this project
PP-27	Replace patient tower roofs because current roofs cannot handle the amount of rain and winds a hurricane produces (Estimated cost 400,000)	Hurricane, High Winds, Rainwater Flooding, Storm Surge, Thunderstorm, Tornado	1.1	High	St. Joseph's Hospital (Plant Operations)	HMGP, PDM	2023-2024	Carry Forward	No grant funding to support this project
PP-28	Replace the windows in the patient tower (Estimated cost 2.1 million)	Hurricane, High Winds, Rainwater Flooding, Storm Surge, Thunderstorm, Tornado	1.1	High	Candler Hospital (Plant Operations)	HMGP, PDM	2023-2024	Carry Forward	No grant funding to support this project
PP-29	Update lightning protection on the building structure to protect the building electrical systems (estimated cost 308,000).	Power outages	1.1	High	Candler Hospital (Plant Operations) Roof Top	HMGP, PDM	2023-2024	Carry Forward	No grant funding to support this project

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Lead Agency / Department	Potential Funding Source	Implementation Timeline	2020 Status	2020 Implementation Status Comments
PP-30	Conduct and engineering study to determine the actions that would best mitigate the threat of coastal flooding from astronomical and tropical events on the Skidaway Marine Science campus of the University of Georgia on Skidaway Island ($40,000)	Flood	1.1	High	UGA-Skidaway Institute	HMGP	2023	Carry Forward	No grant funding to support this project
PP-31	Add sensors and related equipment to determine vulnerability of areas to flooding and other natural hazards	Flood, Hurricane, Sea Level Rise	3.1	Medium	CEMA, Engineering	TBD	2020	New	
PP-32	Elevate or dry floodproof components or systems vulnerable to flood damage	Flood	1.1	High	Engineering/Public Works	TBD	2020	New	
PP-33	Southeast Quadrant Stormwater Drainage Improvements: Stormwater Mitigation - Develop the SEQ in such a way as to capture stormwater runoff for the developed area, mitigate flooding in low-lying areas of the SEQ, and manage stormwater flow into Pipemakers Canal.	Flood, Hurricane, Sea Level Rise, Severe Weather	3.1	High	Savannah Airport Commission	HMGP	2020-2021	New	
PP-34	Conduct a structural study of critical facilities to assess wind and hurricane rating and identify need, methods and cost to harden facilities.	Hurricane, Severe Weather, Tornado	1.1	High	CES	HMGP	2020	New	
PP-35	Harden critical facilities based on structural study.	Hurricane, Severe Weather, Tornado	1.1	High	CES	HMGP	2020	New	
PP-36	Elevate or dry floodproof components, systems and/or structures vulnerable to flood damage	Flood	1.1	High	SCCPSS	TBD	2021	New	
PP-37	Harden roof, windows, doors and rooftop units for critical facilities	All	1.1	Moderate	SCCPSS	TBD	2022	New	
Natural Resource Protection									
NRP-1	Promote the acquisition by conservation organizations of flood areas for community green space.	Flood	1.3	Low	CEMA; MPC; County Engineering	Local Staff Time	2023	Carry Forward	No funding to accomplish this project
Emergency Services									
ES-1	Purchase and install generator connections for critical facilities	All	1.1	Low	County Facilities	Local Funds; CIP	2020-2025	Carry Forward	Revised
ES-2	Portable generators for critical facilities	All	4.1	High	County Facilities	Local Funds; CIP	2021	New	
ES-3	Conduct yearly workshops related to FEMA hazard mitigation grant programs, including FMA, HMGP, PDM, SRL, and RFC.	All	3.1	Moderate	CEMA	HMGP 5%	2023	Carry Forward	Working to secure funding for this project
ES-4	Generators purchased and installed for all critical facilities.	All	1.1	Moderate	CEMA	HMGP 5%	2023	Carry Forward	Working to secure funding for this project
ES-5	Conduct hazardous material transportation accident training, response, and recovery exercises with appropriate agencies.	Hazardous Materials Incident	4.1	Moderate	CEMA	Local Funds; Federal and State Grants	2022	Carry forward	Working to secure funding for this project
ES-6	Replace Generator at Sheriff's Office	All	1.1	High	Sheriff's Office	HMGP, CIP, PDM	2022	Carry Forward	Working to secure funding for this project
ES-7	Add an emergency generator and all components for the Home Health Building. (estimated cost 142,500).	All	1.1	High	Candler Hospital Home Health Building	HMGP	2023-2024	Carry forward	Working to secure funding for this project
ES-8	Add a second emergency generator and all components including a fuel tank to the data center for redundancy (estimated cost 130,000).	All	1.1	High	Candler Hospital Data Center	HMGP	2023-2024	Carry forward	Working to secure funding for this project
ES-9	Adding emergency generator and all components, including upgrading paralleling gear in order to support one of the existing chillers. (estimated cost 562,000).	All	1.1	High	Candler Hospital Boiler Room	HMGP	2023-2024	Carry forward	Working to secure funding for this project

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Lead Agency / Department	Potential Funding Source	Implementation Timeline	2020 Status	2020 Implementation Status Comments
ES-10	Purchase and Install Generators for 12 Critical Facilities	All	1.1	High	SSFD/EMS	HMGP	2023	Carry Forward	Working to secure funding for this project
ES-11	Replace the existing generator with a 1000KW Diesel Generator	All	1.1	High	Savannah Airport Commission	HMGP	2020-2021	New	
ES-12	Purchase backup portable 1000KW Diesel Generator	All	4.1	Moderate	Savannah Airport Commission	HMGP	2020-2021	New	
ES-13	Purchase and install generator quick connects and transfer switches for critical facilities	All	1.1	Moderate	Savannah Airport Commission	HMGP, General Fund	2021	New	
ES-14	Portable generators for critical facilities	All	4.1	High	SCCPSS	Local Funds; CIP	2021	New	
ES-15	Purchase and install generator quick connects and transfer switches for critical facilities	All	1.1	High	SCCPSS	HMGP, General Fund	2021	New	
ES-16	Generators for critical facilities	All	1.1	Moderate	SCCPSS	HMGP, General Fund	2021	New	
Public Education & Awareness									
PEA-1	Conduct public forums to provide mitigation information and all hazards preparedness information.	All	2.2	Low	CEMA	Local Funds; HMGP 5%	2022	Carry forward	Working to secure funding for this project
PEA-2	Disseminate survey/questionnaire and collect information from business, industry, educational, historical, and cultural institutions regarding their questions and needs. Provide informational brochures for distribution explaining flooding safety and storm surge procedures and mitigation actions that can be undertaken by the institutions.	Flood, Hurricane	2.2	Low	CEMA	Local Funds; HMGP 5%	2023	Carry forward	Working to secure funding for this project
PEA-3	Provide all hazards outreach via various outreach methods (print, tv, radio, social media, etc.)	All	2.2	Low	CEMA	Local Funds; HMGP 5%	2022	Carry forward	Revised
PEA-4	Host/support a hazardous materials clean-up day to appropriately dispose of dangerous household chemicals.	Hazardous Materials Incident	2.2	Moderate	CEMA	Local Funds	2022	Carry forward	Working to secure funding for this project
PEA-5	Provide informational brochures for distribution explaining terrorism and tornado safety procedures and mitigation actions that can be undertaken by business, industry, educational, historical, and cultural institutions.	Terror Threat; Tornado	2.2	Low	CEMA	Local Funds; HMGP 5%	2022	Carry forward	Working to secure funding for this project
PEA-6	Encourage residents to purchase NOAA weather radios and explore opportunities to make weather radios available to low-income residents.	All	2.1	Moderate	CEMA; County Engineering	Local Staff Time	2021	Carry forward	Working to secure funding for this project
PEA-7	Provide outreach to the Hispanic members of the community regarding evacuation.	Hurricane	2.2	Moderate	CEMA	HMGP 5%; Local Staff Time	2022	Carry forward	Working to secure funding for this project

Annex B City of Bloomingdale

B.1 PLANNING PROCESS

The table below lists the HMPC members who represented the City of Bloomingdale.

Table B.1 – HMPC Members

Member Name	Title	Agency/Department
Ferman Tyler	Fire Chief, Code Enforcement	Fire Department
Blair Jeffcoat	Chief of Police	Police Department

B.2 COMMUNITY PROFILE

B.2.1 Overview of the Community

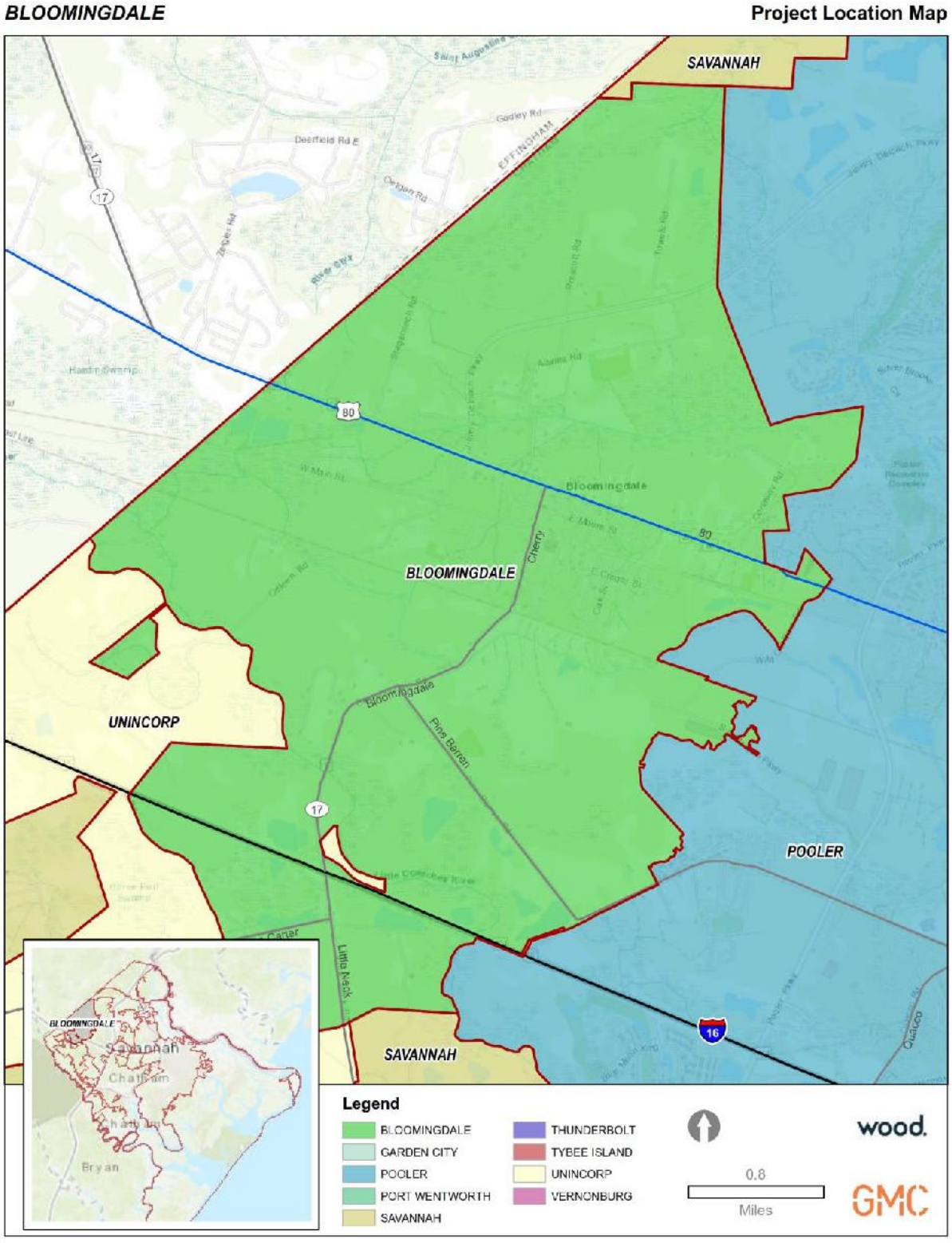
Bloomingdale is located along the northwestern border of Chatham County and is bordered to the northeast by Port Wentworth, to the east by the City of Pooler, to the south by the western portion of the City of Savannah, and to the northwest by Effingham County. U.S. Hwy. 80 runs east–west through the City, and I-16 runs parallel to it through the southern part of the city.

According to the U.S. Census Bureau, Bloomingdale has a total area of 14.0 square miles of which 12.8 square miles (91.4%) is land and 1.2 square miles (8.6%) is water.

According to the U.S. Census Bureau's American Community Survey (ACS) 5-Year Estimates, the City had a total population of 2,752 in 2017. Therefore, the town's average population density is approximately 197 people per square mile.

The figure below reflects the City of Bloomingdale boundaries and shows the City's location within the county and in relation to surrounding municipalities.

Figure B.1 – Location Map, Bloomingdale



B.2.2 Geography and Climate

Please refer to Chatham County Community Profile for a summary of climate for the City.

Bloomingdale lies within the Sea Island Flatwoods Level IV Ecoregion which consists of flat plains on marine terraces. Waterways consists of swamps, bays, and low gradient streams with sandy and silty substrates. Elevations average approximately 20 feet. Typical land cover consists of evergreen forests, pine plantations, and forested wetlands.

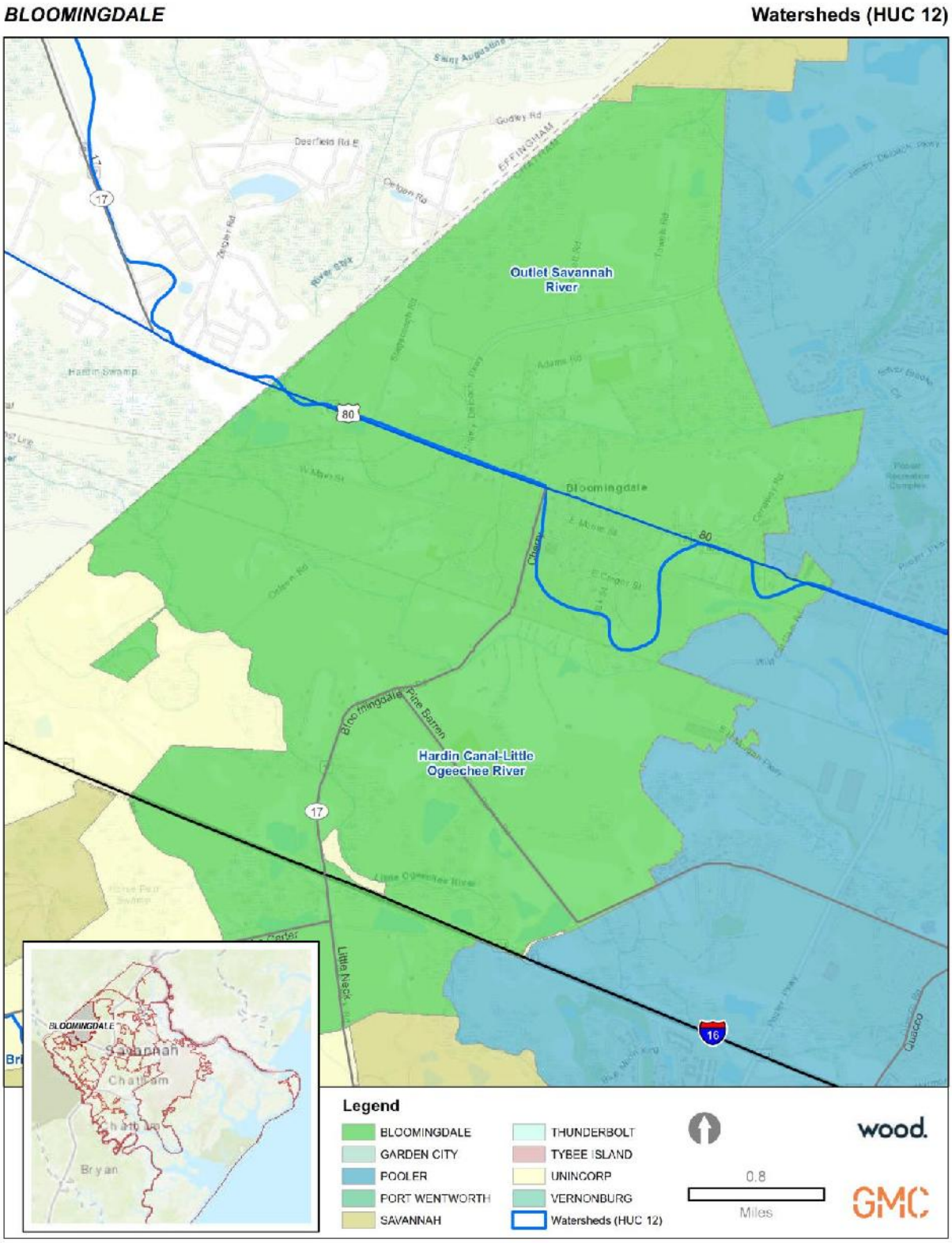
The City of Bloomingdale is located partially within the Outlet Savannah River Basin HUC-12 and the Hardin Canal – Little Ogeechee River HUC-12 Basin

Table B.2 – HUC 12 Watershed

HUC 12 Watershed Name	HUC 12 #
Hardin Canal – Little Ogeechee River	030602040201
Outlet Savannah River	030601090307

Figure B.2 illustrates the HUC-12 drainage basins and drainage features in and around Bloomingdale.

Figure B.2 – HUC-12 Drainage Basins, Bloomingdale



B.2.3 Cultural, Historic and Natural Resources

B.2.3.1 Cultural and Historic Resources

The Bloomingdale History Museum & Visitor's Center is located at 205 East Hwy. 80. The museum is located in the Pierce-Page House which was built in 1920 and is the second brick house built in the City

The Bloomingdale Community Building is located at 202 E. Moore Street and is available for rent for community events.

B.2.3.2 Parks, Preserves, and Conservation

The Bloomingdale Veterans Freedom Park is located at 1 West Hwy. 80 and honors all service men and women who live or have lived in Bloomingdale.

Veterans Freedom Park

Veteran's Monument

B.2.3.3 Natural Resources

Floodplains and Flood Zones

FEMA flood zone designations within the City of Bloomingdale are identified in the Figure below. The flood hazard areas shown are designated by the Federal Emergency Management Agency (FEMA) and include: Zone A (subject to inundation by the 1% annual-chance flood event with no base flood elevation (BFE) determined), Zone AE (subject to inundation by the 1% annual-chance flood event with BFE determined), Zone VE (subject to inundation by the 1% annual-chance flood event with additional hazards due to storm waves with BFE determined), and Zone X (minimal risk areas outside the 1% and 0.2% annual-chance floodplains with no BFE or base flood depths determined)

Table B.3 – Bloomindale Flood Zones

Flood Zone	Area (Acres)	Area (Square Miles)	Percent of City (%)
A	1,345	2.1	15.0
AE	3,053	4.8	34.1
X	4,562	7.1	50.9
TOTAL	**8,960**	**14.0**	**100.0**

Source: FEMA, 2018

According to the 2018 FEMA data, 4,403.6 acres of the land within the City is located within a 100-year floodplain (Zone AE and A) which equals 48.7% of the City. An additional 761.8 acres are located within the 500-year floodplain (8.4% of the City). With over 48 percent of the City at high risk to flooding in the Special Flood Hazard Area (SFHA) and an additional 8 percent at moderate risk to flooding, the City of Bloomingdale should seek ways to balance future development with strategies to preserve sensitive lands and natural drainage features.

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, and the vegetation stabilizes soils during flooding. Natural floodplains in Bloomingdale include wetland areas and low-lying land along the major waterways in and around the City including the Little Ogeechee River, Hardin Canal, and Pipe Makers Canal. Natural floodplains reduce damage by allowing flood waters

to spread out over large areas, aiding infiltration into the ground, reducing flow rates and acting as a flood storage area to reduce downstream peaks. The City should strive to keep floodplain and floodplain waters free of contaminants such as oil, paint, anti-freeze, pesticides, and plastics and other trash. These chemicals and waste materials pollute local waterways, decreasing the water quality that local wildlife and plants depend upon.

Wetlands

Wetlands benefit the ecosystem by storing, changing, and transmitting surface water and groundwater. Through these processes pollution is removed, nutrients are recycled, groundwater is recharged, and biodiversity is enhanced. Wetland composition varies extensively, with five distinct categories for classification: Estuarine, Lacustrine, Marine, Palustrine, and Riverine systems Based on data from the National Wetland Inventory (NWI) wetlands throughout the City of Bloomindale are exclusively the palustrine type and include 2,512 acres (3.9 square miles) or 27.8% of the City (see the Wetland Map below).

Table B.4 – Wetlands

Wetland Type	Area (Acres)	Area (Sq. Miles)	Percent of City
Non-Wetland	6,535	10.2	72.2
Palustrine	2,512	3.9	27.8
TOTAL	**9,047**	**14.1**	**100.0**

Source: National Wetland Inventory

Figure B.3 – FEMA Flood Zones, 2018, Bloomingdale

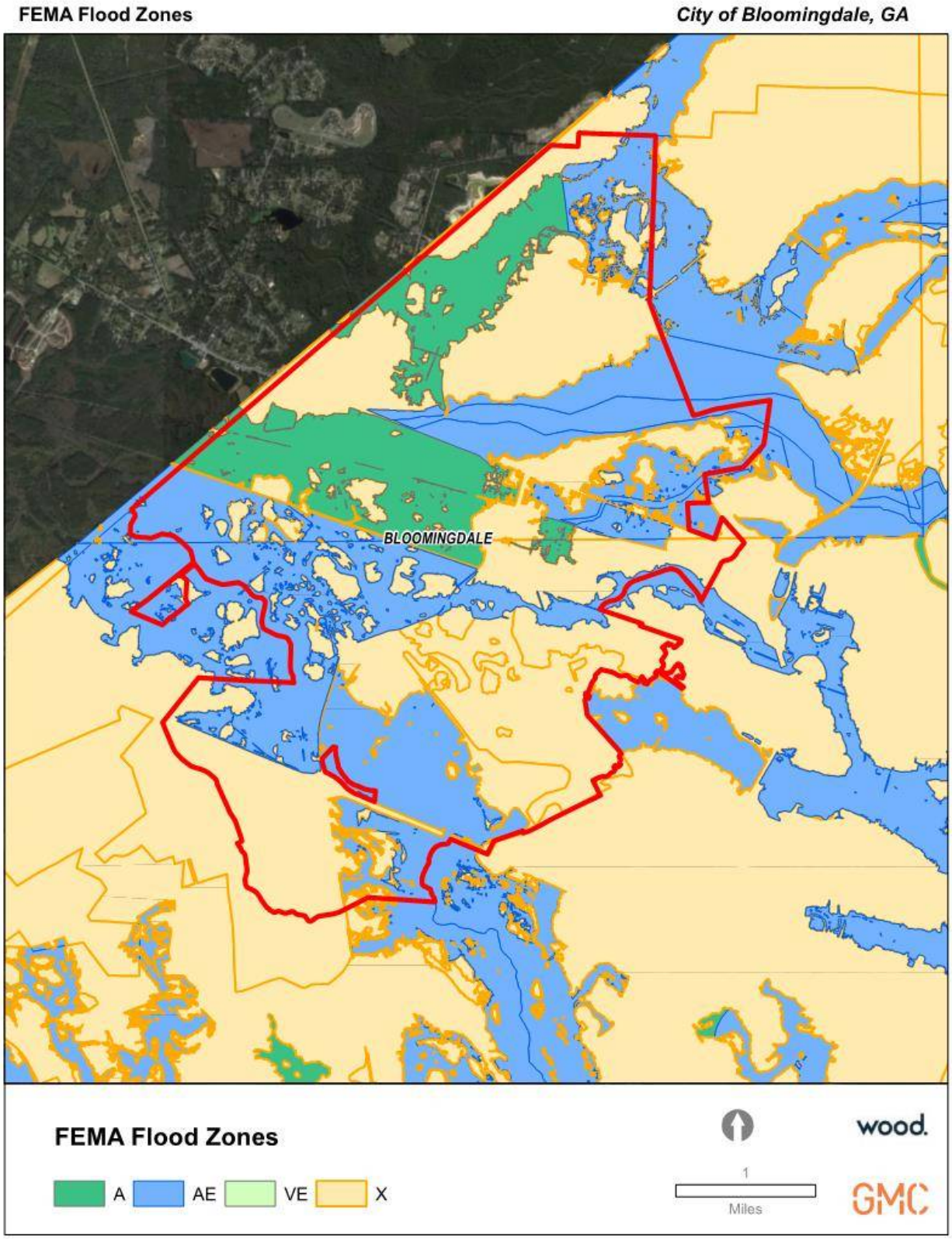
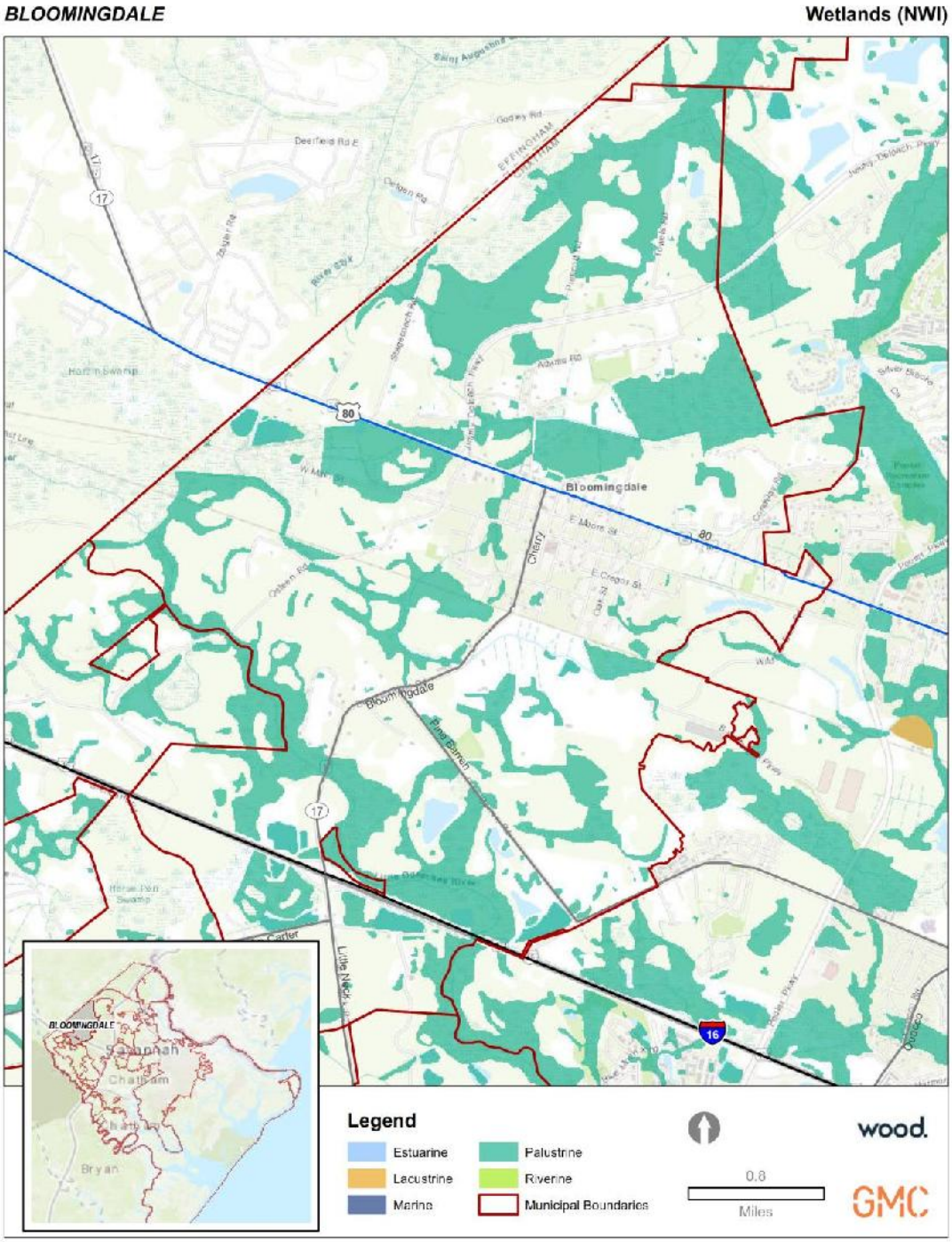
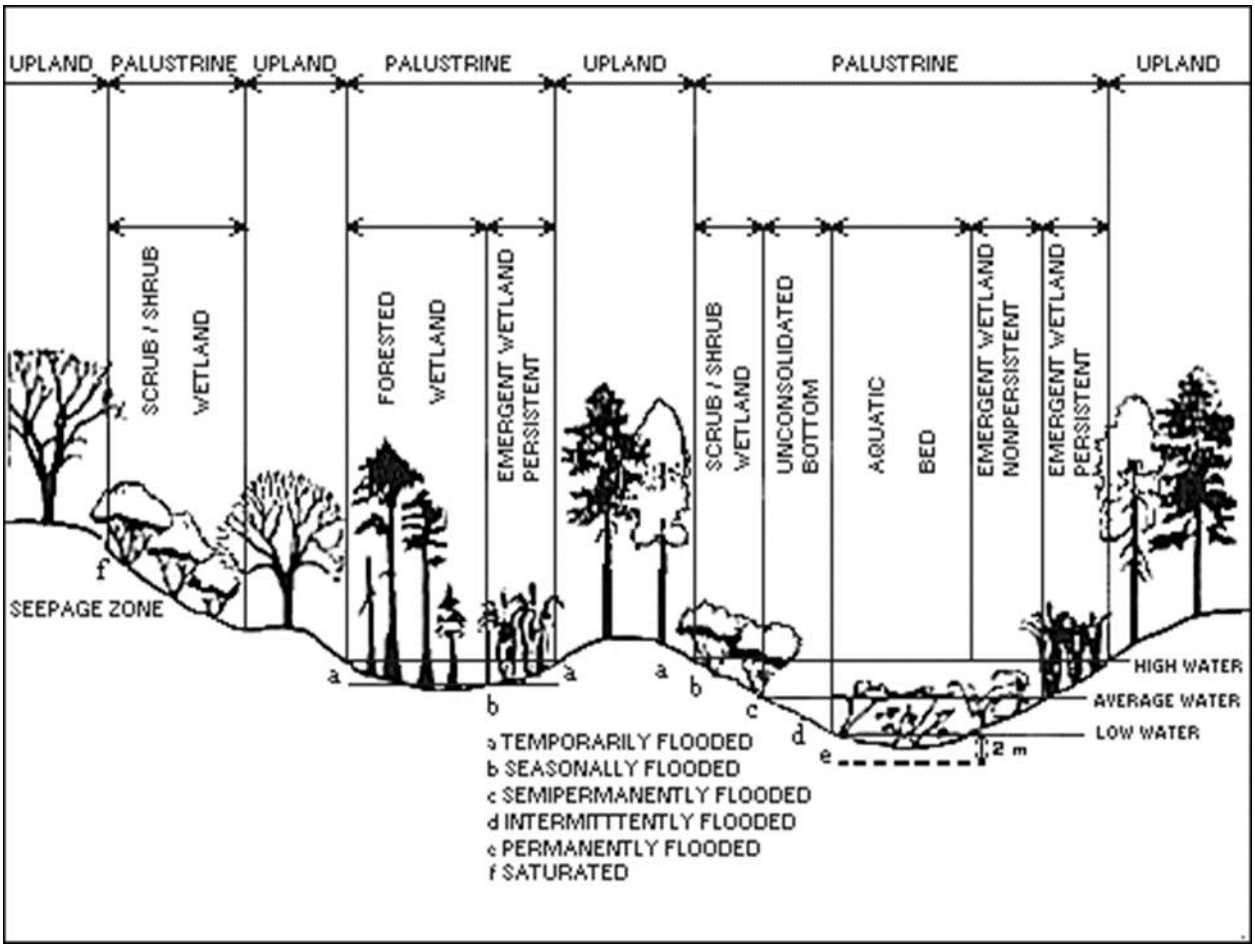


Figure B.4 – Wetland Map, Bloomingdale



Source: U.S. Fish & Wildlife Service, National Wetlands Inventory

The Palustrine (freshwater) system includes all non-tidal wetlands dominated by trees, shrubs, persistent emergent plants, emergent mosses or lichens, and all such wetlands that occur in areas where salinity due to ocean-derived salts is below 0.5%. The Palustrine system is bounded by upland.



Source: Classifications of Wetlands and Deepwater Habitats of the United States, U.S. Fish and Wildlife Service Report No. FWS/OBS-79/31.

B.2.4 Economy

B.2.4.1 Wages and Employment

Per the 2013-2017 American Community Survey 5-Year Estimates, the median household income for Bloomingdale is $55,485, which is over 4.07 percent higher than the state's median household income ($52,977). Approximately 13 percent (358) of the population is considered to be living below the poverty level. Moreover, 15.3 percent (421) of people under 18 years of age and 7.3 percent (201) of people 65 years and over are living below the poverty level.

The table below shows employment and unemployment rates along with industry employment by major classification for the City.

Employment and Occupation Statistics for Bloomingdale, GA, 2017

Employment Status	Count	Percentage (%)
In labor force	1,441	64.9
Employed	1,353	60.9

Unemployed	88	4.0
Armed Forces	0	0.0
Not in labor force	779	35.1
Occupation		
Management, business, science and arts	277	20.5
Service	302	22.3
Sales and office	343	25.4
Natural resources, construction and maintenance	167	12.3
Production, transportation and material moving	264	19.5

Source: U.S. Census Bureau, 2013-2017 American Community Survey 5-Year Estimates

Major industry sectors in the City of Bloomingdale include management, business, science, and arts (20.5%); service (22.3%); and sales and office (25.4%); natural resources, construction, and maintenance (12.3%); and production, transportation, and material moving (19.5%).

Major employers are discussed in the Chatham County Community Profile.

B.2.5 Housing

According to the 2013-2017 ACS 5-Year Estimates, there are 1,182 housing units in Bloomingdale, of which 94.2 percent (1,113) are occupied. Approximately 60.6% (674) of occupied units are owner-occupied (39.4% / 439 occupied by renters). A high percentage of renters is an indicator of higher pre- and post-disaster vulnerability because renters often do not have the financial resources of homeowners, are more transient, are less likely to have information about or access to recovery aid following a disaster, and are more likely to require temporary shelter following a disaster. Therefore, higher rates of home rentals in Bloomingdale may indicate that residents are not able to implement certain types of mitigation in their homes.

Median home value in Bloomingdale is $137,500. Of the town's owner-occupied housing units, 51.0 percent (344) have a mortgage. Most householders (63.8 percent / 711) moved into their current homes since the year 2000; 20.5 percent (228) moved in between 2000 and 2009, and 29.6 percent (330) moved in between 2010 and 2014. 3.7 percent (41) of occupied housing units have no vehicle available to them, which suggests these residents may have difficulty in the event of an evacuation.

The majority (79.9% / 945) of housing units in Bloomingdale are detached single family homes. However, 17.5 percent (207) of units are mobile homes which can be more vulnerable to certain hazards, such as tornadoes and wind storms, especially if they aren't secured with tie downs.

The town's housing stock is aging, with the majority (77.6% / 918) of occupied housing built before 2000. Table H.7 details housing age in the town.

Table B.5 – Housing Age

Year Structure Built	Percent of Occupied Housing	Number of Structures
2014 or later	1.0	12
2010 to 2013	0.8	9
2000 to 2009	20.6	243
1980 to 1999	33.0	390
1960 to 1979	22.2	263
1940 to 1959	16.1	1,912
1939 or earlier	6.3	74

Source: U.S. Census Bureau, American Community Survey 2013-2017 5-Year Estimates

Age can indicate the potential vulnerability of a structure to certain hazards. For example, the City of Bloomingdale first entered the National Flood Insurance Program in 2000. Therefore, based on housing age estimates at least 77.6 percent of housing in the town was built before any floodplain development restrictions were required.

B.2.6 Population

According to the U.S. Census Bureau, Bloomingdale had an estimated population of 2,739 residents in 2017 and a population of 2,680 at the time of the 2010 U.S. Census (2.2% increase from 2010-2017). As of 2017, Bloomingdale's population density was 196 persons per square mile. The table below provides demographic profile data from the 2017 American Community Survey 5-Year Estimates.

Table B.6 – Town of Bloomingdale Demographic Profile Data, 2017

Demographic	Bloomingdale
Gender/Age	
Male	1,455
Female	1,225
Under 5 Years	142
65 Years and Over	316
Race/Ethnicity (One Race)	
White	2,241
Black or African American	391
American Indian/Alaska Native	0
Asian	10
Two or More Races	31
Hispanic or Latino[1]	77
Education	
High School Graduate or Higher	744
Bachelor's Degree or Higher	290

Source: U.S. Census Bureau, 2013-2017 American Community Survey 5-Year Estimates
[1]Hispanics may be of any race, so also are included in applicable race categories.

B.2.7 Land Use

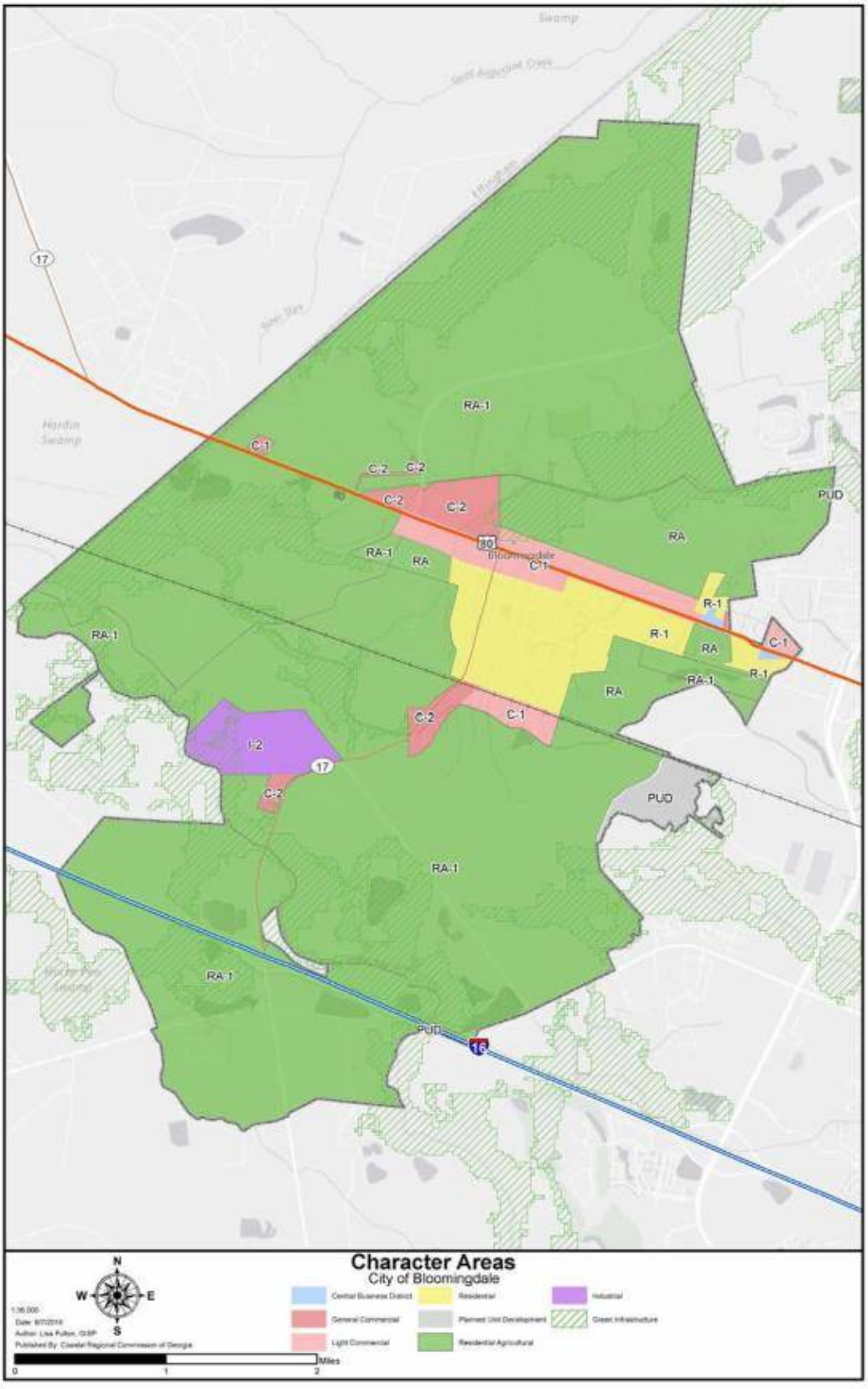
The City of Bloomingdale's 2016 Comprehensive Plan identifies the City's current zoning designations, character areas, and future land use to guide decision making related to future land development.

B.2.7.1 Character Areas

The Character Areas established by the Comp Plan for the City of Bloomingdale include:

- Agriculture: Applied to land which is, or should be developed for agriculture, single family homes, and mobile homes.
- One-Family Residential: Located in the core of the City and will remain residential.
- Central Business District: Intended to create a vibrant mixed-use district along U.S. Hwy. 80 where commercial development will be focused.
- General Commercial: Bloomingdale's primary commercial area along U.S. Hwy. 80 towards Pooler and along U.S. Hwy. 17 / Bloomingdale Road.
- Extensive Industry: Intended for retaining and expanding industry along Jimmy Deloach Parkway.

Figure B.5 – Character Area Map



B.2.7.2 Zoning

The City's Zoning Map represents the City's current zoning districts.

Land Use Districts	Description	Zoning Categories
R-A Agricultural	Permitted Uses: General farming, raising of farm animals and poultry. Single-family dwellings. Conditional Uses: Utilities, business and light industry related to agriculture.	R-A
RA-1 Agricultural	Permitted Uses: All uses included in R-A plus individual mobile homes.	RA-1
PEH Park, Education, and Health	Permitted Uses: Parks, recreation, public and private schools, hospitals. Conditional Uses: Private day care centers, clinics, cemeteries.	PEH
PW Public works	Permitted Uses: Utilities, maintenance facilities, public garages, fire stations. Conditional Uses: Radio transmitting tower and waste disposal treatment.	PW
R-1: One-Family Residential	Permitted Uses: Low density single-family dwellings. Conditional Uses: Churches	R-1
R-2 One- and Two-Family Residential	Permitted Uses: Medium density one- and two-family dwellings, R-1 Uses. Conditional Uses: Churches, day care, and elderly care facilities.	R-1, R-2
R-3: Multiple Unit Residential	Permitted Uses: Medium-high density residential, multiple-family units, R-1, and R-2 uses. Conditional Uses: Churches, day care, and elderly care facilities.	R-1, R-2, and R-3
PUD Planned Unit Development	Permitted Uses: None Conditional Uses: All residential family units, agricultural, group housing, commercial, office or planned high standard combinations, industry, mobile homes, PW uses, and PEH uses	R-A, RA-1, PEH, PW, R-1, R-2, R-3, O-I, C-1, C-2, I-1, and I-2
O-I Office-Institutional	Permitted Uses: Office, public or semi-public institutional use, club, related nonretail use. Conditional Uses: Related services, limited retail business with parking in rear or side yard.	O-I

Land Use Districts	Description	Zoning Categories
C-1 Central Business District	Permitted Uses: Shops, services, and offices to serve a regional trade area. Conditional Uses: Drive-in service.	C-1
C-2 General Commercial	Permitted Uses: Retail, wholesale, storage, and services. Conditional Uses: Off-site signs, repair garages. R-1 uses.	C-2
I-1 Intensive Industry	Permitted Uses: Limited manufacturing, warehouses, repair garages, industrial parks. Conditional Uses: C-2 uses.	I-1
I-2 Extensive Industry	Permitted Uses: General manufacturing, large space users, I-1 uses. Conditional Uses: C-2 uses, junk, salvage yards.	C-2, I-1, I-2
N-C Neighborhood Commercial	Permitted Uses: Convenience Stores and services, R-1 uses. Conditional Uses: Auto service stations.	N-C
MHP Mobile Home Park	Permitted Uses: Mobile home park. Conditional Uses: none	MHP
PDOD Planned Development Overlay District	Permitted Uses: Areas within which comprehensive development plans shall be prepared and/or reviewed by the planning commission and approved by the mayor and council in order to secure an orderly development pattern. Conditional Uses: Those uses permitted in such districts shall be those uses permitted in the zoning district which they overlay.	PDOD

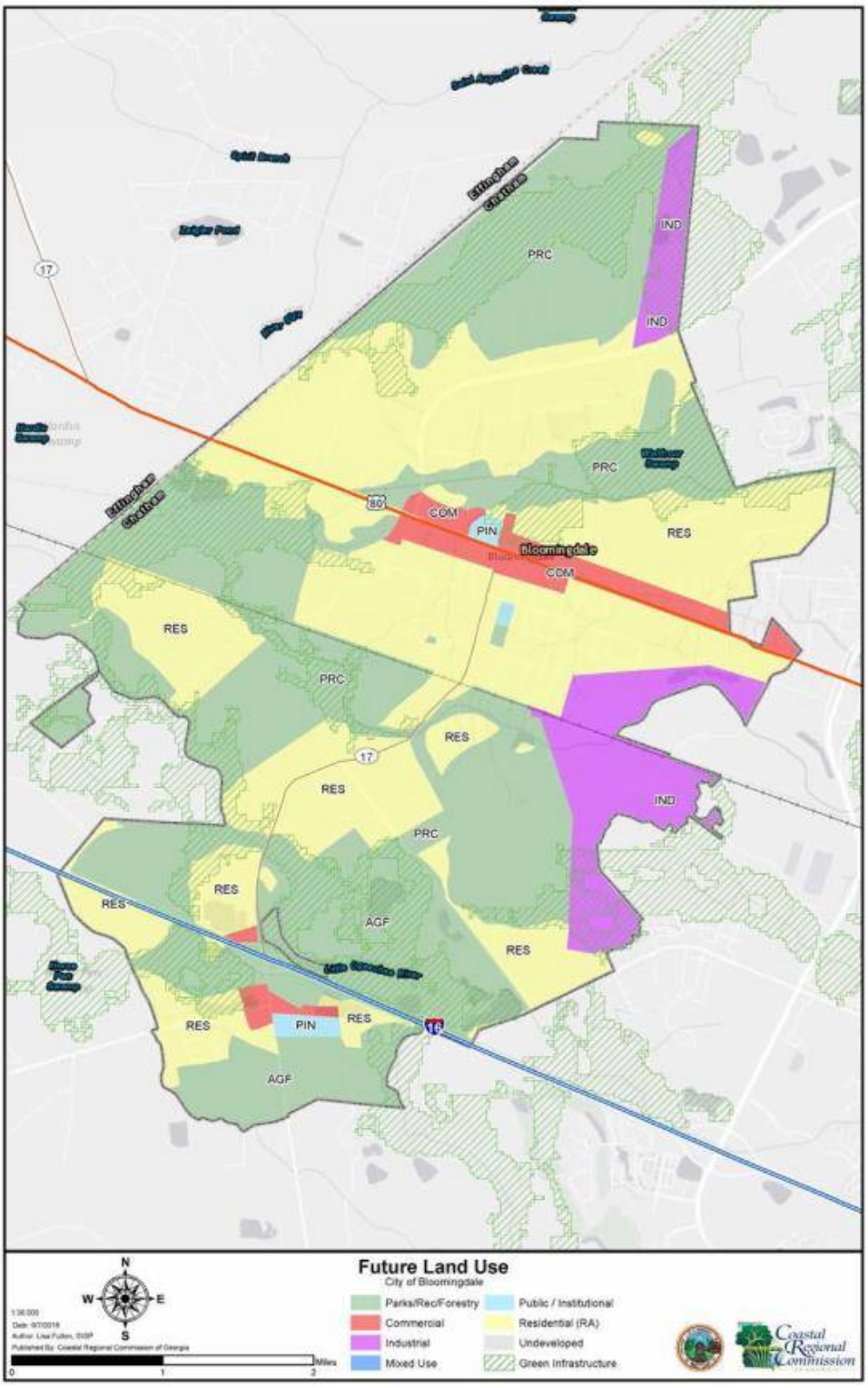
Source: 2016 Comprehensive Plan Update, City of Bloomingdale, GA

B.2.7.3 Future Land Use

The City's Future Land Use map includes the following categories:

- Residential: Predominately single-family and multi-family homes which make up the largest land use category in the City
- Commercial: Located along the corridor in the area of U.S. Hwy. 80
- Industrial: Area of majority of industrial development

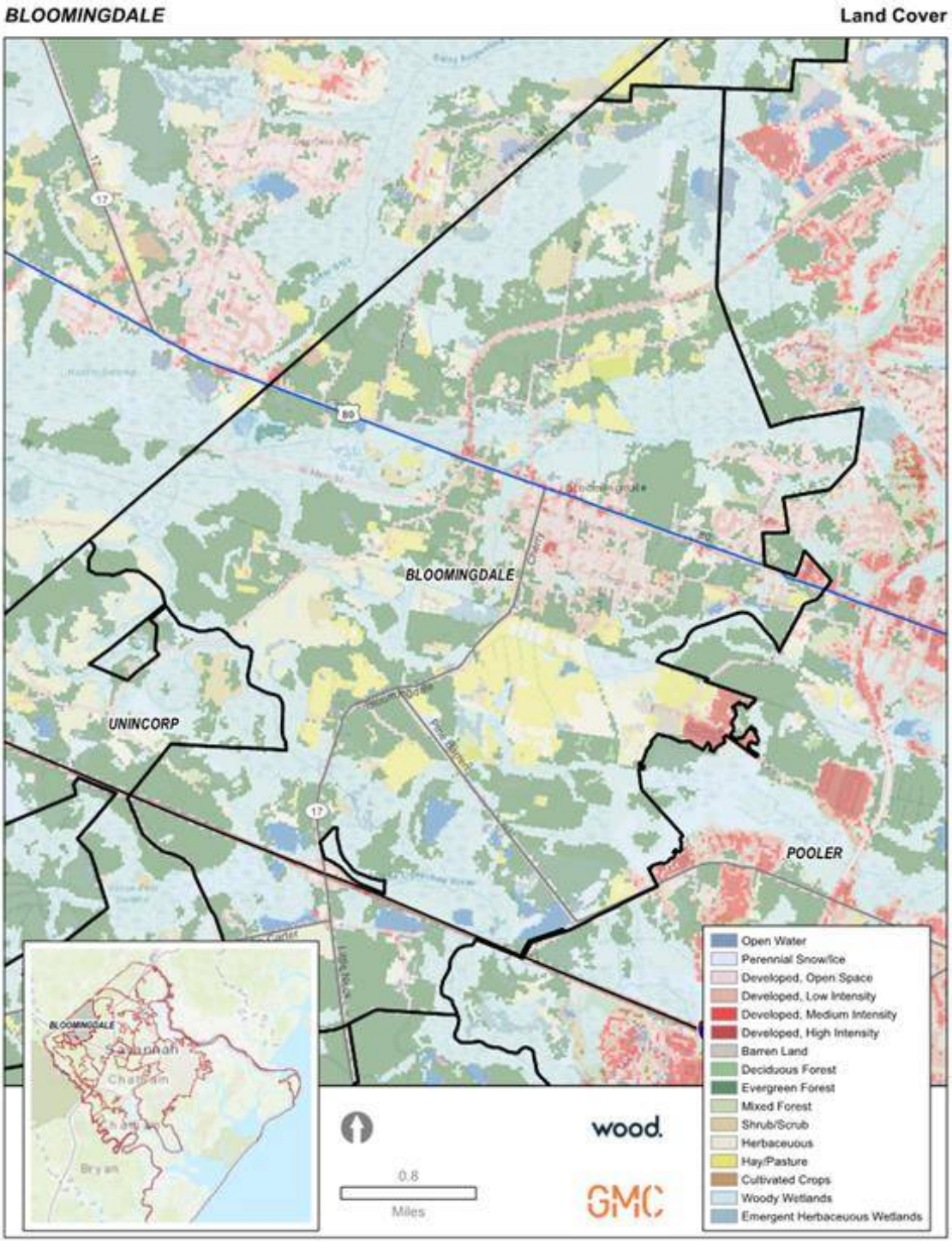
- Public / Institutional: Use consist of city hall, police and fire, schools, churches, the library, and museum
- Parks, Recreation, Forestry: Passive and active recreation locations
- Undeveloped: Undeveloped areas that may be developed in the future or reserved for conservation.



B.2.7.4 Land Cover

Land Cover data for the City of Bloomingdale was obtained from the 2016 National Land Cover Database provided by the Multi-Resolution Land Characteristics (MRLC) Consortium as shown in the figure below.

Figure B.6 – Bloomingdale Existing Land Cover



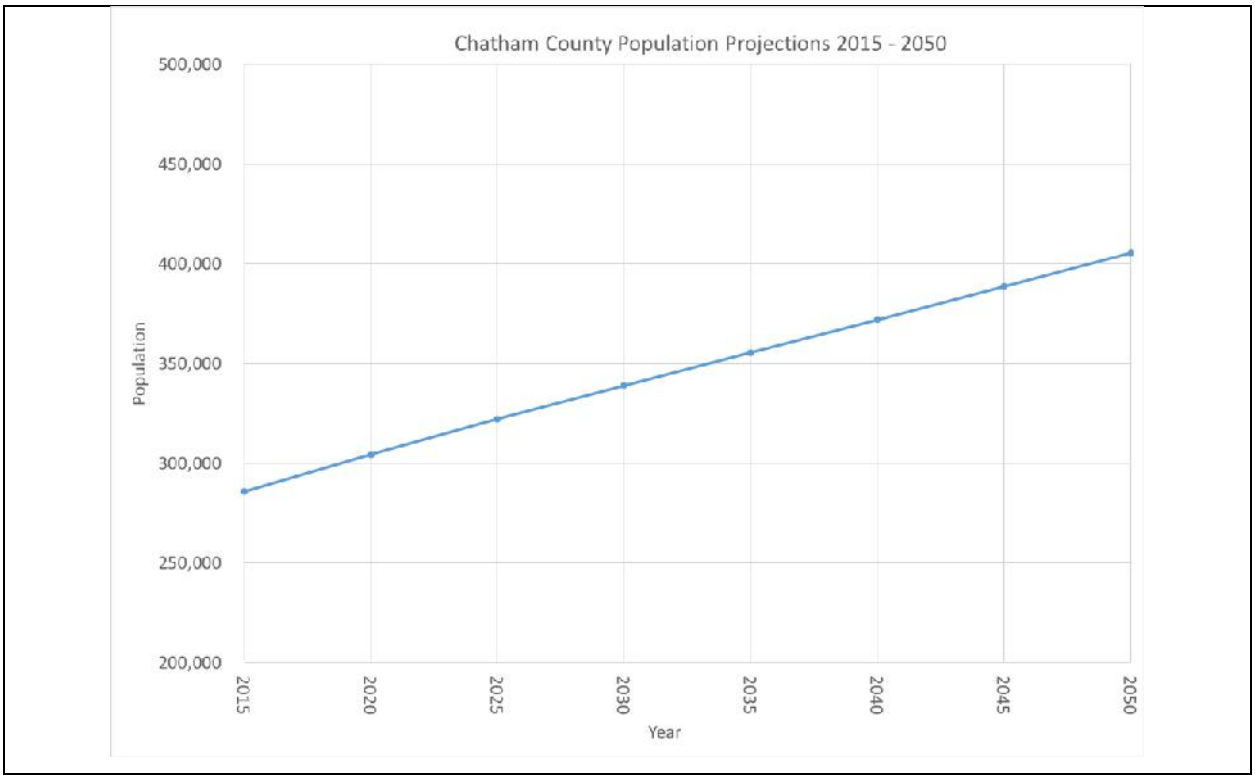
Source: 2016 National Land Cover Data Set

B.2.8 Growth and Development Trends

According to U.S. Census and American Community Survey population estimates, the City of Bloomingdale population has increased from 2,680 in 2010 to 2,739 in 2017 representing a total increase of 2.2% and an annual increase of 0.3%.

According to the Georgia Governor's Office of Planning and Budget (GOPB), Chatham County is projected to reach a population of 405,573 by 2050, which represents a 38% increase from the 2017 population. The population projections from the GOPB estimate the annual growth for the County to be about 1.1% through 2050.

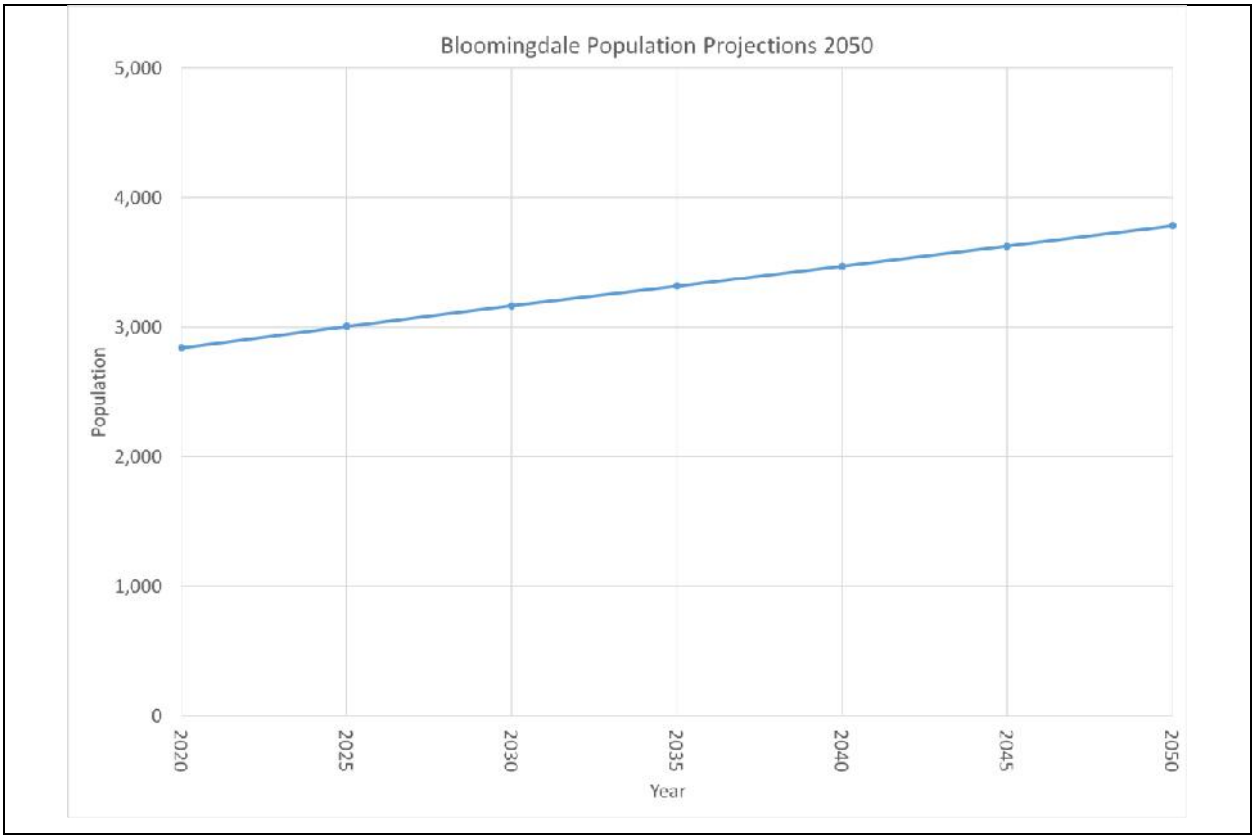
Figure B.7 – Population Projections for Chatham County 2013 - 2050



Source: Georgia Governor's Office of Planning and Budget

Using the projected growth rate for the County, the population of the City of Bloomingdale is expected to increase to 3,785 by 2050 as shown in the graph below.

Figure B.8 – 2050 Population Projections for City of Bloomingdale



B.3 ASSET INVENTORY

B.3.1 Property

Table B.7 – City of Bloomingdale Building Exposure

Occupancy Type	Total Number of Buildings	Total Building Value	Estimated Content Value	Total Value
Commercial	147	$28,996,443.30	$28,996,443.30	$57,992,886.60
Industrial	20	$19,926,798.00	$29,890,197.00	$49,816,995.00
Residential	1,375	$80,306,328.00	$40,153,164.00	$120,459,492.00
Total	**1,542**	**$129,229,569.30**	**$99,039,804.30**	**$228,269,373.60**

Source: Chatham County

B.3.2 Critical Facilities

Table B.8 – Critical Facilities and Infrastructure at Risk

ID	PRIORITY CRITICAL FACILITY NAME	PHYSICAL ADDRESS	LAT	LONG	REASON				
					COG	Life Safety	Debris	Support	Other
B-1	Bloomingdale City Hall	8 W. Hwy 80	32.1336	-81.3019	X				
B-2	Bloomingdale Police Dept.	#6 Adams Rd.	32.1335	-81.3018		X			
B-3	Bloomingdale Fire Dept.	104 W US Hwy 80	32.1339	-81.3028		X			
B-4	Bloomingdale Public Works	Adams Rd.	32.1341	-81.3037			X		
B-5	Bloomingdale Lift Station	609 E. Main St.	32.1268	-81.2936				X	
B-6	Bloomingdale Well #2	#3 Adams Rd.	32.1336	-81.3025					
B-7	Bloomingdale Well #1(B-3 Generator)	205 Poplar St.	32.1271	-81.2985				X	

Source: Chatham County

B.4 RISK ASSESSMENT

This section contains a hazard profile and vulnerability assessment for those hazards that were rated with a higher priority for the City of Bloomingdale than for Chatham County as a whole. Risk and vulnerability findings are also presented here for those hazards that are spatially defined and have variations in risk that could be evaluated quantitatively on a jurisdictional level. The hazards included in this section are: Flood and Wildfire.

B.4.1 Flood

Approximately 50 percent of the Bloomindale falls within the mapped 1%-annual-chance floodplains. Figure B.9 reflects the mapped flood hazard zones for the City of Bloomingdale, and Figure B.10 displays the depth of flooding estimated to occur in these areas during the 1%-annual-chance flood. The data in this risk assessment is based off FEMA's 2014 DFIRM. Minor changes have since been made and the updated 2018 DFIRM can be seen in Figure B.3 for comparison.

Properties at risk are detailed by flood zone in Table B.9, below. Parcel data was used to assess how many buildings are in hazard areas based on each parcel's centroid.

Table B.9 – Properties at Risk by Flood Zone, Bloomingdale

Flood Zone	Number of Buildings	Total Building Value
A	205	$11,035,589.00
AE	230	$16,141,054.33
0.2% Annual Chance Flood Hazard	25	$2,420,053.33
X	1,082	$99,632,872.60
Total	**1,542**	**$129,229,569.27**
SFHA Total	**435**	**$27,176,643.33**

Source: FEMA 2014 DFIRM & Chatham County parcel and building footprint data, 2019

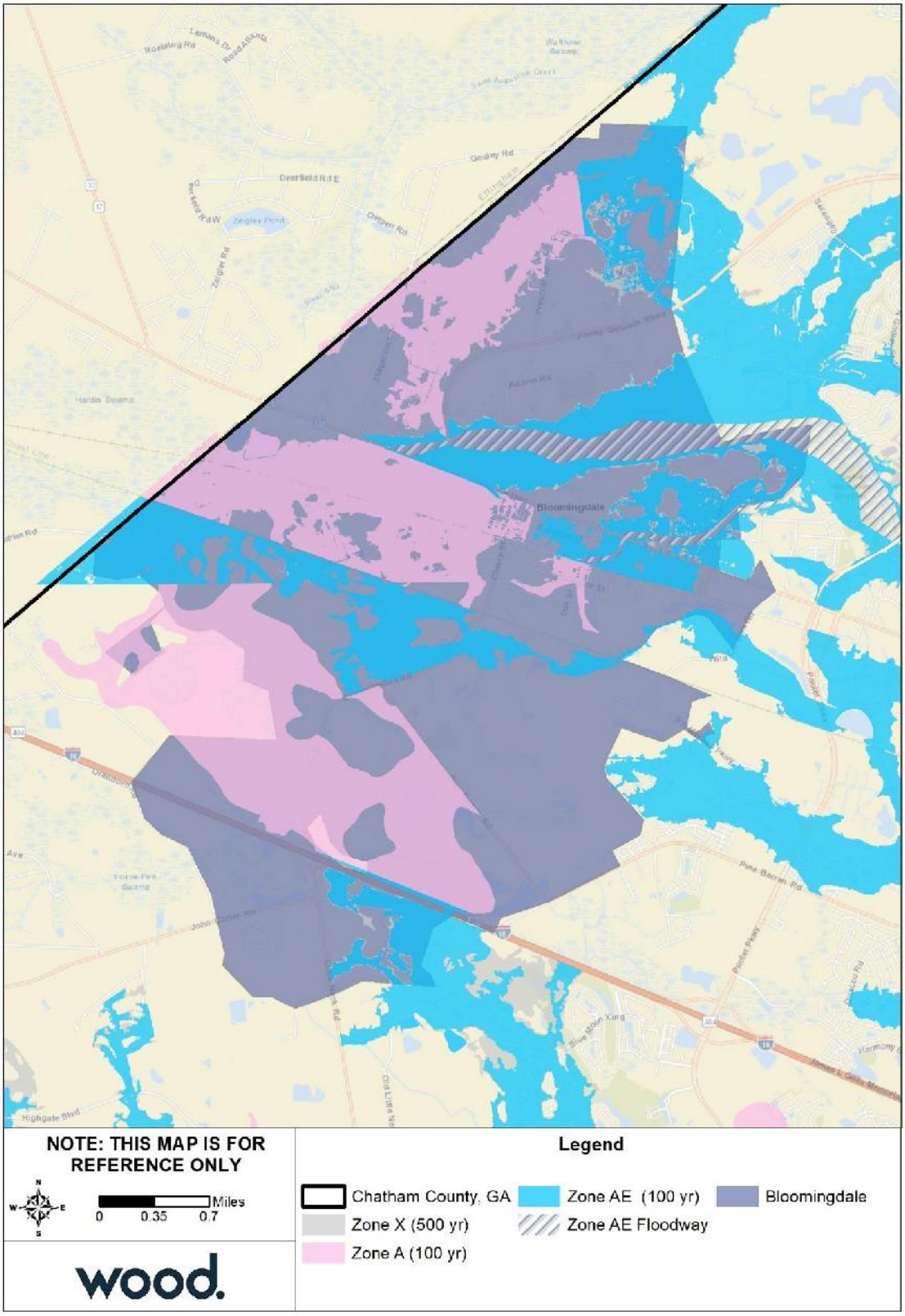
Table B.10 provides building counts and estimated damages by occupancy type for the 1% annual chance flood event.

Table B.10 – Bloomingdale Estimated Building Damage and Content Loss, 1% Annual Chance Flood

Occupancy	Buildings Impacted	Building and Contents Cost	Estimated Building Damages	Estimated Content Damages	Loss Estimate
Commercial	9	$2,092,100.00	$16,361.88	$43,168.65	2.85%
Industrial	3	$2,500,062.50	$47,806.67	$100,593.54	5.94%
Residential	179	$13,865,842.50	$810,577.24	$482,061.62	9.32%
Total	**191**	**$18,458,005.00**	**$874,745.79**	**$625,823.81**	**8.13%**

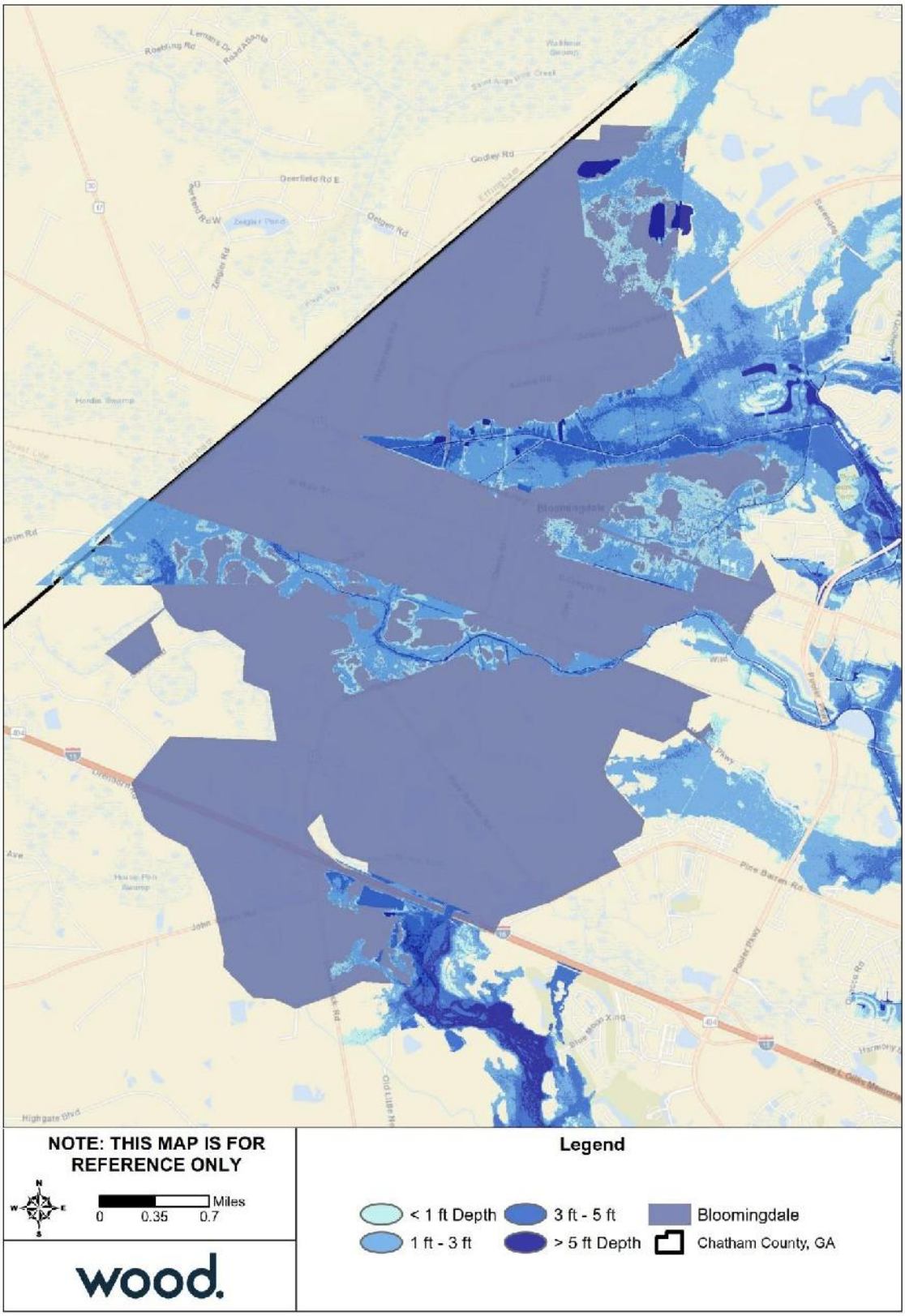
Source: Hazus

Figure B.9 – FEMA Flood Hazard Areas, City of Bloomingdale



Source: FEMA 2014 DFIRM

Figure B.10 – Flood Depth, 1%-Annual-Chance Floodplain, City of Bloomingdale



Source: FEMA 2014 DFIRM

B.4.2 Wildfire

Table B.11 summarizes the acreage in the City of Bloomingdale that falls within the Wildland Urban Interface (WUI), categorized by housing density. Areas in the WUI are those where development may intermix with flammable vegetation. 36 percent of the City of Bloomindale is not included in the WUI.

Table B.11 – Wildland Urban Interface Acreage, City of Bloomingdale

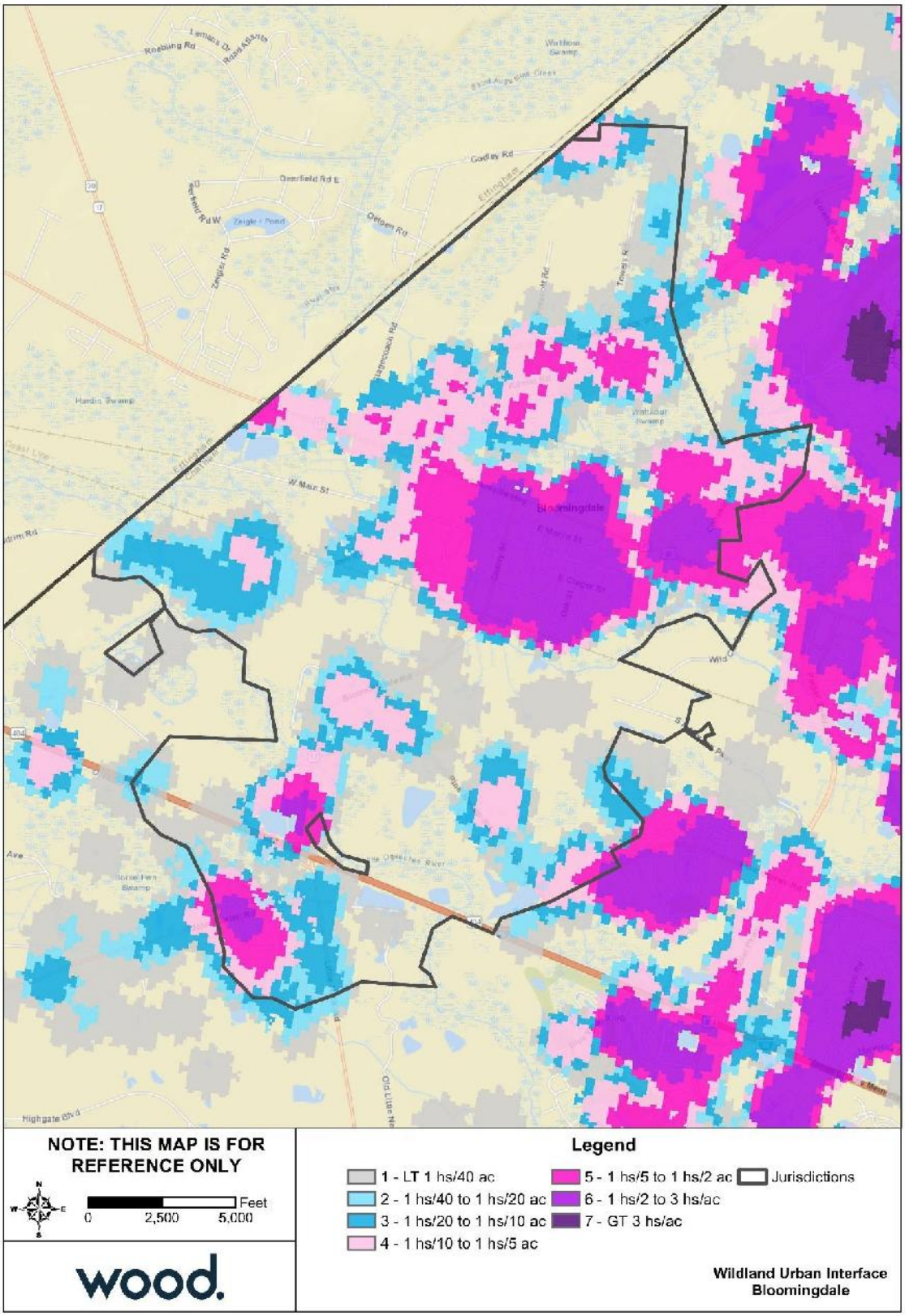
	Housing Density	Total Acreage	Percent of Total Acreage
	Not in WUI	*3,234.1*	*36.0%*
	LT 1hs/40ac	1,302.9	14.5%
	1hs/40ac to 1hs/20ac	694.7	7.7%
	1hs/20ac to 1hs/10ac	1,046.4	11.7%
	1hs/10ac to 1hs/5ac	1,181.9	13.2%
	1hs/5ac to 1hs/2ac	809.2	9.0%
	1hs/2ac to 3hs/1ac	706.7	7.9%
	GT 3hs/1ac	0	0%
	Total	**8,975.9**	

Source: Southern Wildfire Risk Assessment

Figure B.11 depicts the WUI for the City of Bloomingdale. The WUI is the area where housing development is built near or among areas of vegetation that may be prone to wildfire. Figure B.12 depicts the Fire Intensity Scale, which indicates the potential severity of fire based on fuel loads, topography, and other factors. Figure B.13 depicts Burn Probability based on landscape conditions, percentile weather, historical ignition patterns, and historical prevention and suppression efforts.

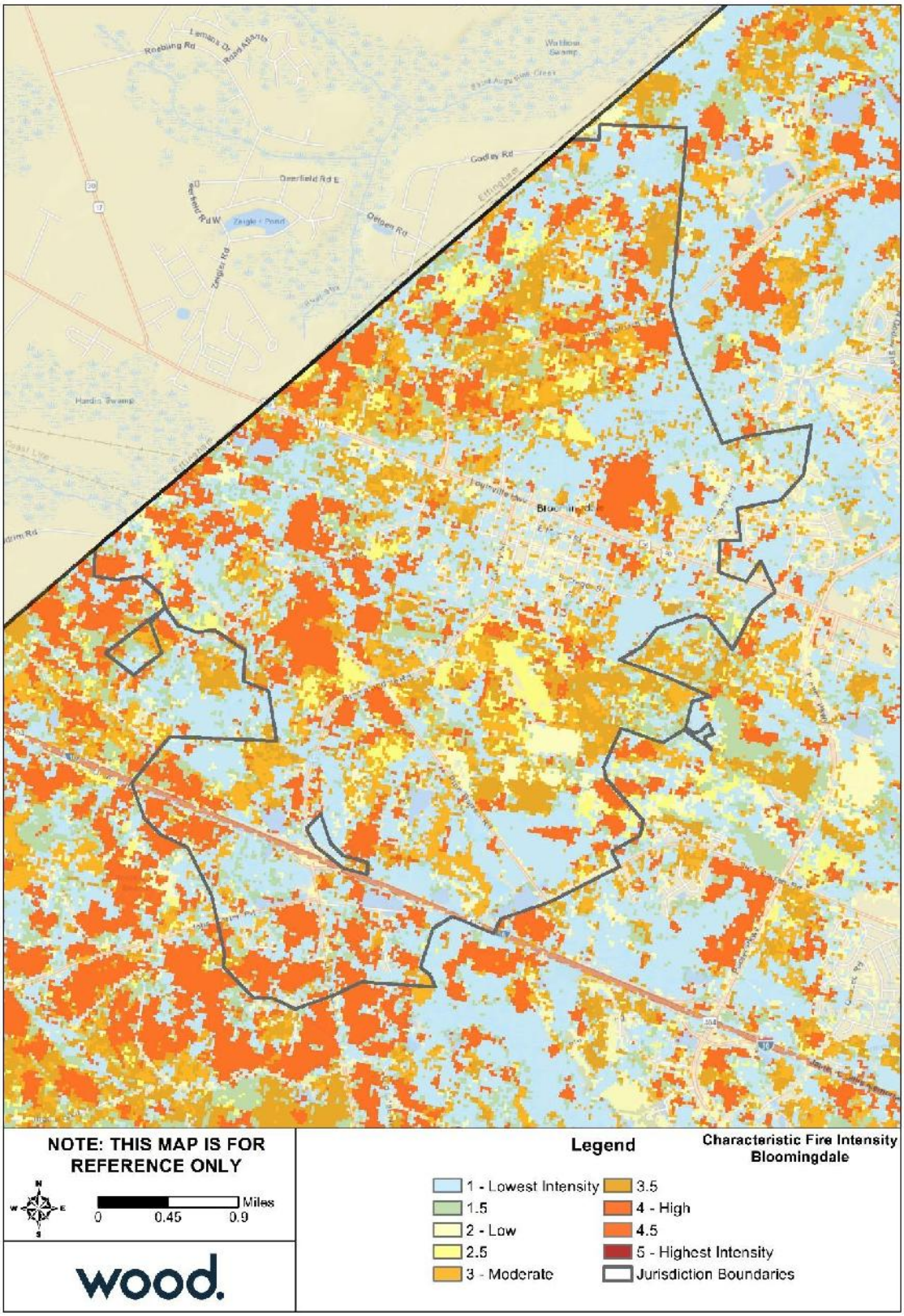
Potential fire intensity varies widely across the City but is highest in south and southwestern areas of the City; however, these areas have relatively low burn probability and are largely outside of the WUI, meaning little to no development is at risk. The area of greatest risk in the City is centrally located southeast where parts of the WUI overlay with moderate fire intensity, but still lower burn probability.

Figure B.11 – Wildland Urban Interface, City of Bloomindale



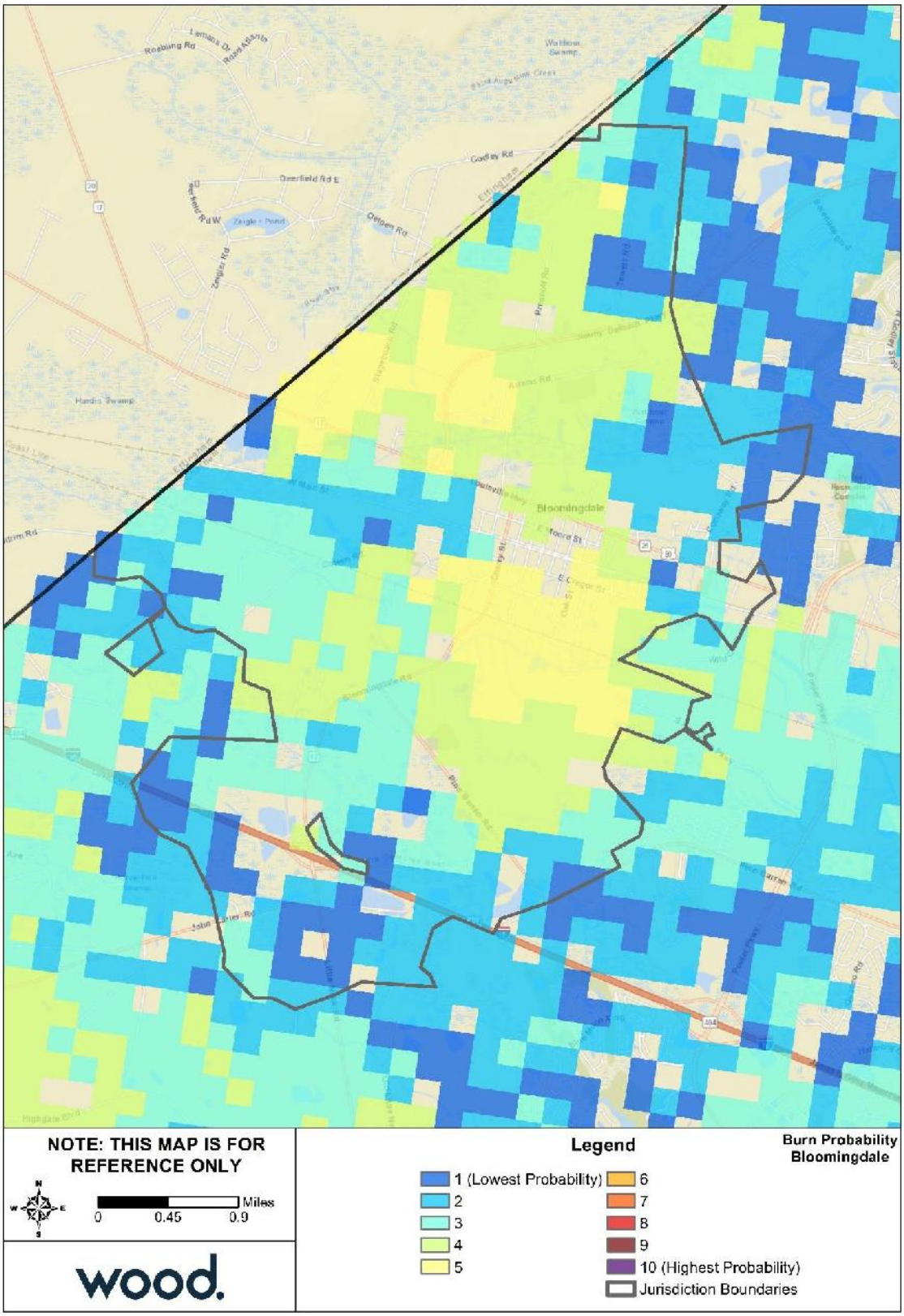
Source: Southern Wildfire Risk Assessment

Figure B.12 – Fire Intensity Scale, City of Bloomingdale



Source: Southern Wildfire Risk Assessment

Figure B.13 – Burn Probability, City of Bloomingdale



Source: Southern Wildfire Risk Assessment

B.1 FLOODPLAIN MANAGEMENT CAPABILITY ASSESSMENT

The City of Bloomingdale joined the NFIP emergency program in 1975 and has been a regular participant in the NFIP since July 1981. The following tables reflect NFIP policy and claims data for the City categorized by structure type, flood zone, Pre-FIRM and Post-FIRM. Zones with no policies or closed paid losses were left out of the tables below.

Table B.12 – NFIP Policy and Claims Data by Structure Type

Structure Type	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
Single Family	189	$147,275	$42,505,400	20	$285,688.68
2-4 Family	0	$0	$0	1	$7,652.39
Non Residential	6	$6,598	$1,825,000	0	$0.00
Total	**195**	**$153,873**	**$44,330,400**	**21**	**$293,341.07**

Source: FEMA Community Information System, accessed September 2019

Table B.13 – NFIP Policy and Claims Data by Flood Zone

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	75	$66,273	$14,629,800	4	$35,901.45
A Zones	38	$48,011	$6,555,500	10	$184,644.78
B, C & X Zone					
Standard	34	$22,012	$8,620,100	2	$6,852.69
Preferred	48	$17,577	$14,525,000	5	$65,942.15
Total	**195**	**$153,873**	**$44,330,400**	**21**	**$293,341.07**

Source: FEMA Community Information System, accessed September 2019

Table B.14 – NFIP Policy and Claims Data Pre-FIRM

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	28	$33,580	$3,660,200	4	$35,901.45
A Zones	19	$27,713	$2,694,800	10	$184,644.78
B, C & X Zone	30	$14,231	$8,499,300	5	$61,594.06
Standard	14	$8,389	$3,494,300	1	$6,034.39
Preferred	16	$5,842	$5,005,000	4	$55,559.67
Total	**77**	**$75,524**	**$14,854,300**	**19**	**$282,140.29**

Source: FEMA Community Information System, accessed September 2019

Table B.15 – NFIP Policy and Claims Data Post-FIRM

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	47	$32,693	$10,969,600	0	$0.00
A Zones	19	$20,298	$3,860,700	0	$0.00
B, C & X Zone	52	$25,358	$14,645,800	2	$11,200.78
Standard	20	$13,623	$5,125,800	1	$818.30
Preferred	32	$11,735	$9,520,000	1	$10,382.48

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
Total	**118**	**$78,349**	**$29,476,100**	**2**	**$11,200.78**

Source: FEMA Community Information System, accessed September 2019

B.2 MITIGATION STRATEGY

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Lead Agency / Department	Potential Funding Source	Implementation Timeline	2020 Status	2020 Implementation Status Comments
				Property Protection					
PP-1	Harden roof, windows, doors and rooftop units for critical facilities	All	1.1	Moderate	City Administration	PDM; HMGP	2020	Carry Forward	Revised to include all critical facilities.
PP-2	Anchor HVAC units and Storage Tanks	Flood, Hurricane	1.1	High	City Administration	HMGP, Local Funds	2021	New	
PP-3	Acquire or elevate properties prone to flooding	Flood, Hurricane	1.1	Moderate	City Administration	HMGP, Local Funds	2020	New	
PP-4	Elevate or dry floodproof components or systems vulnerable to flood damage	Flood, Hurricane	1.1	High	City Administration	HMGP, Local Funds	2020	New	
				Structural Projects					
SP-1	Construct and/or improve drainage systems to alleviate drainage issues	Flood, Thunderstorms	1.1	Moderate	City Public Works	Local Funds	2020-2025	New	
				Emergency Services					
ES-1	Fixed site generators for critical facilities	All	1.1	High	City Administration	HMGP, Local Funds	2020-2025	New	
ES-2	Portable generators for critical facilities	All	1.1	High	City Administration	HMGP, Local Funds	2020-2025	Carry Forward	Revised to include all critical facilities. Incomplete due to lack of funding.
ES-3	Purchase and install generator quick connects and transfer switches for critical facilities	All	1.1	High	City Administration	HMGP, Local Funds	2020-2025	New	
				Public Education and Awareness					
PEA-1	Increase public education and awareness utilizing an all-hazards approach in the City via various outreach methods (print, tv, radio, social media, etc.)	All	2.2	High	City Administration	Local Funds	2020	New	

Annex C City of Garden City

C.1 PLANNING PROCESS

The table below lists the HMPC members who represented the City of Garden City.

Table C.1 – HMPC Members

Member Name	Title	Agency/Department
Corbin Medeiros	Fire Chief	Fire Department
Jackie Jackson	Special Projects Coordinator	Garden City
Gerald Ethridge	Citizen	Garden City

C.2 COMMUNITY PROFILE

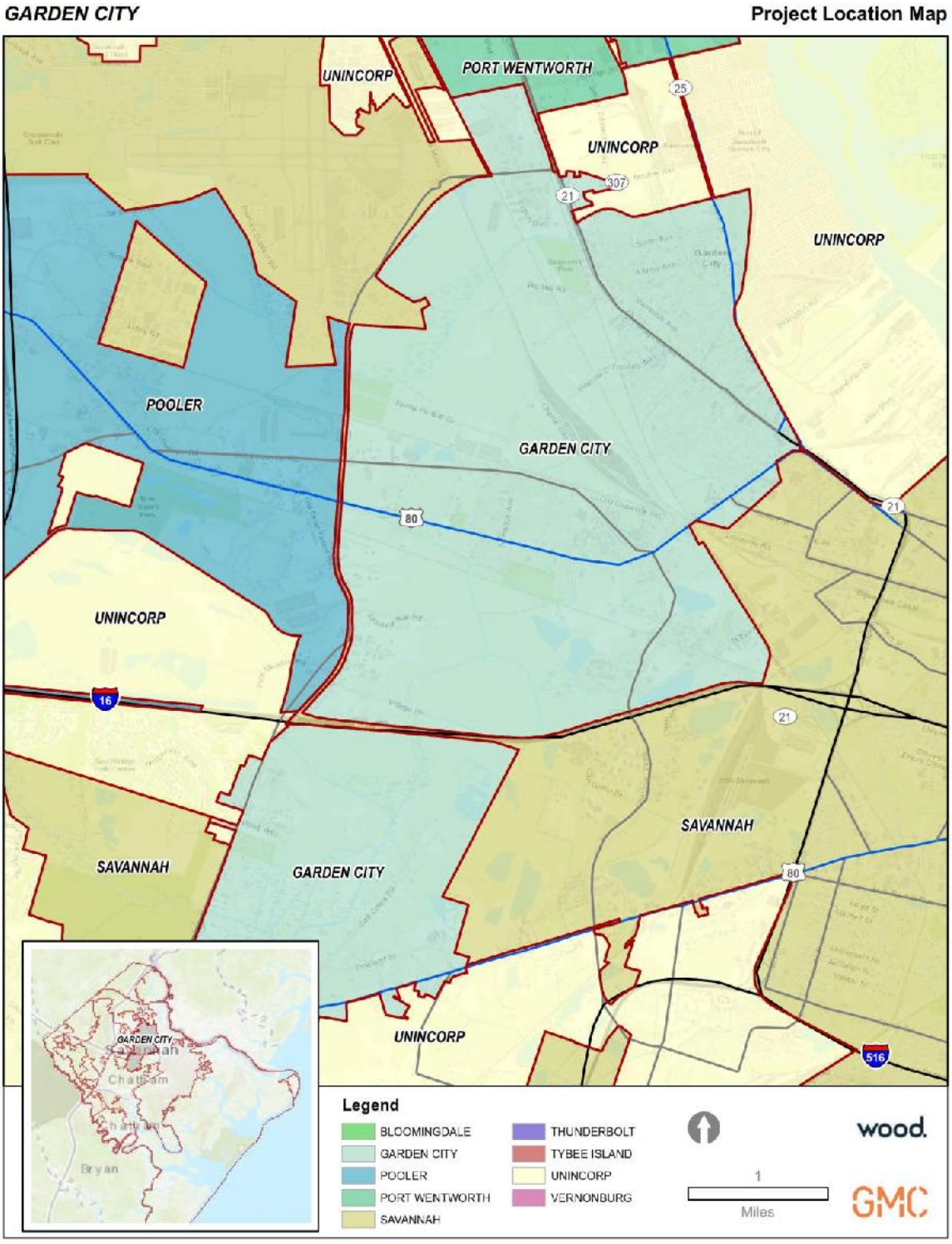
C.2.1 Overview of the Community

Garden City is located northwest of the center of Chatham County. It is bordered to the southeast by the City of Savannah, to the west by the City of Pooler, and to the north by the City of Port Wentworth. Garden City has a total area of 14.2 square miles of which 13.7 square miles are land 0.62 square miles (4.4%) are water.

According to the U.S. Census, the population of Garden City in 2017 was estimated to be 8,961. Therefore, the population density in 2017 is approximately 631 per square mile. Garden City is home to much of the heavy industry in Chatham County and is adjacent to the Port of Savannah a major U.S. seaport operated by the Georgia Ports Authority.

The Location Map below reflects Garden City's boundaries and shows the City's location within the county and in relation to surrounding municipalities.

Figure C.1 – Location Map, Garden City



C.2.2 Geography and Climate

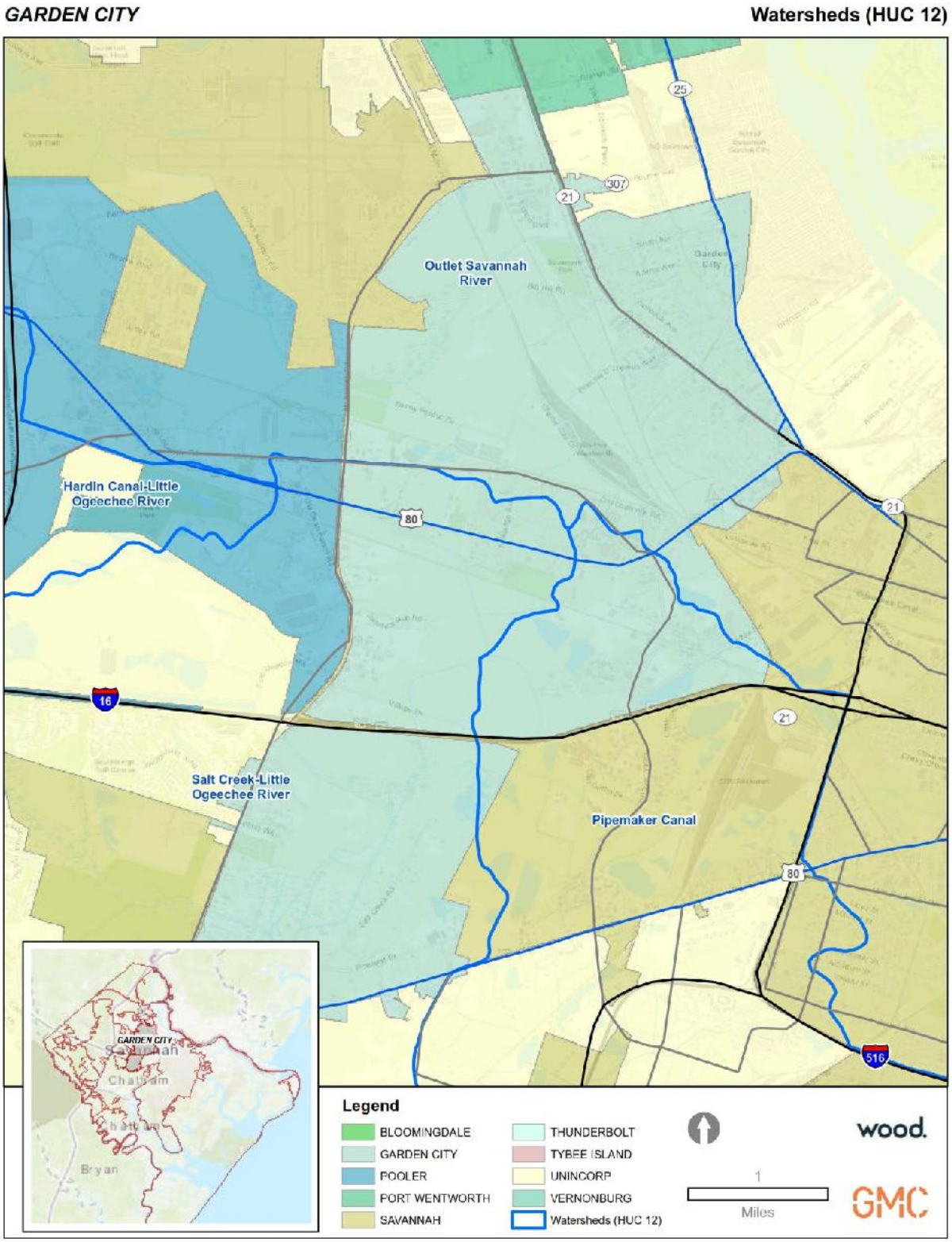
Please refer to Chatham County Community Profile for a summary of climate for Chatham County.

Portions of Garden City lie within 3 (3) different HUC 12 watersheds as summarized in the table below and shown in the HUC 12 Watersheds figure.

Table C.2 – HUC 12 Watersheds

HUC 12 Watershed Name	HUC 12 #
Salt Creek – Little Ogeechee River	030602040203
Outlet Savannah River	030601090307
Pipemakers Canal	030302040202

Figure C.2 - HUC 12 Watersheds



C.2.3 Cultural, Historic and Natural Resources

C.2.3.1 Cultural and Historic Resources

Garden City has two branches of the Live Oak Public Library System: Garden City Branch located at 104 Sunshine Avenue and the Port City Branch located at 3501 Houlihan Avenue.

The oldest residence in Garden City is the Dotson House which was built in 1850 and moved from the area of George A. Mercer School to the site of the current town center. Garden City has no listings on the National Register of Historic Places.

C.2.3.2 Parks, Preserves, and Conservation

Garden City has five public parks as summarized in the table below.

Table C.3 – Garden City Parks

Park	Location	Primary Use	Monuments/Facilities
Bazemore Park	1 Bud Brown Drive	Recreational	Baseball Complex
Griffin Park	500 Griffin Road	Recreational	Playground
The Park at Sharon Park	507 Sharon Park Drive	Recreational	Playgrounds (2), gazebo, pond, and hiking trail
Town Green	100 Central Avenue	Esthetic	Fountain and benches
Volunteer Park	5100 Augusta Road (Hwy. 21)	Commemorative	Fountain and benches

Volunteer Park

C.2.3.3 Natural Resources

Floodplains and Flood Zones

FEMA flood zone designations within Garden City are identified in the figure below. The flood hazard areas shown are designated by the Federal Emergency Management Agency (FEMA) and include: Zone A (subject to inundation by the 1% annual-chance flood event with no base flood elevation (BFE) determined), Zone AE (subject to inundation by the 1% annual-chance flood event with BFE determined),

Zone VE (subject to inundation by the 1% annual-chance flood event with additional hazards due to storm waves with BFE determined), and Zone X (minimal risk areas outside the 1% and 0.2% annual-chance floodplains with no BFE or base flood depths determined)

Table C.4 – Garden City Flood Zones

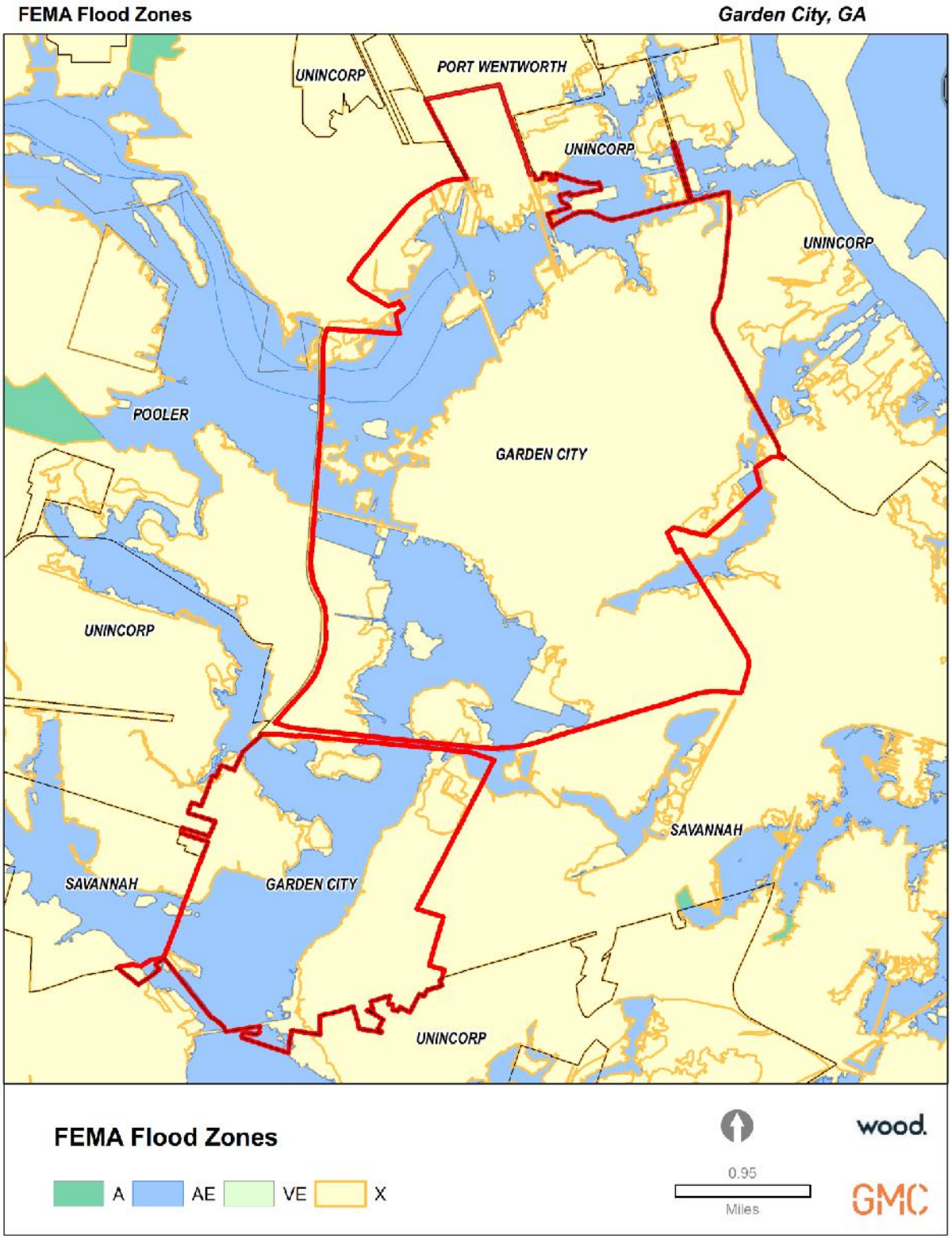
Flood Zone	Area (Acres)	Area (Square Miles)	Percent of City (%)
AE	2,937	4.6	32.3
X	6,151	9.6	67.7
TOTAL	**9,088**	**14.2**	**100.00**

Source: FEMA, 2018

According to the 2018 FEMA data, 2,937 acres of the land within the City is located within a 100-year floodplain (Zone AE) which equals 32.3% of the City. An additional 6,151 acres (67.7%) are located within Zone X considered moderate or minimal flood hazard area. Because approximately 1/3 of the City is located within a high flood hazard area (Zone AE), Garden City should seek ways to balance future development with strategies to preserve sensitive lands and natural drainage features.

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, and the vegetation stabilizes soils during flooding. Natural floodplains in Garden City include wetland areas and low-lying land along the major waterways in and around the City including Salt Creek, the Hardin Canal, the Savannah and Ogeechee Canal, Pipemakers Canal, and the Ogeechee Canal. Natural floodplains reduce damage by allowing flood waters to spread out over large areas, aiding infiltration into the ground, reducing flow rates and acting as a flood storage area to reduce downstream peaks. The City should strive to keep floodplain and floodplain waters free of contaminants such as oil, paint, anti-freeze, pesticides, and plastics and other trash. These chemicals and waste materials pollute local waterways, decreasing the water quality that local wildlife and plants depend upon.

Figure C.3 – FEMA Flood Zones, 2018, Garden City



Wetlands

Wetlands benefit the ecosystem by storing, changing, and transmitting surface water and groundwater. Through these processes pollution is removed, nutrients are recycled, groundwater is recharged, and biodiversity is enhanced. Wetland composition varies extensively, with five distinct categories for classification: Estuarine, Lacustrine, Marine, Palustrine, and Riverine systems Based on data from the National Wetland Inventory (NWI) wetlands throughout Garden City include those summarized in the Wetland Types table and Wetland by Type map below.

Table C.5 – Wetland Types

Wetland Type	Area (Acres)	Area (Sq. Miles)	Percent of City
Estuarine	370	0.6	4.0
Lacustrine	51	01	0.6
Palustrine	2,895	4.5	31.3
Non-Wetland	5,922	9.3	64.1
TOTAL	**9,238**	**14.4**	**100.0**

Source: National Wetland Inventory

The Palustrine System

The Palustrine (freshwater) system includes all non-tidal wetlands dominated by trees, shrubs, persistent emergent plants, emergent mosses or lichens, and all such wetlands that occur in areas where salinity due to ocean-derived salts is below 0.5%. The Palustrine system is bounded by upland.

The Estuarine System

The Estuarine system consists of deep-water tidal habitat and adjacent tidal wetlands that are usually semi-enclosed by land but have open, partly obstructed, or sporadic access to the open ocean, and in which ocean water is at least occasionally diluted by freshwater runoff from the land. The Estuarine system extends (1) upstream and landward to where ocean-derived salts measure less than 0.5% during the period of average annual low flow; (2) to an imaginary line closing the mouth of a river, bay, or sound; and (3) to the seaward limit of emergent wetlands, shrubs, or trees where they are not included in (2). It also includes offshore areas of continuously diluted sea water. It contains two sub-systems: subtidal (where the substrate is continuously submerged) and intertidal (where the substrate is exposed and flooded by tides including the associated splash zone).

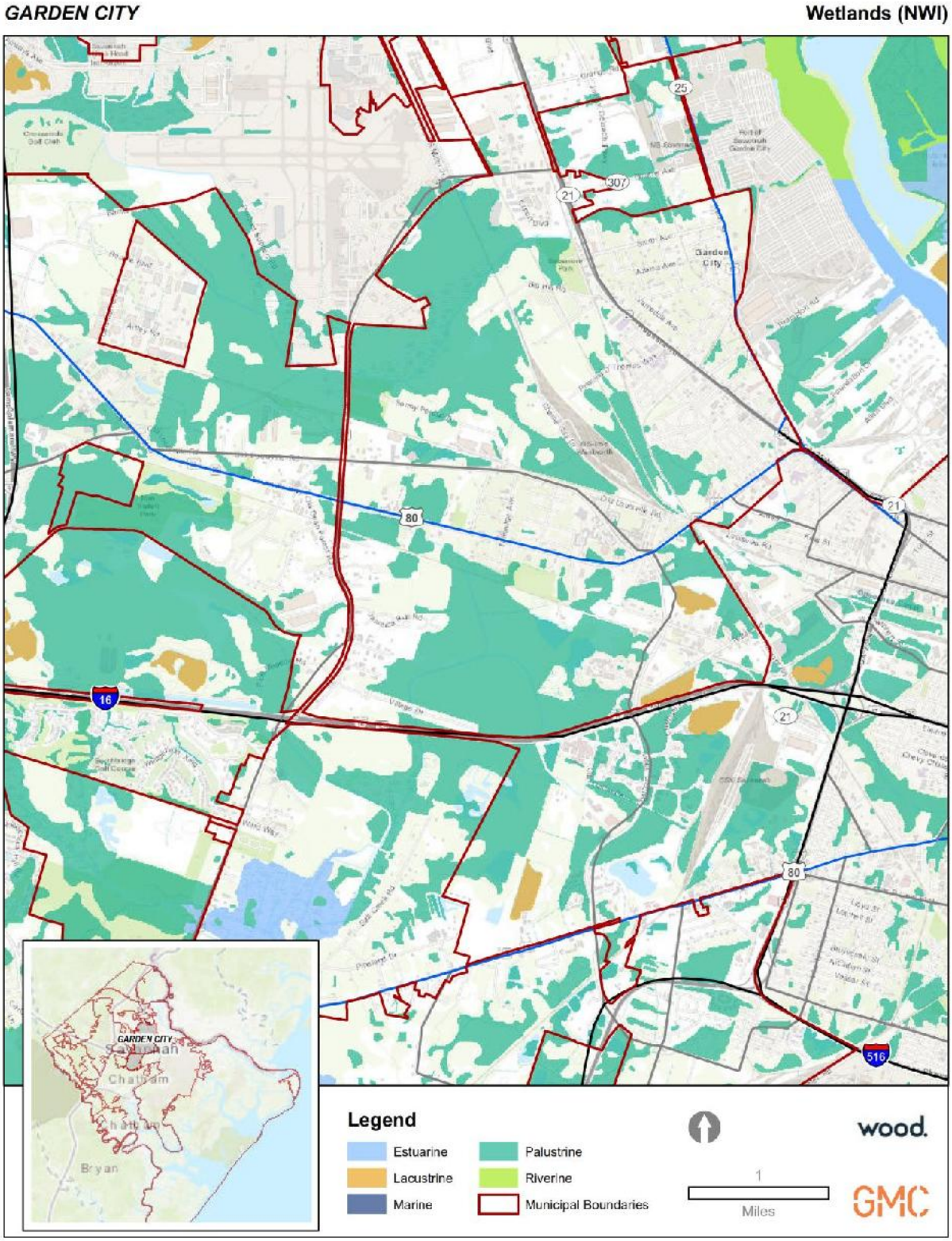
Lacustrine Wetlands

Lacustrine wetlands are large, open, water-dominated systems (e.g. lakes). This definition also applies to modified systems which possess characteristics similar to lacustrine systems (e.g. deep standing or slow-moving waters).

Waterbodies

Approximately 4.4 percent of the City's area is open water, and another 35.9 percent is wetlands. These areas are primarily associated the main waterways surrounding the City including Salt Creek, Hardin Canal, Savannah and Ogeechee Canal, Pipemakers Canal, and Ogeechee Canal.

Figure C.4 – Wetlands by Type, Garden City



Source: National Wetland Inventory (NWI)

C.2.4 History

In the early 1930's, in the depth of the Great Depression, Lewis Hamilton Smith showed his optimism for Chatham County's future. He had a vision of developing a place where people could own cheap lots that were big enough to have a vegetable garden and livestock area. With this vision, he began to plan the development of what was then known as "Industrial City Gardens". The name "Garden City" came about after many people began to feel that the name was too long and implied a mill town.

On February 8, 1939, Garden City officially became a state-chartered municipality. The city continued to grow as more and more people settled into the area. A city council was formed, organizations were founded, businesses sprung, and the community continued to thrive as Garden City came into what it is today

C.2.5 Economy

C.2.5.1 Wages and Employment

Per the 2013-2017 American Community Survey 5-Year Estimates, the median household income for Garden City is $41,607, which is over 21 percent lower than the state's median household income ($52,977). Approximately 28.8% of the population is considered to be living below the poverty level. Moreover, 28.8 percent of people under 18 years of age and 12.6 percent of people 65 years and over are living below the poverty level.

The table below shows employment and unemployment rates along with industry employment by major classification for the City.

Employment and Occupation Statistics for Garden City, GA

Table C.6 – Employment and Occupation Statistics for Garden City, GA, 2017

Employment Status	Count	Percentage (%)
In labor force	4,556	67.4
Employed	4,293	63.5
Unemployed	249	3.7
Armed Forces	14	0.2
Not in labor force	2,205	32.6
Occupation		
Management, business, science and arts	555	12.9
Service	1,025	23.9
Sales and office	723	16.8
Natural resources, construction and maintenance	853	19.9
Production, transportation and material moving	1,137	26.5

Source: U.S. Census Bureau, 2013-2017 American Community Survey 5-Year Estimates

Major industry sectors in Garden City include management, business, science, and arts (12.9%); service (23.9%); and sales and office (16.8%); natural resources, construction, and maintenance (19.9%); and production, transportation, and material moving (26.5%).

Major employers are discussed in the Chatham County Community Profile.

C.2.6 Housing

According to the 2013-2017 ACS 5-Year Estimates, there are 3,537 housing units in Garden City, of which 89.7 percent (3,174) are occupied. Approximately 32.2 percent (1,023) of occupied units are owner-occupied. A high percentage of renters is an indicator of higher pre- and post-disaster vulnerability because, according to Cutter, et al. (2003), renters often do not have the financial resources of homeowners, are more transient, are less likely to have information about or access to recovery aid following a disaster, and are more likely to require temporary shelter following a disaster. Therefore, higher rates of home rentals in Garden City may indicate that residents are not able to implement certain types of mitigation in their homes.

Median home value in Garden City is $120,200. Of the town's owner-occupied housing units, 46.3 percent (474) have a mortgage. Most householders (77.9 percent / 2,472) moved into their current homes since the year 2000; 26.4 percent (838) moved in between 2000 and 2009, and 38.3 percent (1,216) moved in between 2010 and 2014. Householders of nearly 14.6 percent (462) of occupied housing units have no vehicle available to them, which suggests these residents may have difficulty in the event of an evacuation.

Approximately half (45.5% / 1,611) of housing units in Garden City are detached single family homes. However, 24.1 percent (853) of units are mobile homes which can be more vulnerable to certain hazards, such as tornadoes and wind storms, especially if they aren't secured with tie downs.

The City's housing stock is aging, with the majority (87.5% / 2,478) of occupied housing built before 2000. The table below details housing age in the town.

Table C.7 – Housing Age

Year Structure Built	Percent of Occupied Housing	Number of Structures
2014 or later	0.0	0
2010 to 2013	0.7	26
2000 to 2009	11.7	413
1980 to 1999	37.2	1,318
1960 to 1979	18.8	668
1940 to 1959	28.5	1,006
1939 or earlier	3.0	106

Source: U.S. Census Bureau, American Community Survey 2013-2017 5-Year Estimates

Age can indicate the potential vulnerability of a structure to certain hazards. For example, Garden City first entered the National Flood Insurance Program in 1973. Therefore, based on housing age estimates at least 42.4 percent of housing in the town was built before any floodplain development restrictions were required.

C.2.7 Population

According to the U.S. Census Bureau, Garden City had an estimated population of 8,961 residents in July of 2017 and a population of 8,712 at the time of the 2010 U.S. Census (3% increase from 2010-2017). As of 2017, Garden City's population density was 631 persons per square mile. The table below provides demographic profile data from the 2017 American Community Survey 5-Year Estimates.

Table C.8 – Town of Garden City Demographic Profile Data, 2017

Demographic	Garden City
Gender/Age	
Male	4,660
Female	4,301
Under 5 Years	825
65 Years and Over	1,088
Race/Ethnicity (One Race)	
White	4,003
Black or African American	3,401
American Indian/Alaska Native	101
Asian	226
Two or More Races	396
Hispanic or Latino[1]	2,228
Education	
High School Graduate or Higher	2,312
Bachelor's Degree or Higher	532

Source: U.S. Census Bureau, 2013-2017 American Community Survey 5-Year Estimates
[1]Hispanics may be of any race, so also are included in applicable race categories.

C.2.8 Land Use

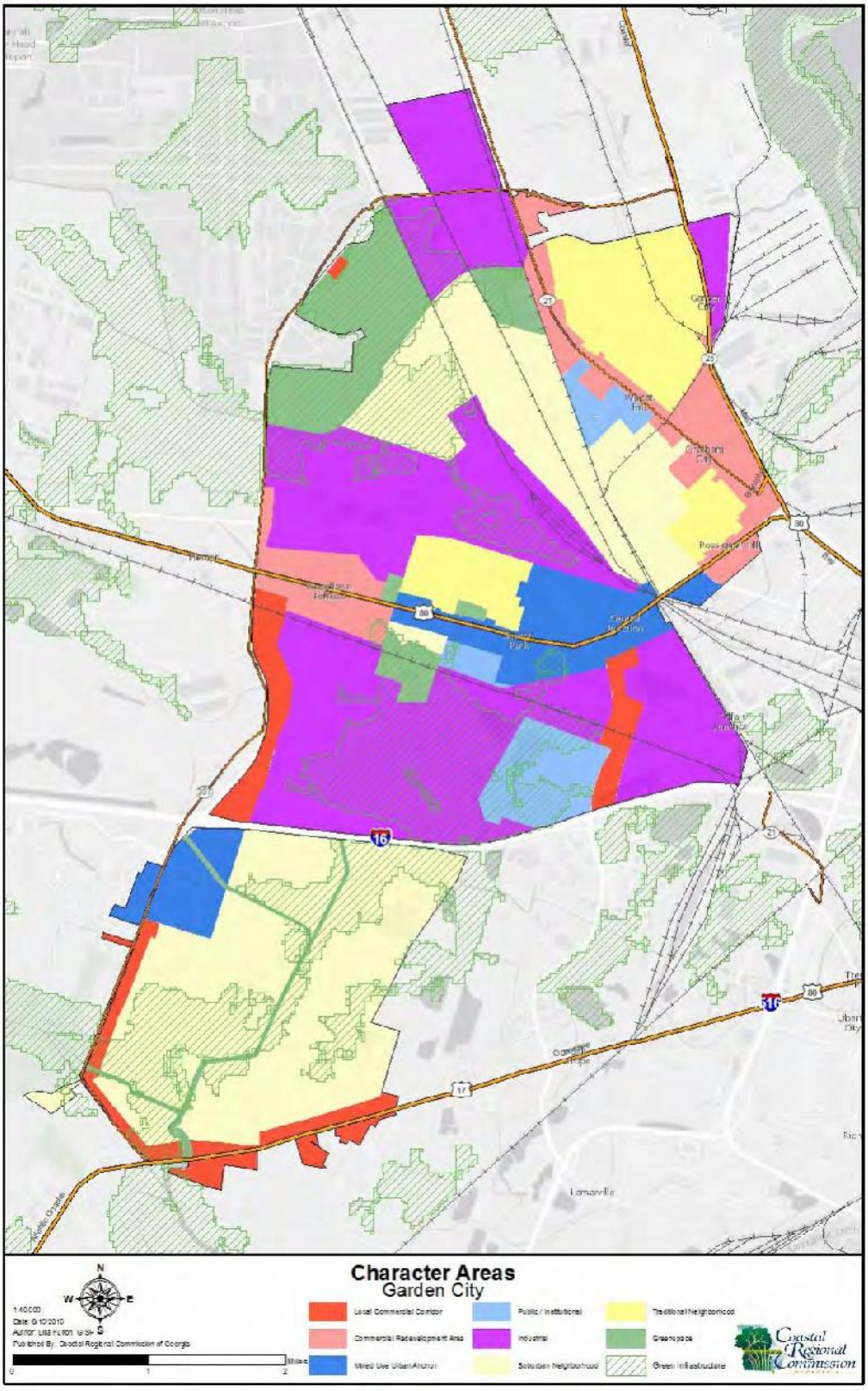
The Garden City's Comprehensive Plan 2016-2036 establishes Character Areas to guide future development and includes a Future Land Use Map.

C.2.8.1 Character Areas

The Character Areas established by the Comp Plan for Garden City include:

- Local Commercial Corridor: Land which is or should be developed for general commercial purposes, institutional, and professional services
- Commercial Redevelopment Area
- Mixed use, Urban Anchor: Intended for projects that integrate different land uses such as retail stores, restaurants, residences, civic buildings, offices and parks within a defined area.
- Industrial: Industrial and commercial land uses. 90 percent of land within the character area is already zoned for industrial use and should be buffered from adjacent residential uses.
- Public / Institutional: Intent is to provide public services, such as infrastructure, equitably throughout the community.
- Suburban (Neighborhood): Intended to preserve trees and encourage the preservation of open space and conservation-type subdivisions.
- Traditional (Neighborhood): Areas characterized by mixed land uses, grid street patterns, pedestrian circulation, intensively used open spaces, architectural character, and sense of community.
- Greenspace: Areas the City would like to preserve land for natural greenspace and greenways. 70 percent of the land area within this character area is currently zoned industrial.

Figure C.5 – Character Areas, Garden City



Source: Garden City Comprehensive Plan 2016-2036

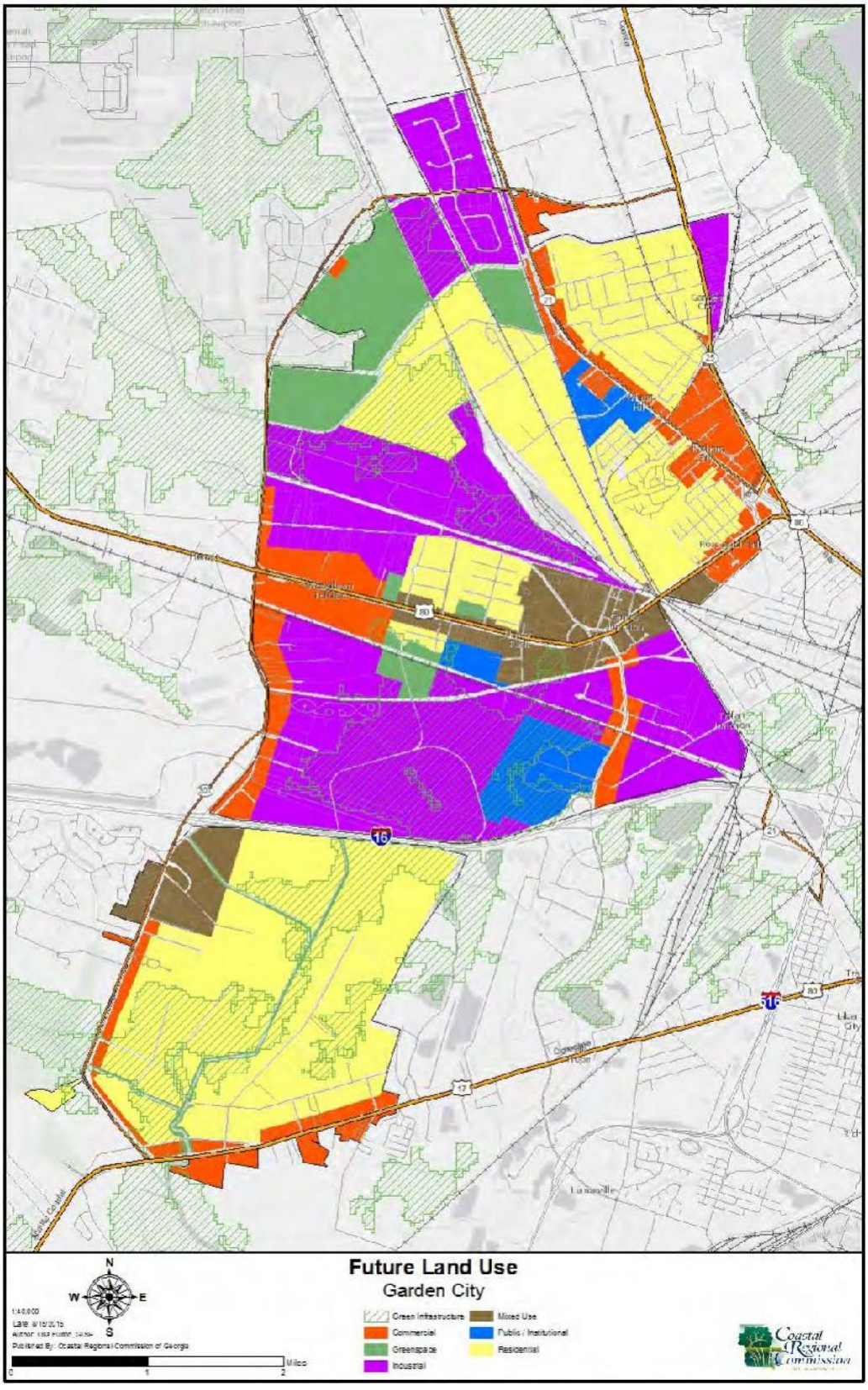
C.2.8.2 Future Land Use

The Garden City Comp Plan 2016-2035 includes a Future Land Use Map (see map below) that serves as a visual representation of the City's future land use as described in the table below.

Land Use	Description
Commercial	
Commercial Office	This category is for land dedicated to non-industrial business uses, including retail sales, office, service and entertainment facilities, organized into general categories of intensities. Commercial uses may be located as a single use in one building or grouped together in a shopping center or office building. Communities may elect to separate office uses from other commercial uses, such as retail, service or entertainment facilities.
Commercial Retail	
Industrial	
Industrial - Heavy	This category is for land dedicated to manufacturing facilities, processing plants, factories, warehousing and wholesale trade facilities, mining or mineral extraction activities, or other similar uses.
Industrial - Light	
Residential	
Residential Multi-family	The predominant use of land within the residential category is for single-family and multi-family dwelling units organized into general categories of net densities.
Residential Single-family	
Public / Institutional	
Public / Institutional	This category includes certain state, federal or local government uses, and institutional land uses. Government uses include government building complexes, police and fire stations, libraries, prisons, post offices, schools, military Installations, etc. Examples of institutional land uses include colleges, churches, cemeteries, hospitals, etc. Do not include facilities that are publicly owned, but would be classified more accurately in another land use category. For example, include publicly owned parks and/or recreational facilities in the park/recreation/conservation category; include landfills in the industrial category; and include general office buildings containing government offices in the commercial category.

Land Use	Description
Greenspace	
Agriculture/Forestry	This category is for land dedicated to farming (fields, lots, pastures, farmsteads, specialty farms, livestock production, etc.), agriculture, or commercial timber or pulpwood harvesting. This category is also for land dedicated to active or passive recreational uses. These areas may be either publicly or privately owned and may include playgrounds, public parks, nature preserves, wildlife management areas, national forests, golf courses, recreation centers or similar uses.
Recreation Active	
Mixed Use	
Mixed Use	For a detailed, fine-grained mixed land use, or one in which land uses are more evenly balanced, mixed land use categories may be created and applied at the discretion of the community. If used, mixed land use categories must be clearly defined, including the types of land uses allowed, the percentage distribution among The mix of uses (or other objective measure of the combination), and the allowable density of each use.

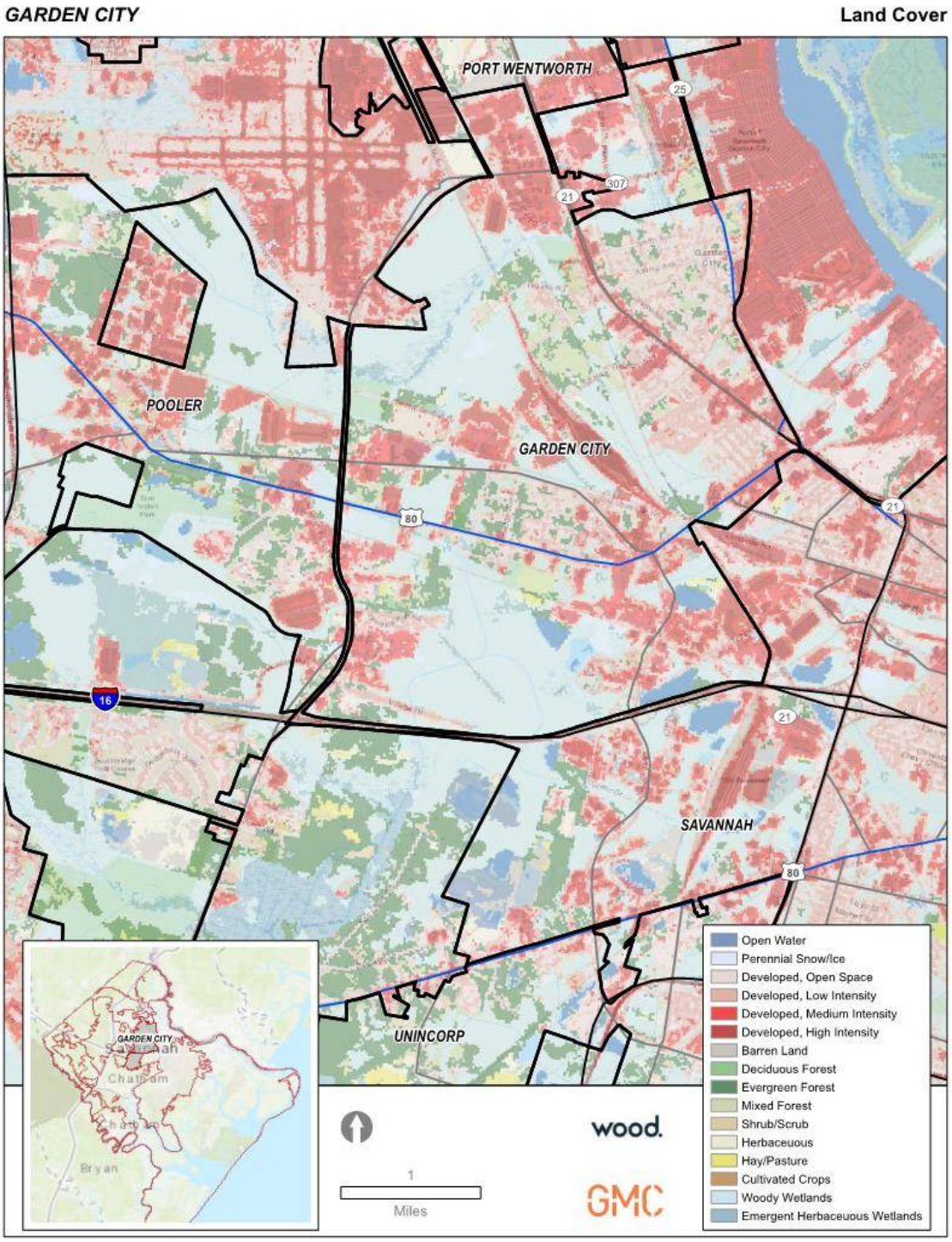
Figure C.6 – Future Land Use Map, Garden City



C.2.8.3 Land Cover

Land Cover data for Garden City was obtained from the 2016 National Land Cover Database provided by the Multi-Resolution Land Characteristics (MRLC) Consortium as shown in the figure below.

Figure C.7 – Land Cover Map, Garden City

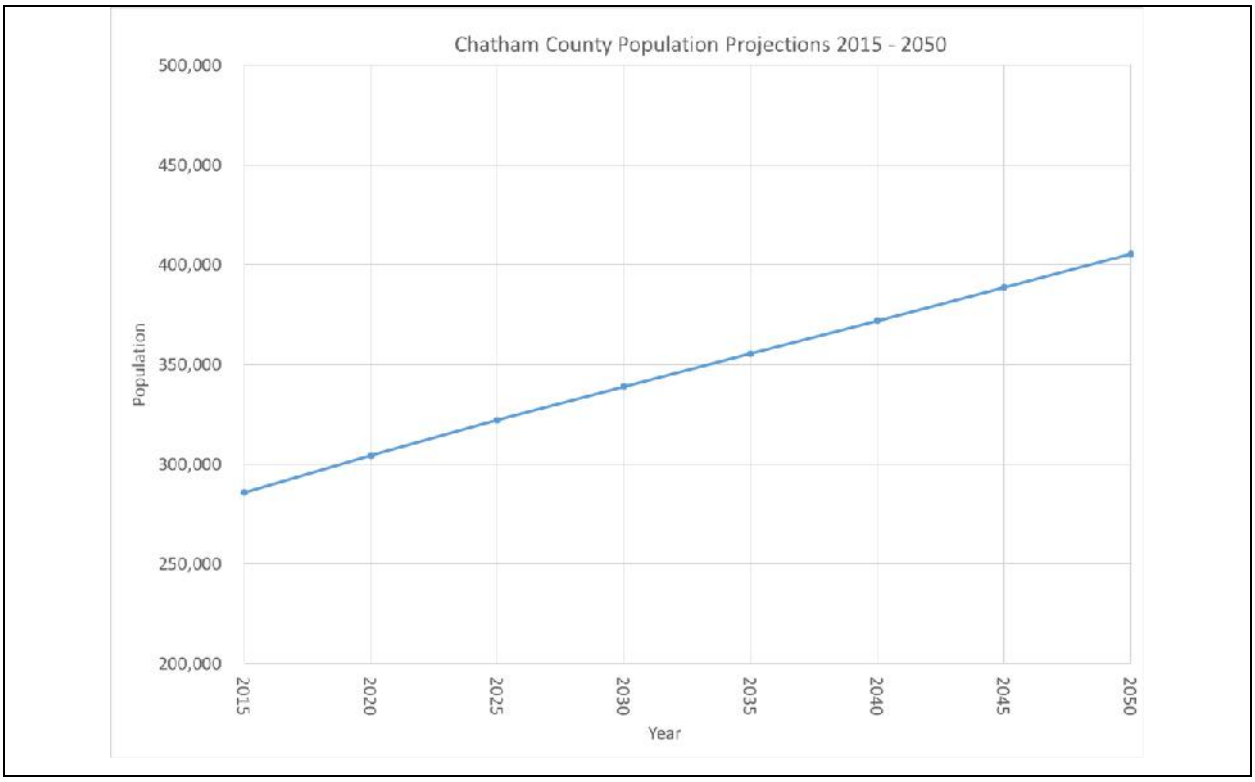


C.2.9 Growth and Development Trends

According to U.S. Census and American Community Survey population estimates, Garden City's population has decreased slightly from 8,969 in 2010 to 8,961 in 2017.

According to the Georgia Governor's Office of Planning and Budget (GOPB), Chatham County is projected to reach a population of 405,573 by 2050, which represents a 38% increase from the 2017 population. The population projections from the GOPB estimate the annual growth for the County to be about 1.1% through 2050.

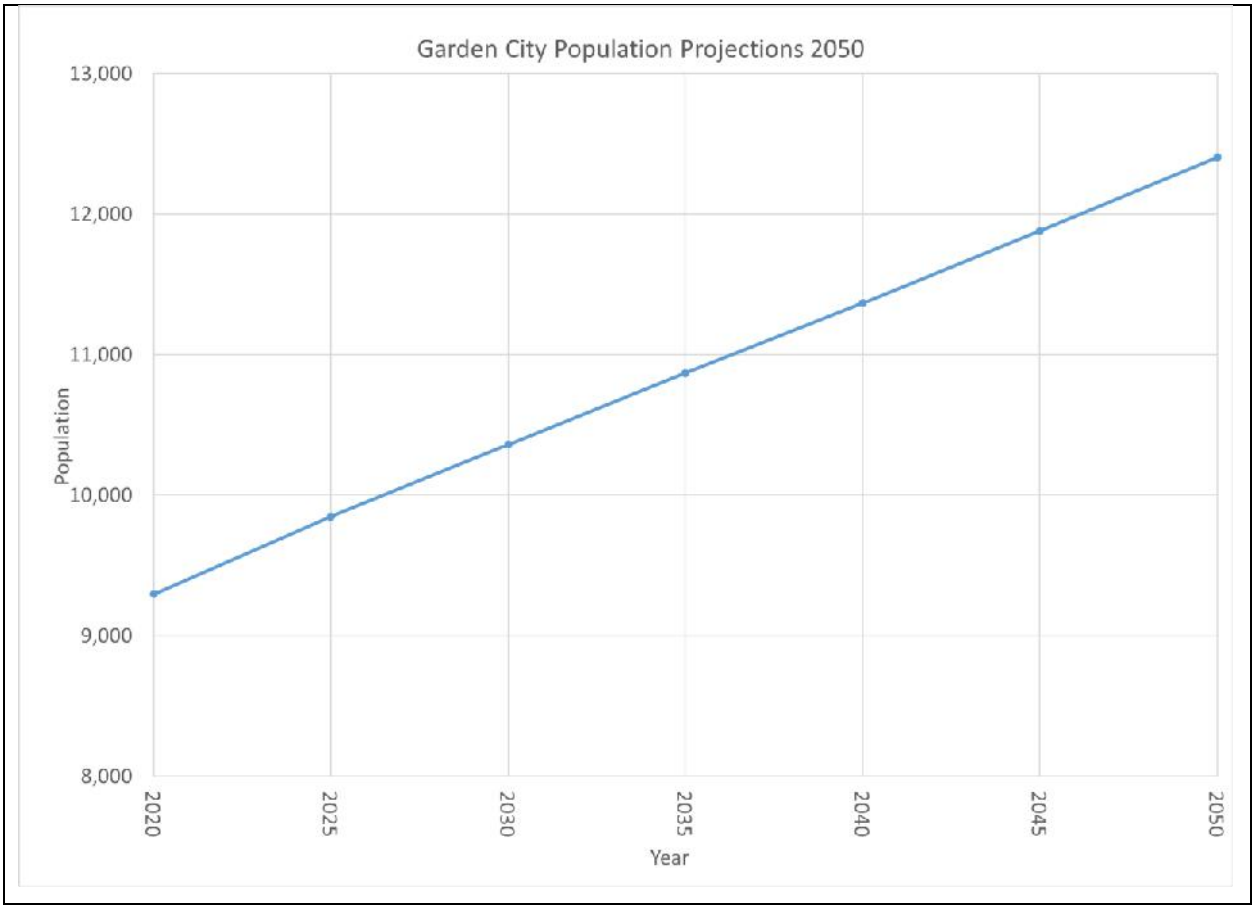
Figure C.8 – Population Projections for Chatham County 2013 - 2050



Source: Georgia Governor's Office of Planning and Budget

Using the projected growth rate for the County, the population of Garden City would increase to 12,403 by 2050 as shown in the graph below.

Figure C.9 - Population Projections for Garden City 2013 - 2050



C.3 ASSET INVENTORY

C.3.1 Property

Table C.9 – City of Garden City Building Exposure

Occupancy Type	Total Number of Buildings	Total Building Value	Estimated Content Value	Total Value
Commercial	1,888	$196,834,162.00	$196,834,162.00	$393,668,324.00
Industrial	390	$190,027,164.30	$285,040,746.45	$475,067,910.75
Residential	2,655	$136,016,972.00	$68,008,486.00	$204,025,458.00
Total	**4,933**	**$522,878,298.30**	**$549,883,394.45**	**$1,072,761,692.75**

Source: Chatham County

C.3.2 Critical Facilities

Table C.10 – Critical Facilities and Infrastructure at Risk

ID	PRIORITY CRITICAL FACILITY NAME	PHYSICAL ADDRESS	LAT	LONG	REASON				
					COG	Life Safety	Debris	Support	Other
GC-1	Garden City, City Hall	100 Central Ave	32.0634	-81.2051	X		X		
GC-2	Garden City Fire Depart.	160 Main Street	32.113	-81.1485	X	X	X		
GC-3	Garden City Fire Depart./ Lift Station #4	2406 Hwy 80	32.0882	-81.1748	X	X	X		
GC-4	Garden City Lift Station #1	112 Azelia Ave						X	
GC-5	Garden City Lift Station #10	Biscuit Hill Rd	32.1101	-81.1706				X	
GC-6	Garden City Lift Station #11	1360 Hwy. 80 At the Curve	32.0861	-81.1654				X	
GC-7	Garden City Lift Station #12	43 Harley Drive. Chatham City	32.09903	-81.1575				X	
GC-8	Garden City Lift Station #12	1002 Chatham Parkway	32.065367	-81.16193				X	
GC-9	Garden City Lift Station #13	135 Prosperity Drive	32.076	-81.1899				X	
GC-10	Garden City Well #1	Rommel Ave	32.1143	-81.1548		X		X	
GC-11	Garden City Water Tower	100 Sonny Perdue Drive	32.102628	-81.17314		X		X	
GC-12	Public Works	2 Bud Brown	32.117216	-81.16867				X	
GC-13	Public Works Plant	2 Bud Brown	32.117216	-81.16867				X	
GC-14	EFF Generator	2 Bud Brown	32.117216	-81.16867				X	
GC-15	Well #2	2406 Hwy 80	32.0882	-81.1748	X	X	X		
GC - 16	Garden City Lift Station #2	6009 Commerce Blvd	32.128541	-81.17484				X	
GC - 17	Garden City Lift Station #3	Priscilla D. Thomas Way						X	
GC –18	Garden City Lift Station #5	Covington Avenue						X	
GC - 19	Garden City Lift Station #6	Old Louisville Road						X	
GC –20	Garden City Lift Station #7	314 Big Hill Road	32.114101	-81.16823				X	
GC - 21	Garden City Lift Station #8	Plant Lift Station						X	
GC - 22	Garden City Lift Station #9	Plant Exit Station						X	
GC - 23	Garden City Lift Station #14	West Port						X	
GC - 24	Water Tower	Export				X		X	
GC - 25	Water Tower	Rommel Ave // Nelson Ave				X		X	
GC - 26	Water Tower	1000 Chatham Parkway	32.077695	-81.15752		X		X	
GC - 27	Garden City Well #3	Jones				X		X	

Source: Chatham County

C.4 RISK ASSESSMENT

This section contains a hazard profile and vulnerability assessment for those hazards that were rated with a higher priority for the City of Garden City than for Chatham County as a whole. Risk and vulnerability findings are also presented here for those hazards that are spatially defined and have variations in risk that could be evaluated quantitatively on a jurisdictional level. The hazards included in this section are: Flood and Wildfire.

C.4.1 Flood

Over 30 percent of the Garden City falls within the mapped 1%-annual-chance floodplains. Figure C.10 reflects the mapped flood hazard zones for the City of Garden City, and Figure C.11 displays the depth of flooding estimated to occur in these areas during the 1%-annual-chance flood. The data in this risk assessment is based off FEMA's 2014 DFIRM. Minor changes have since been made and the updated 2018 DFIRM can be seen in Figure C.3 for comparison.

Properties at risk are detailed by flood zone in Table C.11 below. Parcel data was used to assess how many buildings are in hazard areas based on each parcel's centroid.

Table C.11 – Properties at Risk by Flood Zone

Flood Zone	Number of Buildings	Total Building Value
AE	969	$70,010,104.40
0.2% Annual Chance Flood Hazard	1,840	$178,906,203.80
X	2,124	$273,961,989.90
Total	**4,933**	**$522,878,298.10**
SFHA Total	**969**	**$70,010,104.40**

Source: FEMA 2014 DFIRM & Chatham County parcel and building footprint data, 2019

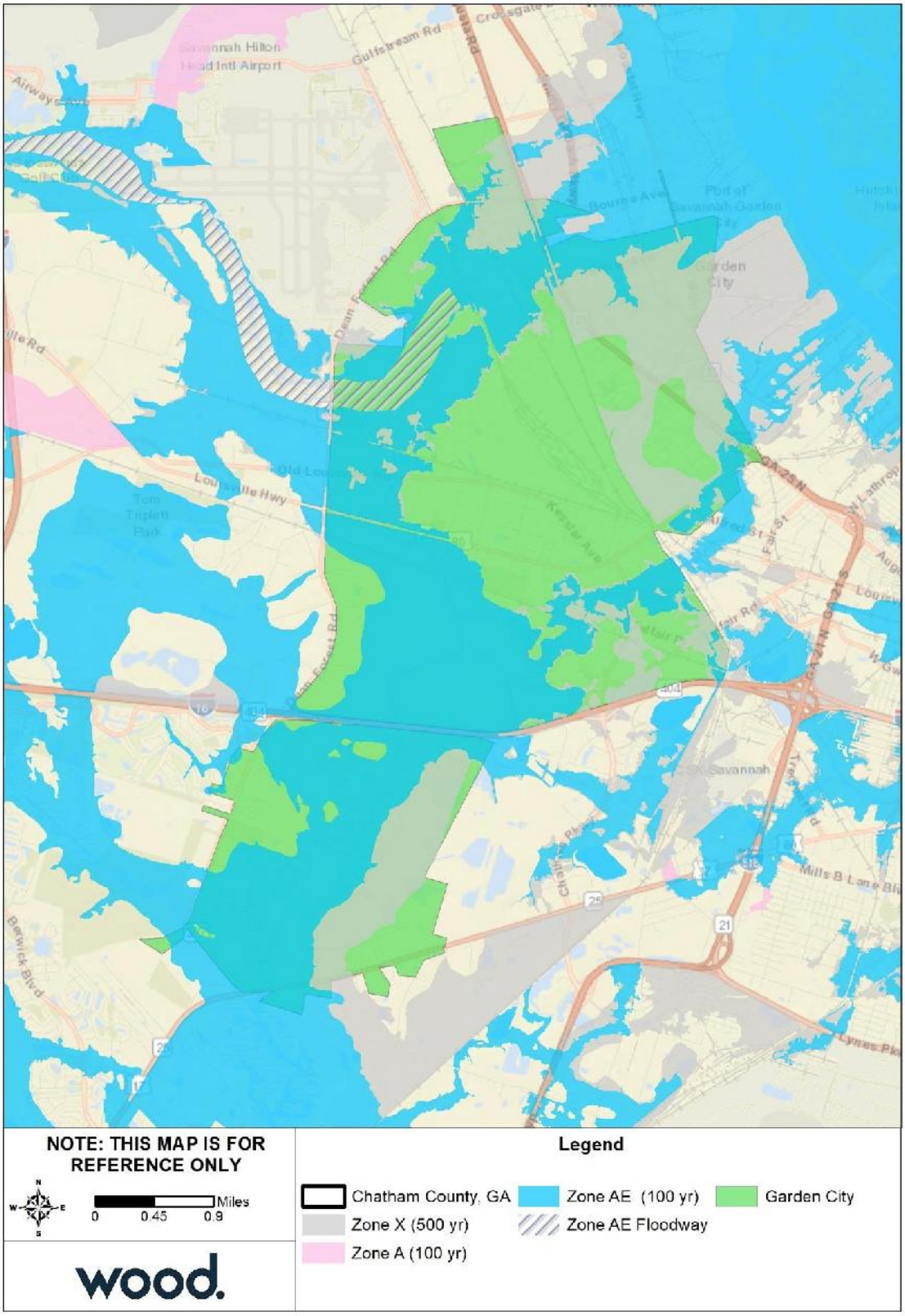
Table C.12 provides building counts and estimated damages by occupancy type for the 1% annual chance flood event.

Table C.12 – Garden City Estimated Building Damage and Content Loss, 1% Annual Chance Flood

Occupancy	Buildings Impacted	Building and Contents Cost	Estimated Building Damages	Estimated Content Damages	Loss Estimate
Commercial	307	$29,111,093.56	$1,294,297.72	$4,341,161.56	19.36%
Industrial	56	$26,909,466.67	$832,334.21	$2,461,822.26	12.24%
Residential	268	$26,182,851.50	$5,080,615.62	$2,869,663.62	30.36%
Total	**542**	**$82,203,411.73**	**$7,207,247.54**	**$9,672,647.44**	20.53%

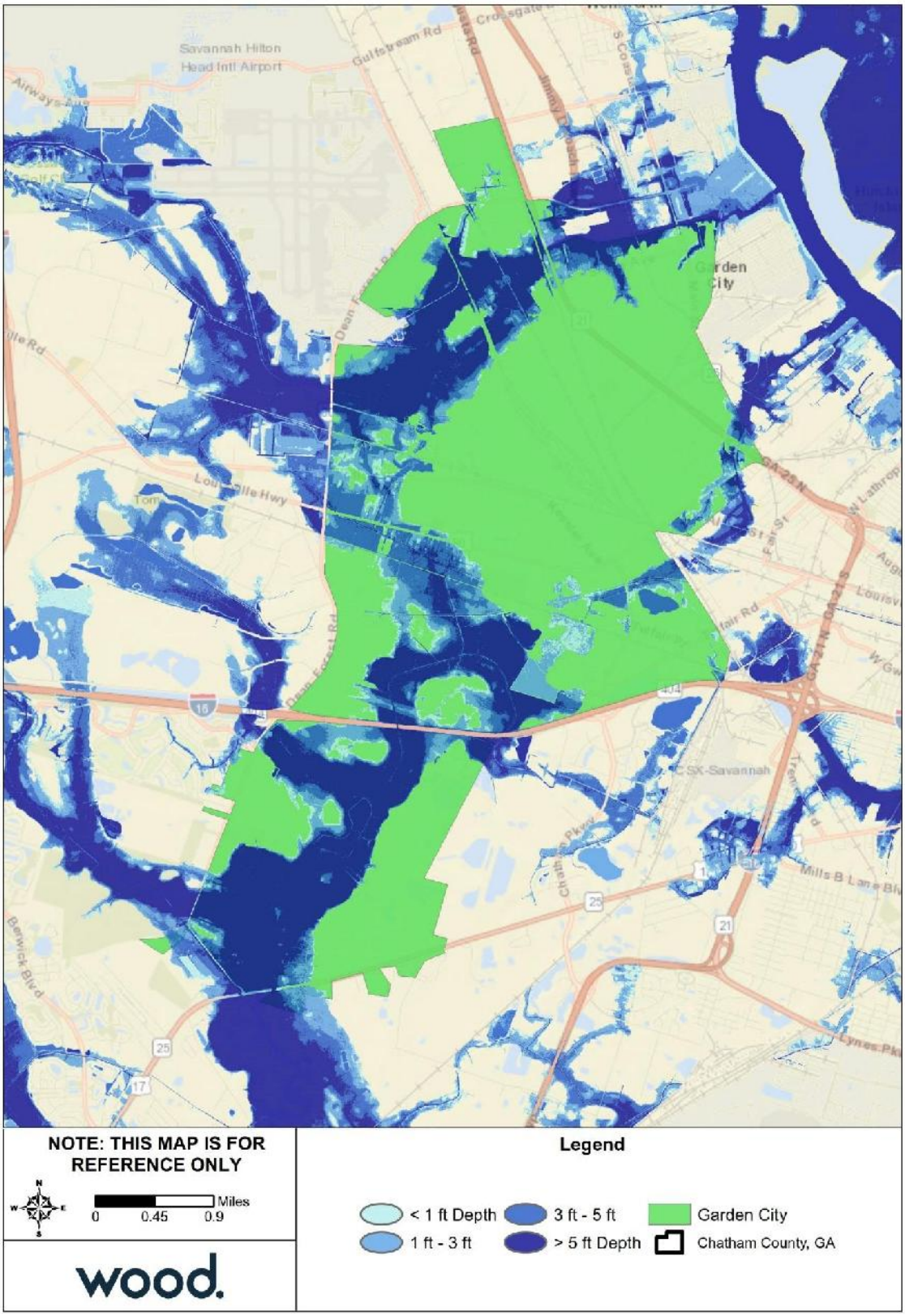
Source: HAZUS

Figure C.10 – FEMA Flood Hazard Areas, City of Garden City



Source: FEMA 2014 DFIRM

Figure C.11 – Flood Depth, 1%-Annual-Chance Floodplain, City of Garden City



Source: FEMA 2014 DFIRM

C.4.2 Wildfire

Table C.13 summarizes the acreage in the City of Garden City that falls within the Wildland Urban Interface (WUI), categorized by housing density. Areas in the WUI are those where development may intermix with flammable vegetation. Nearly 30 percent of Garden City is not included in the WUI.

Table C.13 – Wildland Urban Interface Acreage, City of Garden City

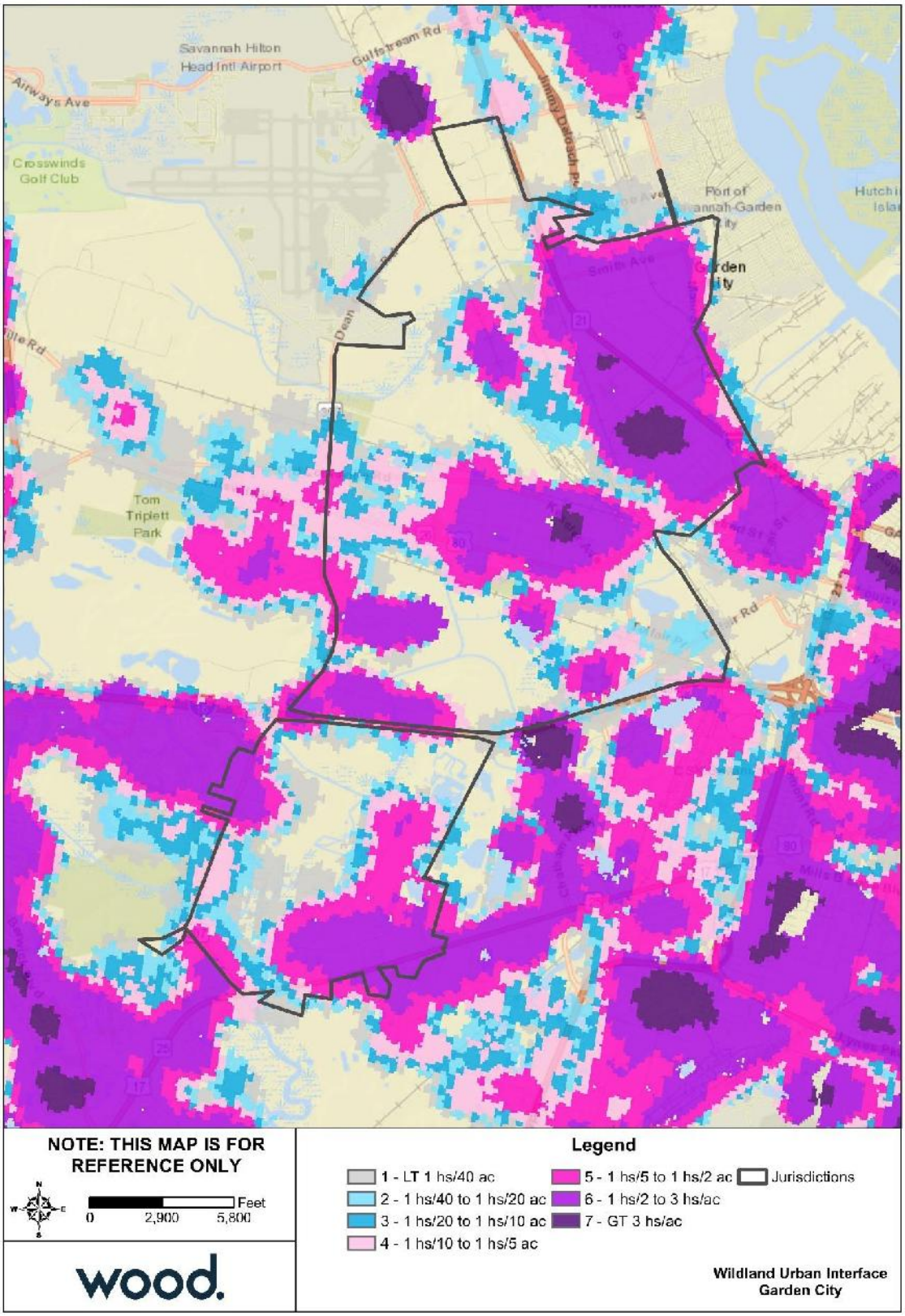
	Housing Density	Total Acreage	Percent of Total Acreage
	Not in WUI	*2,589.4*	*27.9%*
	LT 1hs/40ac	715.6	7.7%
	1hs/40ac to 1hs/20ac	508.6	5.5%
	1hs/20ac to 1hs/10ac	617.3	6.7%
	1hs/10ac to 1hs/5ac	974.9	10.5%
	1hs/5ac to 1hs/2ac	1,342.0	14.5%
	1hs/2ac to 3hs/1ac	2,381.5	25.7%
	GT 3hs/1ac	137.7	1.5%
	Total	9,266.9	

Source: Southern Wildfire Risk Assessment

Figure C.12 depicts the WUI for the City of Garden City. The WUI is the area where housing development is built near or among areas of vegetation that may be prone to wildfire. Figure C.13 depicts the Fire Intensity Scale, which indicates the potential severity of fire based on fuel loads, topography, and other factors. Figure C.14 depicts Burn Probability based on landscape conditions, percentile weather, historical ignition patterns, and historical prevention and suppression efforts.

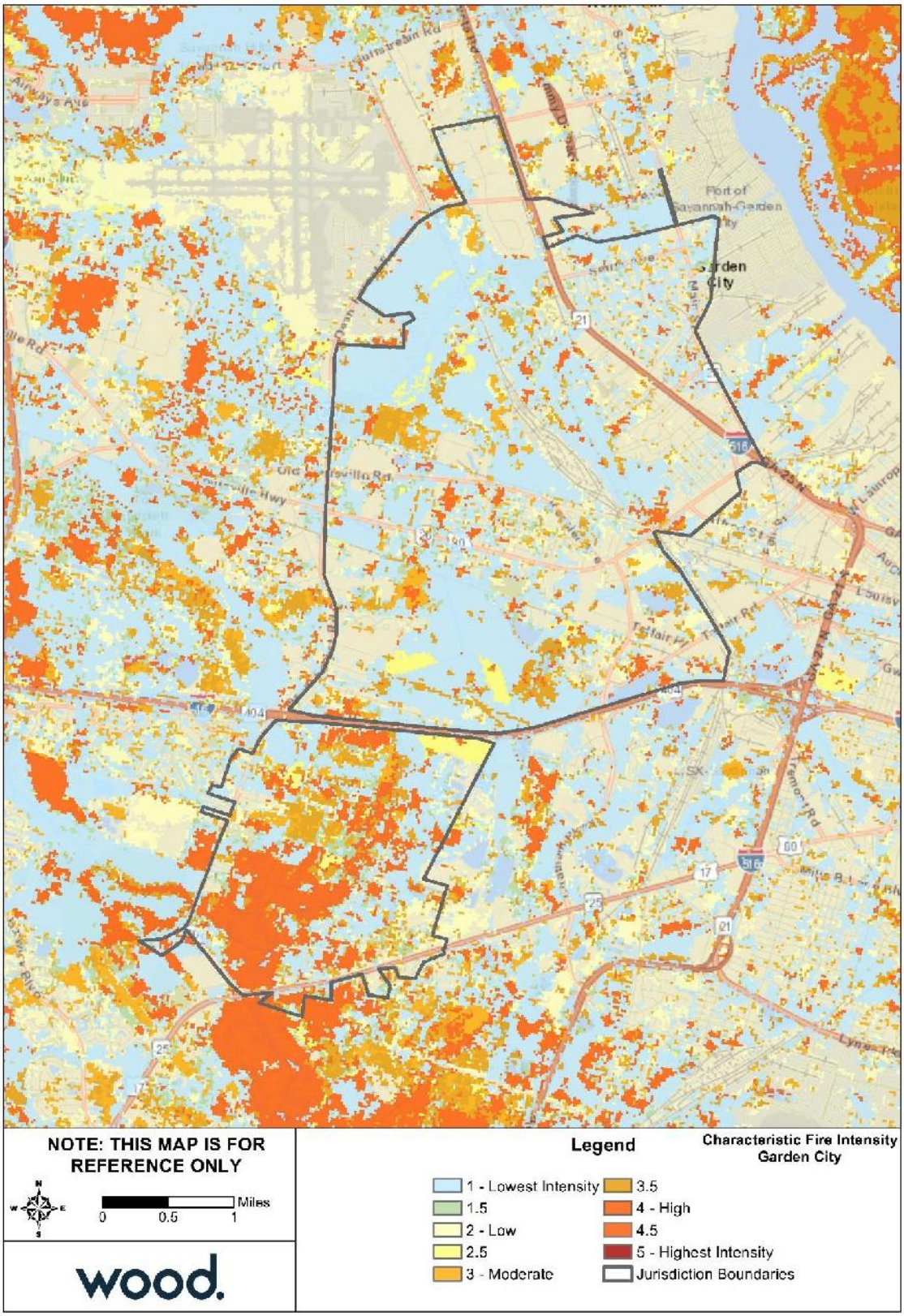
Potential fire intensity is highest in southern Garden City, which also has moderate burn probability. This area is partially within the WUI, so some of these areas may have greater exposure to wildfire than others. The remainder of the city has both low-to-no potential fire intensity as well as low burn probability.

Figure C.12 – Wildland Urban Interface, City of Garden City



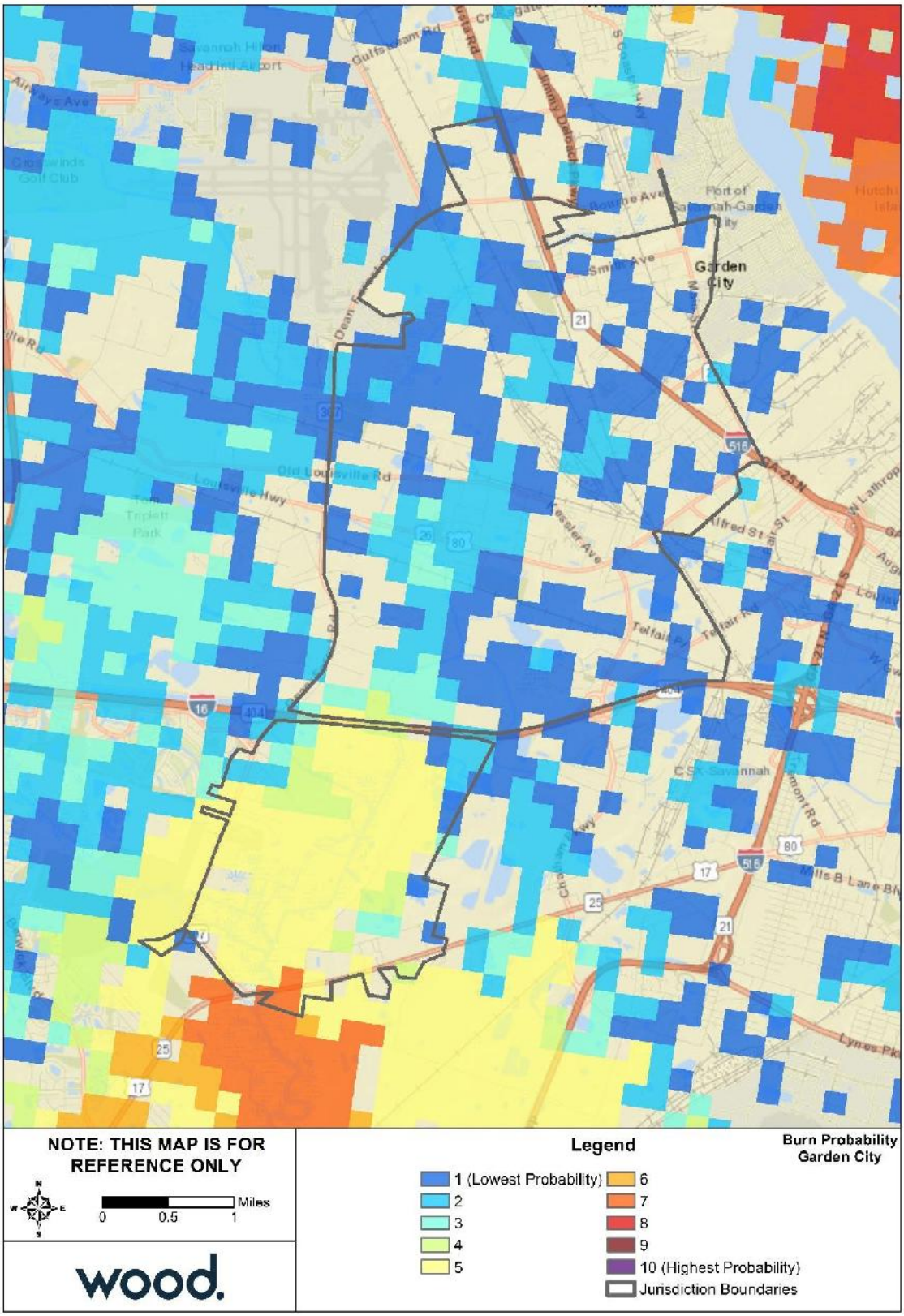
Source: Southern Wildfire Risk Assessment

Figure C.13 – Fire Intensity Scale, City of Garden City



Source: Southern Wildfire Risk Assessment

Figure C.14 – Burn Probability, City of Garden City



Source: Southern Wildfire Risk Assessment

C.1 FLOODPLAIN MANAGEMENT CAPABILITY ASSESSMENT

The City of Garden City joined the NFIP emergency program in 1971 and has been a regular participant in the NFIP since March 1973. The following tables reflect NFIP policy and claims data for the City categorized by structure type, flood zone, Pre-FIRM and Post-FIRM. Zones with no policies or closed paid losses were left out of the tables below.

Table C.14 – NFIP Policy and Claims Data by Structure Type

Structure Type	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
Single Family	198	$123,651	$46,610,900	26	$478,181.33
All Other Residential	2	$509	$34,000	0	$0.00
Non Residential	74	$168,063	$34,556,100	9	$943,694.50
Total	**274**	**$292,223**	**$81,201,000**	**35**	**$1,421,875.83**

Source: FEMA Community Information System, accessed September 2019

Table C.15 – NFIP Policy and Claims Data by Flood Zone

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	120	$184,131	$31,502,600	18	$1,228,778.12
B, C & X Zone					
Standard	9	$15,009	$3,156,700	4	$39,233.01
Preferred	142	$91,283	$46,437,000	13	$153,864.70
Total	**271**	**$290,423**	**$81,096,300**	**35**	**$1,421,875.83**

Source: FEMA Community Information System, accessed September 2019

Table C.16 – NFIP Policy and Claims Data Pre-FIRM

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	47	$100,496	$7,933,200	12	$1,105,587.52
B, C & X Zone	87	$34,438	$24,696,000	13	$70,151.87
Standard	3	$1,200	$646,000	1	$3,769.91
Preferred	84	$33,238	$24,050,000	12	$66,381.96
Total	**134**	**$134,934**	**$32,629,200**	**25**	**$1,175,739.39**

Source: FEMA Community Information System, accessed September 2019

Table C.17 – NFIP Policy and Claims Data Post-FIRM

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	73	$83,635	$23,569,400	6	$123,190.60
B, C & X Zone	64	$71,854	$24,897,700	4	$122,945.84
Standard	6	$13,809	$2,510,700	3	$35,463.10
Preferred	58	$58,045	$22,387,000	1	$87,482.74
Total	**137**	**$155,489**	**$48,467,100**	**10**	**$246,136.44**

Source: FEMA Community Information System, accessed September 2019

C.2 MITIGATION STRATEGY

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Lead Agency / Department	Potential Funding Source	Implementation Timeline	2020 Status	2020 Implementation Status Comments
Prevention									
P-1	Revise and adopt Garden City Local Design Manual and flood damage prevention ordinance to higher regulatory and design standards.	Flood	3.1	High	Planning and Zoning Dept.	Local Funds	2021	Carry Forward	Revised. Part of CRS program - mtg in Feb
Property Protection									
PP-1	Harden roof, windows, doors and rooftop units for critical facilities	All	1.1	Moderate	Administration	HMGP; PDM	2022	Carry Forward	Revised
PP-2	Relocate Fire Station 1 located at 116 Main Street out of susceptible flooding area.	Flood	1.1 & 3.1	High	City Administration	Federal grants	2024	Carry Forward	Revised. Station has been remodeled in 2017
PP-3	Upsize, install and/or raise generator at various critical facilities in the City	All	1.1	High	Water/Sewer	HMGP	2022	Carry Forward	*NEW POST MATTHEW
PP-4	Raise lift stations out of floodplain	Flood	1.1	High	Water/Sewer	HGMP	2022	Carry Forward	*NEW POST MATTHEW
PP-5	Purchase and install bypass pumps	Flood, Hurricane	1.1	Moderate	Public Works	Local Funds	2022	New	
PP-6	Anchor HVAC units and Storage Tanks	All	1.1	Moderate	Public Works	TBD	2021	New	
PP-7	Acquire or elevate properties prone to flooding	Flood, Hurricane	1.2 & 3.1	Moderate		TBD	2025	New	
PP-8	Elevate or dry floodproof components or systems vulnerable to flood damage	Flood, Hurricane	1.1	High	Public Works	TBD	2020	New	
PP-9	Install sewer access covers for instances where elevation is not feasible or practical	Flood, Hurricane	1.1	Moderate	Water/Sewer	TBD	2022	New	
PP-10	Seal exposed portions of well systems or raise the elevation of the well head to prevent infiltration of flood waters	Flood, Hurricane	1.1	Moderate	Water/Sewer	TBD	2022	New	
Structural Projects									
SP-1	Construct and/or improve drainage systems to alleviate drainage issues.	Flood, Hurricane	3.1	Moderate	Public Works	General fund, grants	2021	Carry Forward	Revised
SP-2	Raise all manholes city-wide within the 100-year floodplain	Flood	1.1	High	Public Works	HGMP	2022	Carry Forward	*NEW POST MATTHEW
Emergency Services									
ES-1	Generators for critical facilities	All	1.1	Moderate	City Administration	HMGP, General Fund	2021	New	
ES-2	Portable generators for critical facilities	All	1.1	Moderate	City Administration	HMGP, General Fund	2021	New	
ES-3	Purchase and install generator quick connects and transfer switches for critical facilities	All	1.1	Moderate	City Administration	HMGP, General Fund	2021	New	
ES-4	Conduct hazardous materials training, response and recovery exercises	All	4.1	Moderate	City Administration	TBD	2020	New	
Public Education and Awareness									
PEA-1	Increase public education and awareness utilizing an all-hazards approach in the City via various outreach methods (print, tv, radio, social media, etc.)	All	2.2	High	City Administration	Local Funds	2020	Carry Forward	Revised. FD has been doing this- recurring outreach
PEA-2	Host/support a hazardous materials clean-up day to appropriately dispose of dangerous household chemicals	Hazardous Materials Incident	2.1	Moderate	City Administration	Local Funds, Grants	2021	New	
PEA-3	Provide outreach to vulnerable populations via various outreach methods (print, tv, radio, social media, etc.)	All	2.2	High	City Administration	Local Funds	2020	New	

Annex D City of Pooler

D.1 PLANNING PROCESS

The table below lists the HMPC members who represented the City of Pooler.

Table D.1 – HMPC Members

Member Name	Title	Agency/Department
Robert Byrd	City Manager	Pooler
Wade Simmons	Fire Chief	Fire Department

D.2 COMMUNITY PROFILE

D.2.1 Overview of the Community

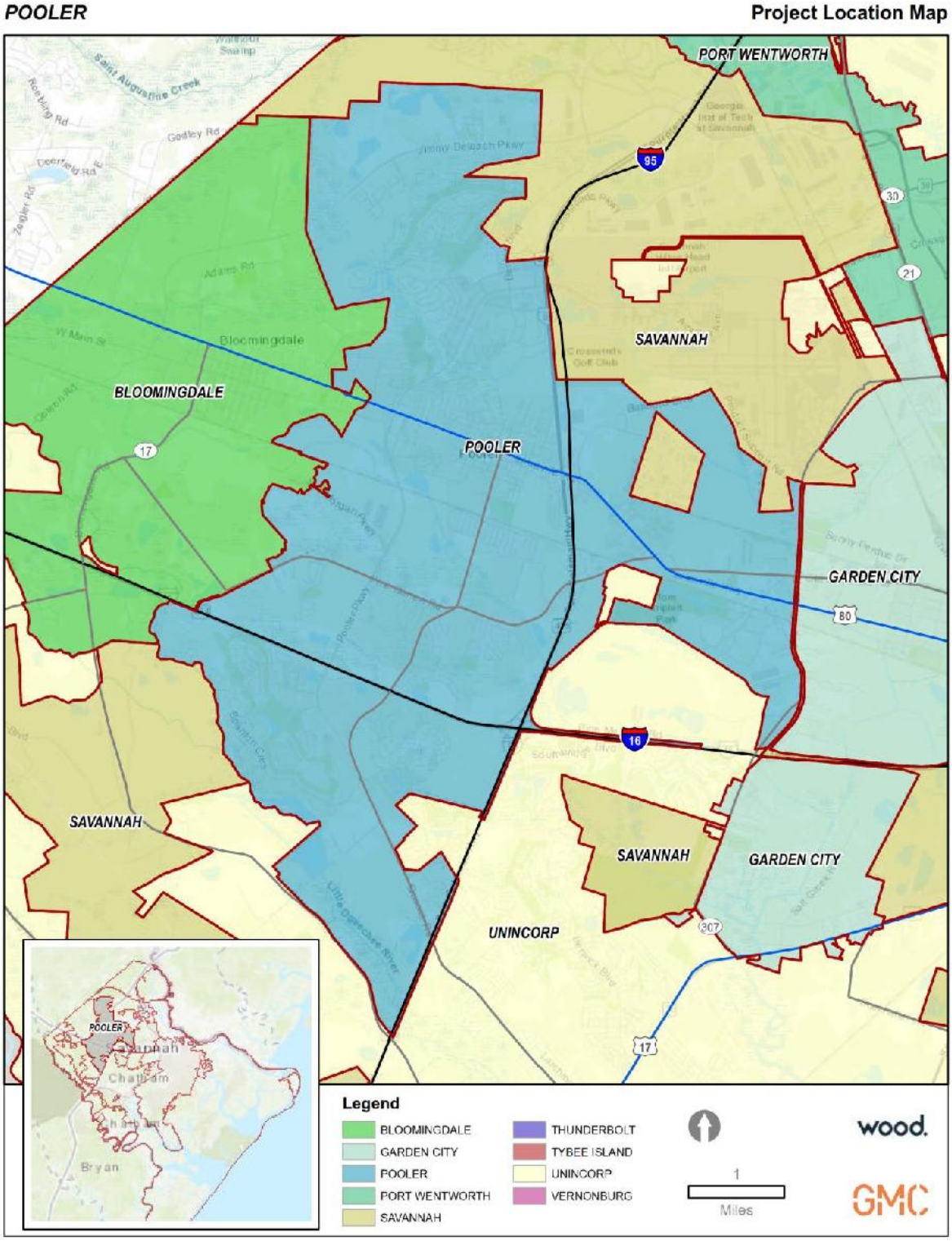
The City of Pooler is located along western Chatham County northwest of the City of Savannah and is bordered by Port Wentworth to the north and Garden City to the east.

According to the U.S. Census Bureau, Pooler has a total area of 30.3 square miles of which 29.4 square miles (97%) is land and 0.9 square miles (3%) is water.

According to the U.S. Census Bureau's American Community Survey (ACS) 5-Year Estimates, the town had a total population of 22,477 in 2017. Therefore, the City's average population density is approximately 742 people per square mile.

The figure below reflects Pooler's boundaries and shows the City's location within the county and in relation to surrounding municipalities.

Figure D.1 – Location Map, Pooler



D.2.2 Geography and Climate

Please refer to Chatham County Community Profile for a summary of climate for the City.

The City of Pooler lies within the Sea Island Flatwoods Level IV Ecoregion which consists of flat plains on marine terraces. Waterways consists of swamps, bays, and low gradient streams with sandy and silty substrates. Elevations average approximately 20 feet. Typical land cover consists of evergreen forests, pine plantations, and forested wetlands.

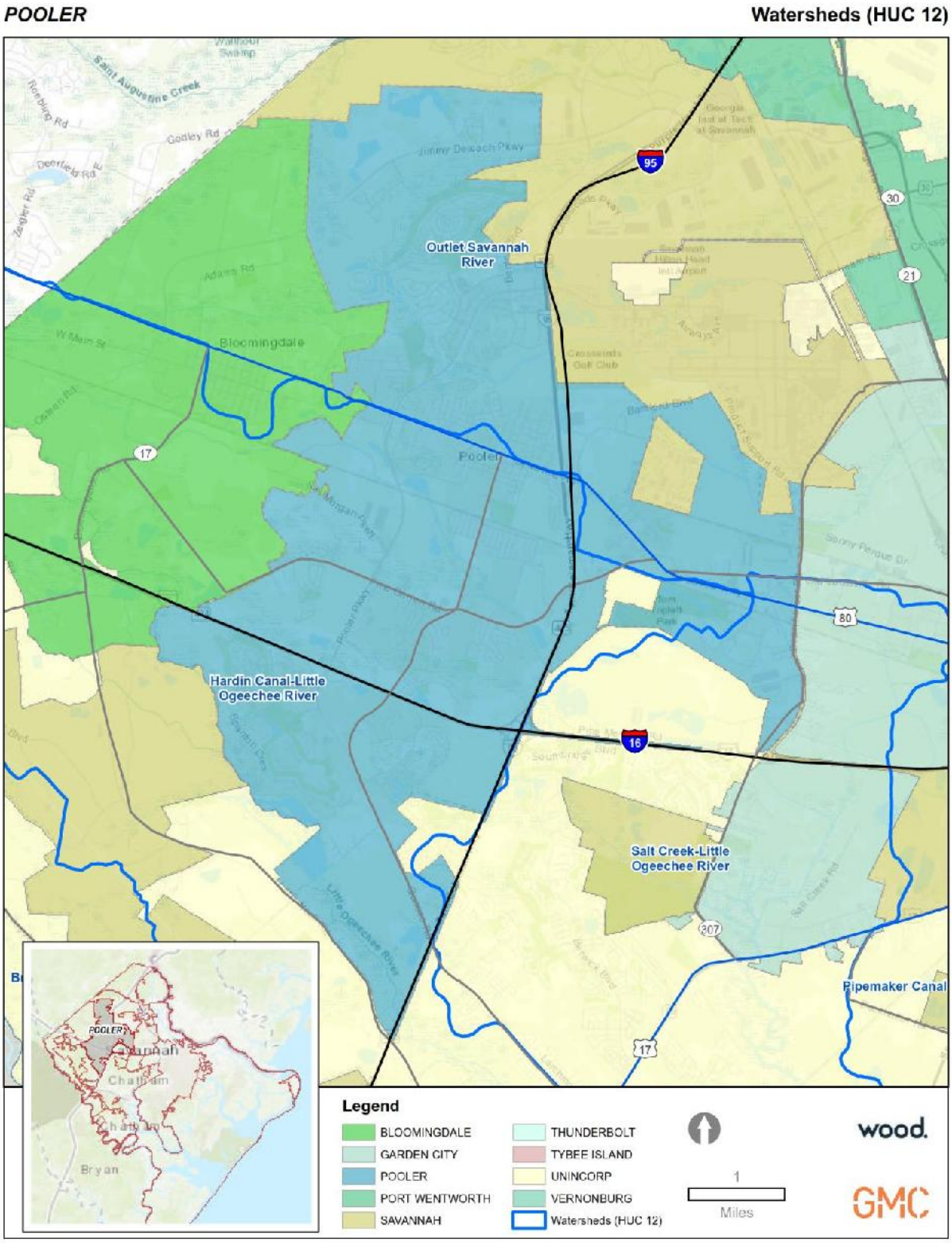
The City of Pooler is located within the HUC 12 Basins listed in the table below.

Table D.2 – HUC 12 Watersheds

HUC 12 Watershed Name	HUC 12 #
Hardin Canal – Little Ogeechee River	030602040201
Outlet Savannah River	030601090307
Salt Creek – Little Ogeechee River	030602040203

The figure below illustrates the HUC 12 drainage basins and drainage features in and around Pooler.

Figure D.2 – HUC 12 Drainage Basins, Pooler



D.2.3 Cultural, Historic and Natural Resources

D.2.3.1 Cultural and Historic Resources

National Museum of the Mighty Eighth Air Force

This museum is dedicated to the history of the Eighth Air Force (Mighty Eighth) which is the largest deployed air force in the American army which contributed substantially to the European theatre in World War II. The Eighth Air Force was created in 1044 from the VIII Bomber, Fighter, and Air Support Commands. The Mighty Eighth operated out of a British air based and flew missions against enemy targets in north-east Europe.

D.2.3.2 Natural Resources

Floodplains and Flood Zones

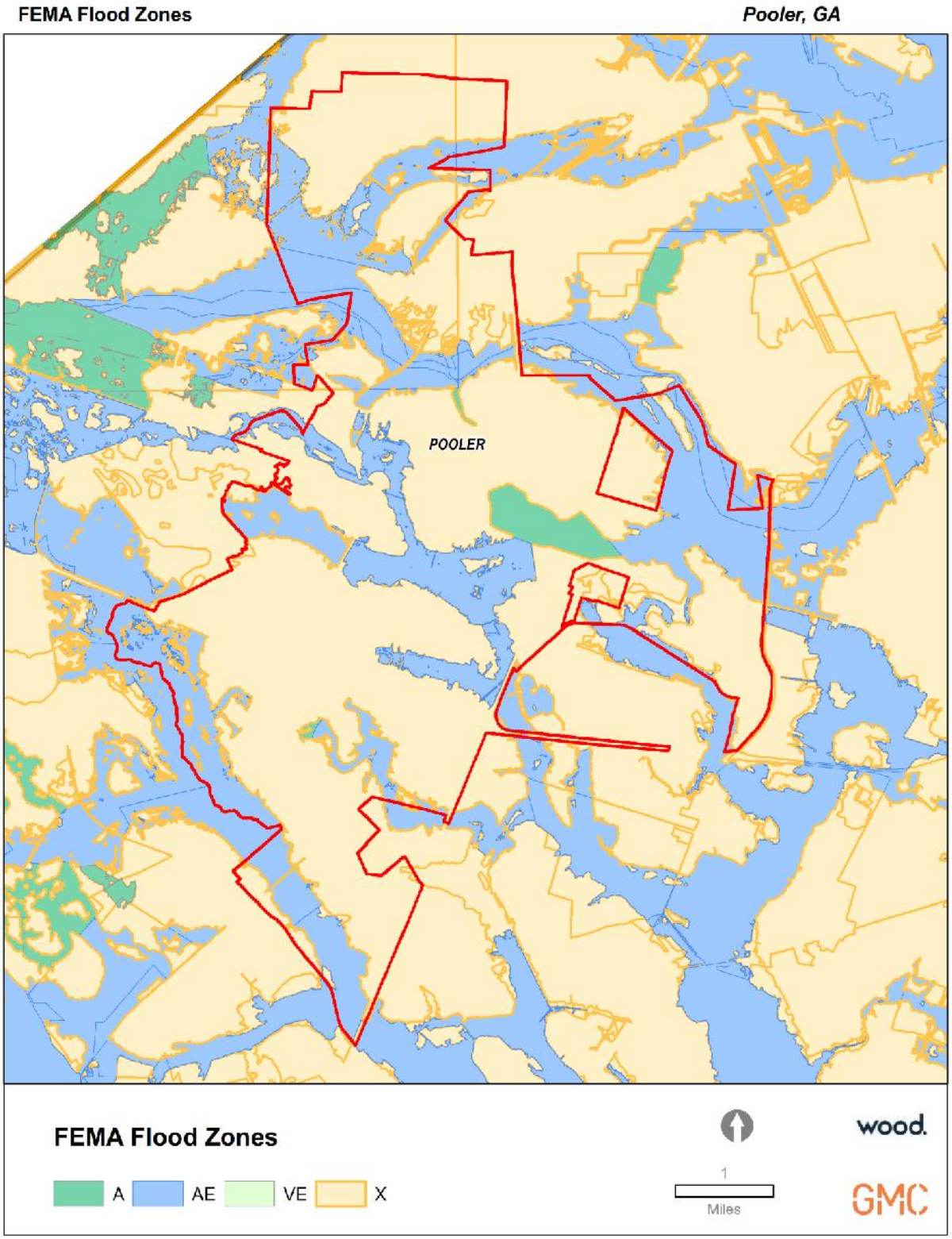
FEMA flood zone designations within the City of Pooler are identified in the Figure below. The flood hazard areas shown are designated by the Federal Emergency Management Agency (FEMA) and include: Zone A (subject to inundation by the 1% annual-chance flood event with no base flood elevation (BFE) determined), Zone AE (subject to inundation by the 1% annual-chance flood event with BFE determined), Zone VE (subject to inundation by the 1% annual-chance flood event with additional hazards due to storm waves with BFE determined), and Zone X (Moderate Risk areas outside the 1% and inside the 0.2% annual-chance floodplains with no BFE or base flood depths determined).

Table D.3 – Pooler Flood Zones

Flood Zone	Area (Acres)	Area (Square Miles)	Percent of City (%)
A	345	0.5	1.8
AE	5,492	8.6	28.3
X	13,555	13.2	69.9
TOTAL	**19,392**	**30.3**	**100.0**

Source: FEMA, 2018

Figure D.3 - FEMA Flood Zones, 2018, Pooler



According to the 2018 FEMA data, 5,837acres of the land within the City is located within a 100-year floodplain (Zone AE and A) which equals 30.1% of the City. An additional 13,555 acres are located within Zone X considered moderate or minimal flood risk (69.9% of the City). With nearly 30 percent of the City at high risk to flooding in the Special Flood Hazard Area (SFHA) and the remainder at moderate or minimal risk to flooding, the City of Pooler should seek ways to balance future development with strategies to preserve sensitive lands and natural drainage features.

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, and the vegetation stabilizes soils during flooding. Natural floodplains in Pooler include wetland areas and low-lying land along the major waterways in and around the City including the Little Ogeechee River, Hardin Canal, and Pipe Makers Canal. Natural floodplains reduce damage by allowing flood waters to spread out over large areas, aiding infiltration into the ground, reducing flow rates and acting as a flood storage area to reduce downstream peaks. The City should strive to keep floodplain and floodplain waters free of contaminants such as oil, paint, anti-freeze, pesticides, and plastics and other trash. These chemicals and waste materials pollute local waterways, decreasing the water quality that local wildlife and plants depend upon.

Wetlands

Wetlands benefit the ecosystem by storing, changing, and transmitting surface water and groundwater. Through these processes pollution is removed, nutrients are recycled, groundwater is recharged, and biodiversity is enhanced. Wetland composition varies extensively, with five distinct categories for classification: Estuarine, Lacustrine, Marine, Palustrine, and Riverine systems Based on data from the National Wetland Inventory (NWI) wetlands throughout the City of Pooler are the palustrine type (5,222 acres / 8.2 square miles) or 26.9 percent of the City or lacustrine (54 acres / 0.1 square miles) or 0.3 percent of the City. (see the Wetland Map below).

Table D.4 – Wetland Types, Pooler

Wetland Type	Area (Acres)	Area (Sq. Miles)	Percent of City
Non-Wetland	14,116	22.1	72.8
Lacustrine	54	0.1	0.3
Palustrine	5,222	8.2	26.9
TOTAL	**19,392**	**30.3**	**100.0**

Source: National Wetland Inventory

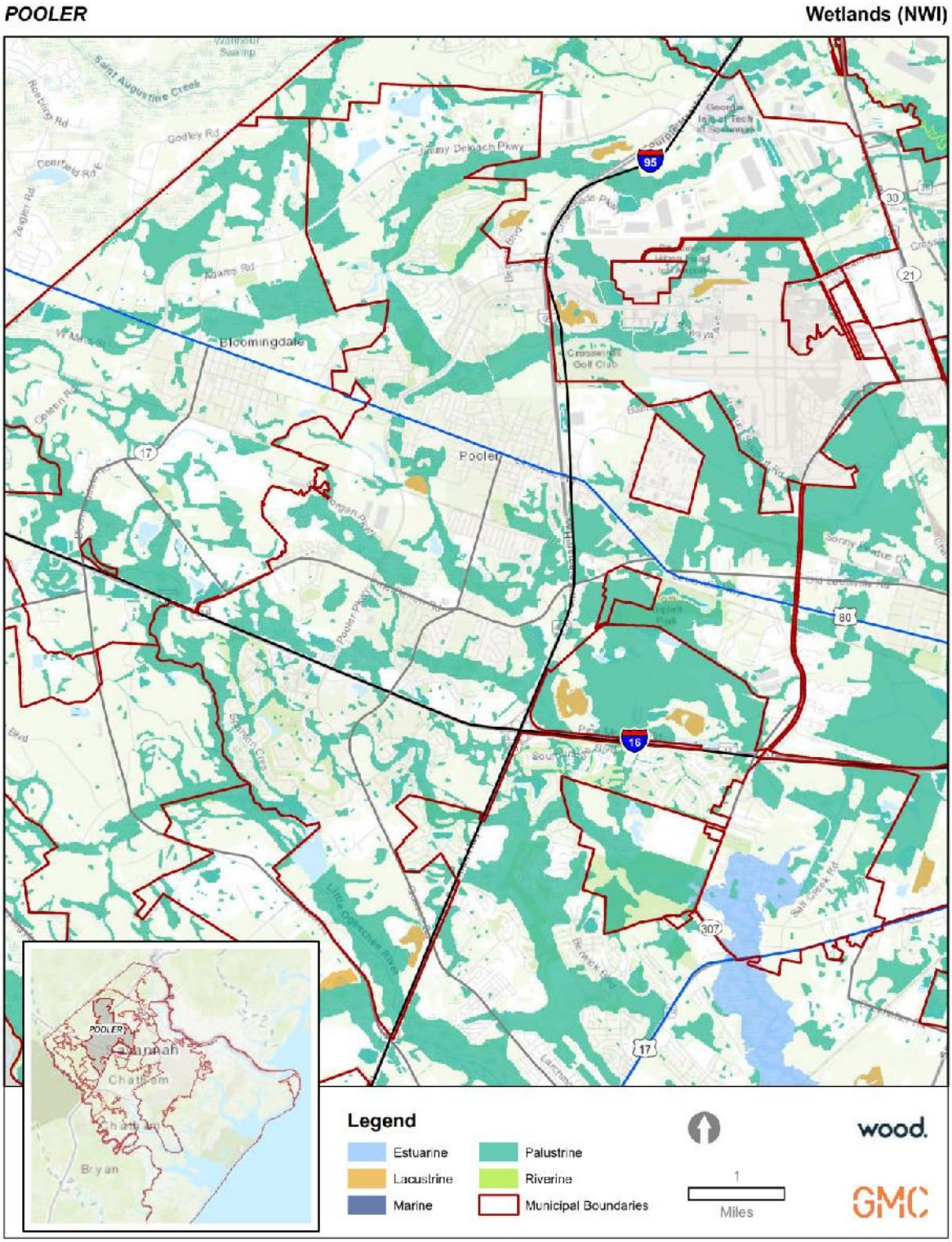
The Palustrine System

The Palustrine (freshwater) system includes all non-tidal wetlands dominated by trees, shrubs, persistent emergent plants, emergent mosses or lichens, and all such wetlands that occur in areas where salinity due to ocean-derived salts is below 0.5%. The Palustrine system is bounded by upland.

Lacustrine Wetlands

Lacustrine wetlands are large, open, water-dominated systems (e.g. lakes). This definition also applies to modified systems which possess characteristics similar to lacustrine systems (e.g. deep standing or slow-moving waters).

Figure D.4 – Wetlands by Type, Pooler



Source: National Wetland Inventory (NWI)

D.2.4 History

The City of Pooler was named after Robert William Pooler in 1838. Mr. Pooler was a very civic-minded resident of Savannah and worked for the Central of Georgia Railroad. Mr. William W. Gordon, President of the Central of Georgia, named the first station west of Savannah after William Pooler. Mr. Pooler had worked long and hard to establish a "feasibility study" of the venture in the towns and counties through which a proposed railroad would extend. Mr. Gordon and Mr. Pooler were both graduate law and engineering students, both born the same year, 1796, and each took a prominent part in the civic and military affairs of Savannah. Mr. Pooler never lived in the community named after him, and died on Christmas Day, 1853, at his residence on Bull and Liberty Streets in Savannah, and was buried in Colonial Cemetery, but later his body was interred in Laurel Grove Cemetery.

About 1883, Mr. Ben Rothwell, bought several hundred acres in the community pioneered in a new method of community development by giving free lots to builders of permanent homes. Dan Newton built the first Baptist Church in Pooler in what is now known as Gleason Park. He also built a Presbyterian Church, which survived only a few years, and gave lumber for Pooler's First Methodist Church. A sawmill was built to supply lumber to homebuilders and the embryonic community began to take shape. The brickyard supplied other needed materials and dairies soon found a ready market. Remains of the brickyard can be found near the railroad tracks just south of what is now I-95.

In 1907, Pooler was incorporated. Mr. H.G. Beaufort was the first mayor. A town hall was erected in 1923 in order to have a permanent place to transact municipal business. One of the first woman to vote in the State of Georgia was Mrs. Gary Goggins, who was also the only woman alderman for the Town of Pooler in the early 1900's.

The town grew with the establishment of banks, automobile service stations and repair shops, restaurants, and with the opening of Interstate 95. The Mighty Eighth Air Force Heritage Museum opened in 1996, bringing the veterans of the Eighth Air Force back "home".

D.2.5 Economy

D.2.5.1 Wages and Employment

Per the 2013-2017 American Community Survey 5-Year Estimates, the median household income for Pooler is $75,193, which is over 41.9 percent higher than the state's median household income ($52,977). Approximately 6.9 percent (1,551) of the population is considered to be living below the poverty level. Moreover, 8.4 percent (1,888) of people under 18 years of age and 4.9 percent (1,101) of people 65 years and over are living below the poverty level.

The table below shows employment and unemployment rates along with industry employment by major classification for the City.

Table D.5 – Employment and Occupation Statistics for Pooler, GA, 2017

Employment Status	Count	Percentage (%)
In labor force	12,590	70.2
Employed	11,504	64.1
Unemployed	832	4.6
Armed Forces	254	1.4
Not in labor force	5,354	29.8
Occupation		
Management, business, science and arts	5,041	43.8

Employment Status	Count	Percentage (%)
Service	1,990	17.3
Sales and office	2,771	24.1
Natural resources, construction and maintenance	584	5.1
Production, transportation and material moving	1,118	9.7

Source: U.S. Census Bureau, 2013-2017 American Community Survey 5-Year Estimates

Major industry sectors in the City of Pooler include management, business, science, and arts (43.8%); service (17.3%); and sales and office (24.1%); natural resources, construction, and maintenance (5.1%); and production, transportation, and material moving (9.7%).

Major employers are discussed in the Chatham County Community Profile.

D.2.6 Housing

According to the 2013-2017 ACS 5-Year Estimates, there are 9,099 housing units in Pooler, of which 94.2 percent (8,567) are occupied. Approximately 61.0 percent (5,230) of occupied units are owner-occupied (39.0% occupied by renters). A high percentage of renters is an indicator of higher pre- and post-disaster vulnerability because renters often do not have the financial resources of homeowners, are more transient, are less likely to have information about or access to recovery aid following a disaster, and are more likely to require temporary shelter following a disaster. Therefore, higher rates of home rentals in Pooler may indicate that residents are not able to implement certain types of mitigation in their homes.

Median home value in Pooler is $206,200. Of the town's owner-occupied housing units, 80.8 percent (4,225) have a mortgage. Most householders (87.2 percent / 7,470) moved into their current homes since the year 2000, 39.9 percent (3,420) moved in between 2000 and 2009, and 28.8 percent (2,464) moved in between 2010 and 2014. 1.9 percent (162) of occupied housing units have no vehicle available to them, which suggests these residents may have difficulty in the event of an evacuation.

The majority (63.8% / 5,808) of housing units in Pooler are detached single family homes. However, 6.6 percent (603) of units are mobile homes which can be more vulnerable to certain hazards, such as tornadoes and wind storms, especially if they aren't secured with tie downs.

The town's housing stock is relatively new, with the majority (69.1% / 6,287) of occupied housing built after 2000. The table below details housing age in the City.

Table D.6 – Housing Age, Pooler

Year Structure Built	Percent of Occupied Housing	Number of Structures
2014 or later	2.0	183
2010 to 2013	9.5	864
2000 to 2009	57.5	5,233
1980 to 1999	14.1	1,288
1960 to 1979	10.9	993
1940 to 1959	4.1	371
1939 or earlier	1.8	167

Source: U.S. Census Bureau, American Community Survey 2013-2017 5-Year Estimates

Age can indicate the potential vulnerability of a structure to certain hazards. For example, the City of Pooler first entered the National Flood Insurance Program in 1981. Therefore, based on housing age

estimates approximately 16.8 percent of housing in the town was built before any floodplain development restrictions were required.

D.2.7 Population

According to the U.S. Census Bureau, Pooler had an estimated population of 22,477 residents in 2017 and a population of 16,683 at the time of the 2010 U.S. Census (34.7% increase from 2010-2017). As of 2017, Pooler's population density was 742 persons per square mile. Table D.7 provides demographic profile data from the 2017 American Community Survey 5-Year Estimates.

Table D.7 – Town of Pooler Demographic Profile Data, 2017

Demographic	Pooler
Gender/Age	
Male	10,605
Female	11,872
Under 5 Years	1,531
65 Years and Over	2,527
Race/Ethnicity (One Race)	
White	14,602
Black or African American	5,622
American Indian/Alaska Native	220
Asian	802
Two or More Races	1,004
Hispanic or Latino[1]	1,144
Education	
High School Graduate or Higher	3,236
Bachelor's Degree or Higher	3,399

Source: U.S. Census Bureau, 2013-2017 American Community Survey 5-Year Estimates
1Hispanics may be of any race, so also are included in applicable race categories.

D.2.8 Land Use

The City of Pooler's Comprehensive Plan 2016-2036 (Comp Plan) establishes Character Areas to guide future development and includes a Future Land Use Map.

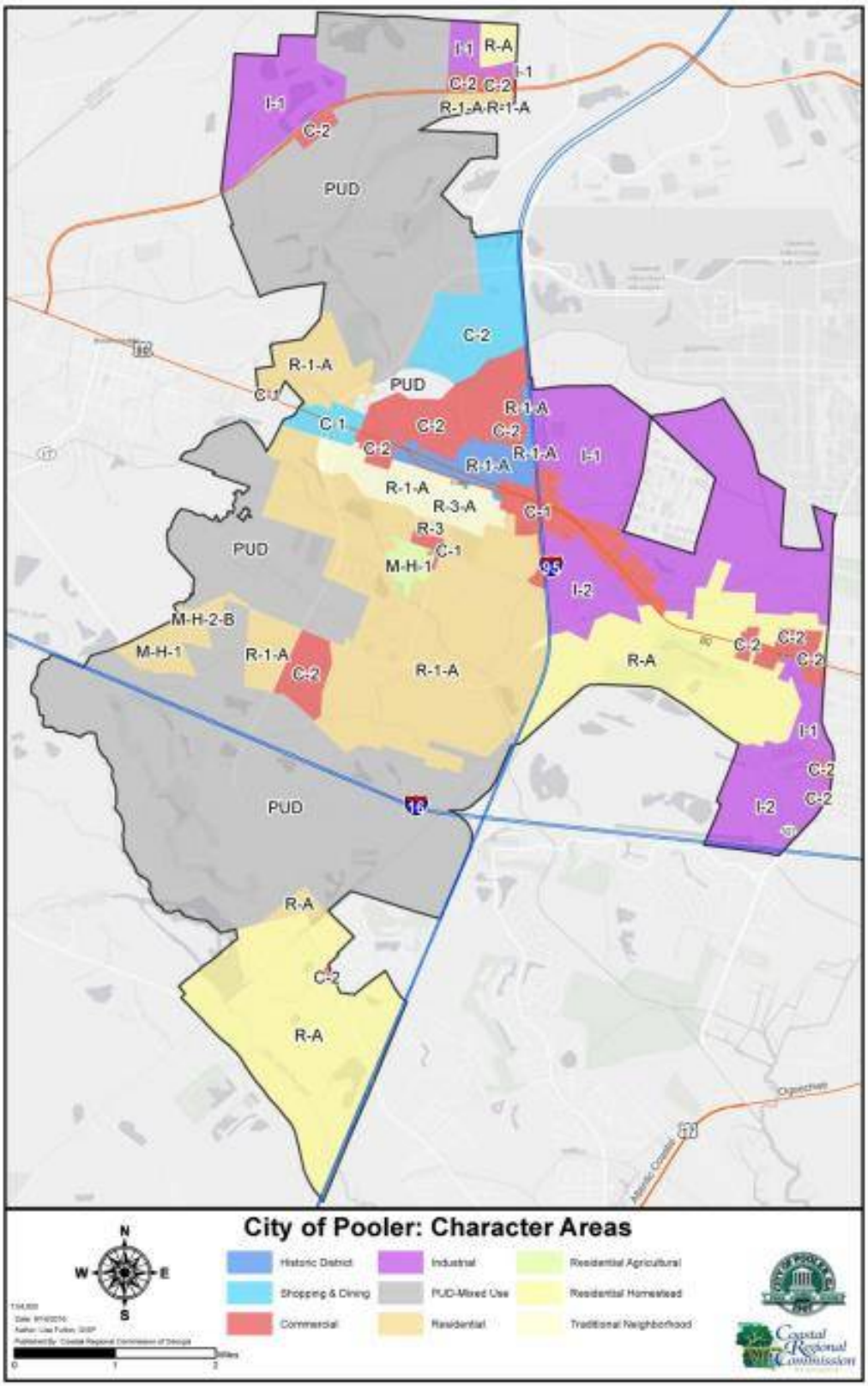
D.2.8.1 Character Areas

The Character Areas established by the City's Comp Plan include those listed below and shown in the Character Area Map.

- Historic District: Designed to protect the City's historic area from incompatible development
- Shopping & Dining: Intended to retain existing commercial uses and to provide for establishments catering to the lodging, dining, shopping and service needs of residents and tourists.
- Commercial: Strategic location located close to the interstate that will attract commercial businesses
- Industrial: Intended for projects that protect industrial areas from an inappropriate level of unrelated uses and where activity could improve or accommodate a wider range of employment opportunities.
- PUD Mixed Use: Projects that integrate different land uses such as retail stores, restaurants, residences, civic buildings, offices, and parks within a defined area.

- Residential: Residential districts are characterized by grid street patterns, pedestrian circulation, architectural character, and a sense of community.
- Residential Agricultural: Promotes a compatible mixture of agricultural, forestry, conservation, and very-low density residential uses.
- Residential Homestead: Designed for large tracts of land upon which a large home or estate can be built.
- Traditional Neighborhood: Characterized by mixed land uses, grid street patterns, pedestrian circulation, intensively-used open spaces, architectural character, and a sense of community.

Figure D.5 – Character Area Map, Pooler



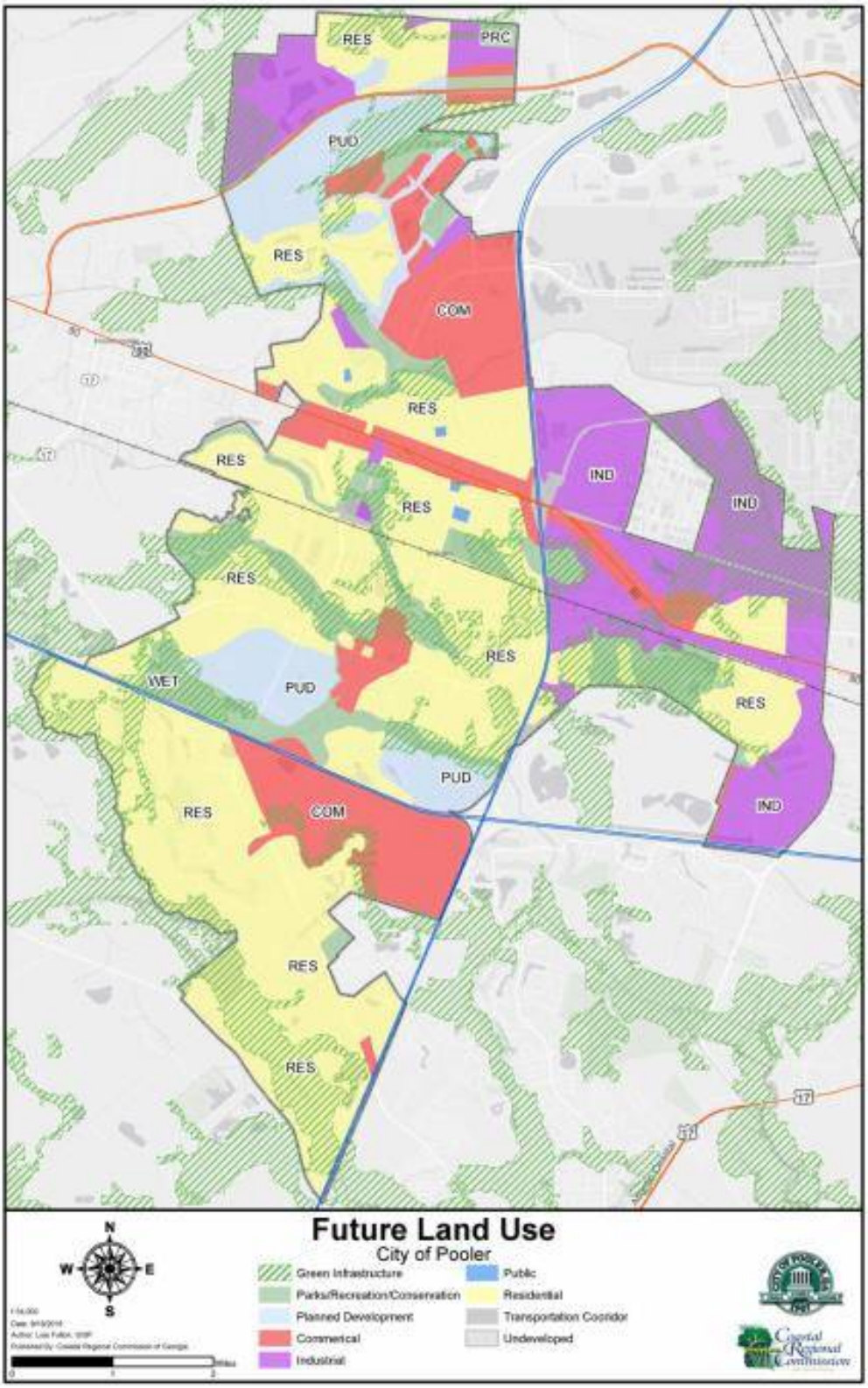
Source: City of Pooler Comp Plan, 2016-2036

D.2.8.2 Future Land Use

The Pooler Comp Plan establishes the following future land use districts:

- Commercial: Area designated for the development of commercial properties with land uses for less than two acres.
- Industrial: Land for industrial uses which are not significantly objectionable with regard to noise, odor, fumes, etc., to surrounding properties.
- Public: Includes state, federal, or local government uses.
- Planned Development: Encourage flexibility in land planning that will result in improved design, character, and quality of new mixed-use developments.
- Transportation Corridor: Includes major transportation routes, public transit stations, power generation plants, railroad facilities, radio towers, telephone switching stations, airports, port facilities or other similar uses.
- Green Infrastructure/Park/Recreation/Conservation: Land dedicated to active or passive recreational uses.
- Undeveloped Lands/Other: Land for lots or tracts that are undeveloped.

Figure D.6 – Future Land Use Map

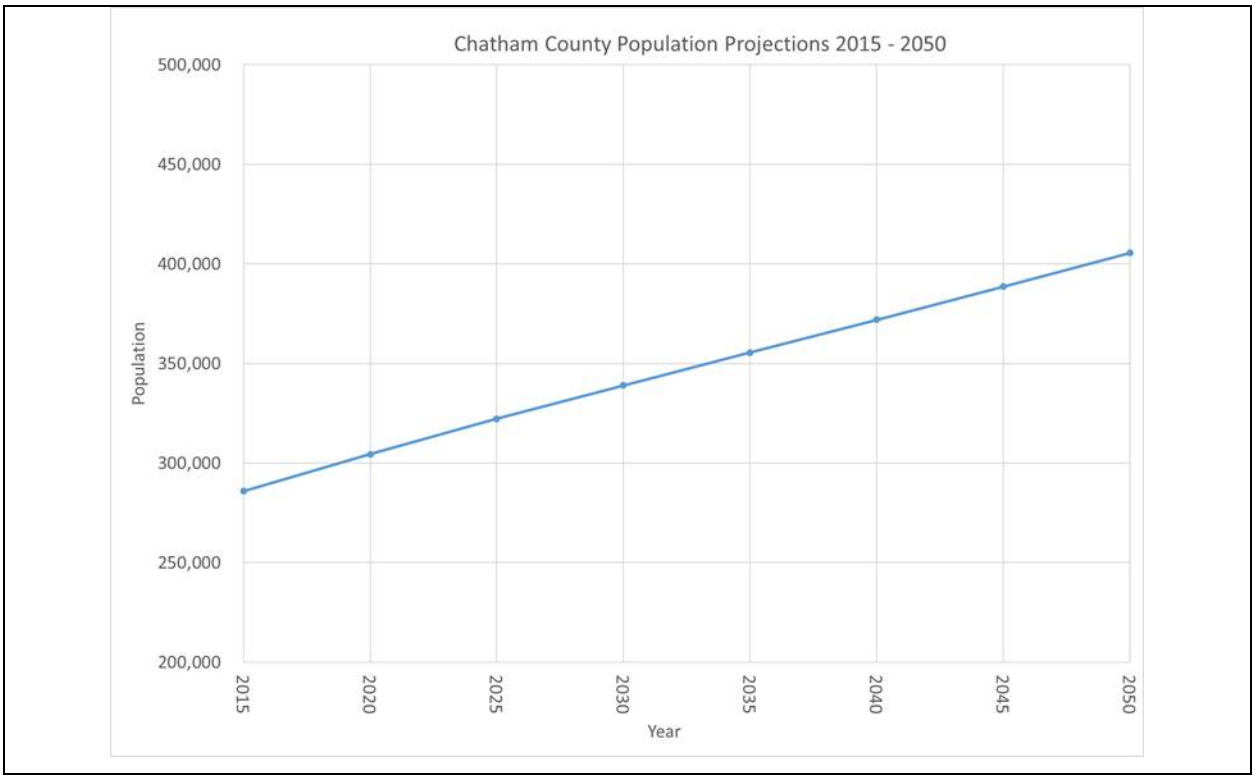


D.2.9 Growth and Development Trends

According to U.S. Census and American Community Survey population estimates, Pooler's population has increased slightly from 19,140 in 2010 to 22,477 in 2017.

According to the Georgia Governor's Office of Planning and Budget (GOPB), Chatham County is projected to reach a population of 405,573 by 2050, which represents a 38% increase from the 2017 population. The population projections from the GOPB estimate the annual growth for the County to be about 1.1% through 2050.

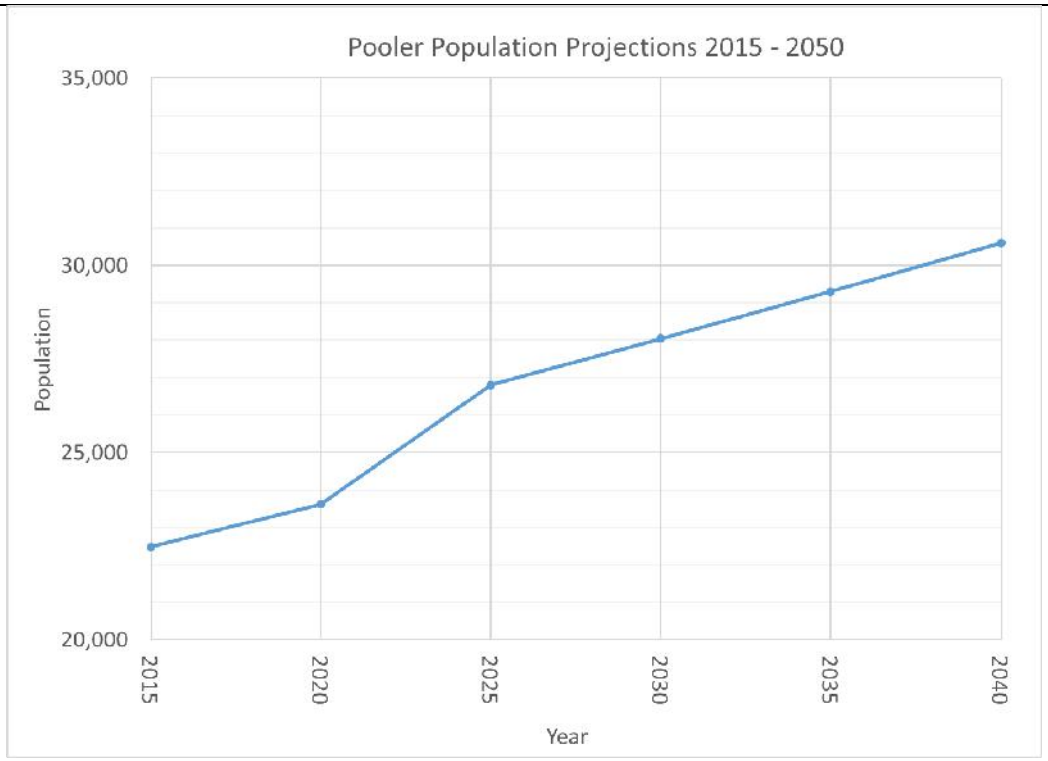
Figure D.7 – Population Projections for Chatham County 2013 - 2050



Source: Georgia Governor's Office of Planning and Budget

Using the projected growth rate for the County, the population of the City of Pooler would increase to 30,593 by 2050 as shown in the graph below.

Figure D.8 – Population Projections for Pooler 2013 - 2050



D.3 ASSET INVENTORY

D.3.1 Property

Table D.8 – City of Pooler City Building Exposure

Occupancy Type	Total Number of Buildings	Total Building Value	Estimated Content Value	Total Value
Commercial	1,071	$669,256,503.60	$669,256,503.60	$1,338,513,007.20
Industrial	210	$401,744,576.60	$602,616,864.90	$1,004,361,441.50
Residential	7,214	$1,129,449,783.30	$564,724,891.65	$1,694,174,674.95
Total	**8,495**	**$2,200,450,863.50**	**$1,836,598,260.15**	**$4,037,049,123.65**

Source: Chatham County

D.3.2 Critical Facilities

Table D.9 – Critical Facilities and Infrastructure at Risk

ID	PRIORITY CRITICAL FACILITY NAME	PHYSICAL ADDRESS	LAT	LONG	REASON				
					COG	Life Safety	Debris	Support	Other
P-1	Pooler City Hall	100 SW Hwy 80	32.1157	-81.2502	X				
P-2	Pooler Police Department	100 SW Hwy 80	32.1159	-81.25		X			
P-3	Pooler Fire Dept. Station 1	1035 S. Rogers Street	32.1076	-81.2535		X			
P-4	Pooler Fire Dept. Station 2	912 Pooler Pkwy	32.1276	-81.2626		X			
P-5	Pooler Fire Dept. Station 3	105 Barrow Drive	32.0896	-81.2353		X			
P-6	Pooler Fire Dept. Station 4	1750 Quacco Road	32.0656	-81.2728		X			
P-7	Pooler Public Works	1095 S. Rogers St.	32.1069	-81.2526				X	
P-8	Well #2	327 E. U.S. Hwy 80	32.1141	-81.2439				X	
P-9	Lift Station	401 W. Whatley St.	32.114	-81.2541				X	
P-10	Water Tower	1035 Hwy 80 E.	32.1063	-81.2301				X	
P-11	Water Treatment Facility	1091 South Rodgers St	32.0661	81.1577				X	
P-12	Townlakes Lift Station	103 Manor Rd	32.0814	81.155				X	
P-13	Valve Station	Benton Blvd	32.087	81.1484				X	
P-14	YMCA Lift Station	1 Isaac Laroche Dr	32.0754	81.1545				X	
P-15	Barrow Lift Station	105 Barrow Drive	32.0896	81.2353				X	

Source: Chatham County

D.4 RISK ASSESSMENT

This section contains a hazard profile and vulnerability assessment for those hazards that were rated with a higher priority for the City of Pooler than for Chatham County as a whole. Risk and vulnerability findings are also presented here for those hazards that are spatially defined and have variations in risk that could be evaluated quantitatively on a jurisdictional level. The hazards included in this section are: Flood and Wildfire.

D.4.1 Flood

Approximate 30 percent of the City of Pooler falls within the mapped 1%-annual-chance floodplains. Figure D.9 reflects the mapped flood hazard zones for the City of Pooler, and Figure D.10 displays the depth of flooding estimated to occur in these areas during the 1%-annual-chance flood. The data in this risk assessment is based off FEMA's 2014 DFIRM. Minor changes have since been made and the updated 2018 DFIRM can be seen in Figure D.3 for comparison.

Properties at risk are detailed by flood zone in Table D.10, below. Parcel data was used to assess how many buildings are located in hazard areas based on each parcel's centroid.

Table D.10 – Properties at Risk by Flood Zone

Flood Zone	Number of Buildings	Total Building Value
A	284	$59,840,975.50
AE	975	$378,532,680.30
0.2% Annual Chance Flood Hazard	195	$47,137,169.50
X	7,041	$1,714,940,038.20
Total	8,495	$2,200,450,863.50
SFHA Total	**1,259**	**$438,373,655.80**

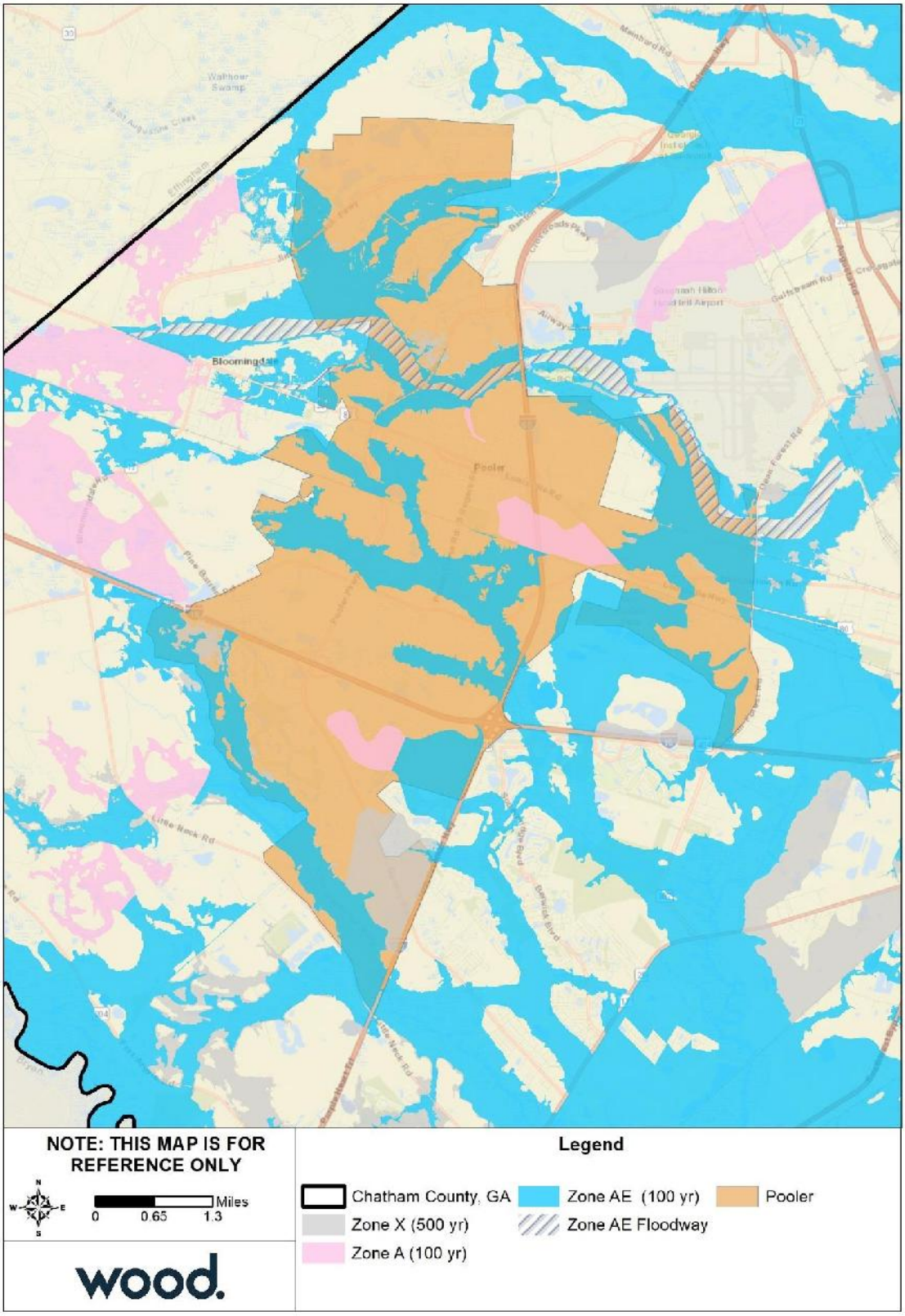
Table D.11 provides building counts and estimated damages by occupancy type for the 1% annual chance flood event. There are no critical facilities in Pooler at risk of damage during a 1% annual chance flood.

Table D.11 – Pooler Estimated Building Damage and Content Loss, 1% Annual Chance Flood

Occupancy	Buildings Impacted	Building and Contents Cost	Estimated Building Damages	Estimated Content Damages	Loss Estimate
Commercial	75	$127,324,539.78	$5,774,685.20	$18,866,310.41	19.35%
Industrial	26	$124,988,171.87	$3,557,430.97	$10,163,880.13	10.98%
Residential	467	$143,621,026.50	$14,773,982.32	$8,343,958.60	16.10%
Total	**568**	**$395,933,738.15**	**$24,106,098.49**	**$37,374,149.15**	**15.53%**

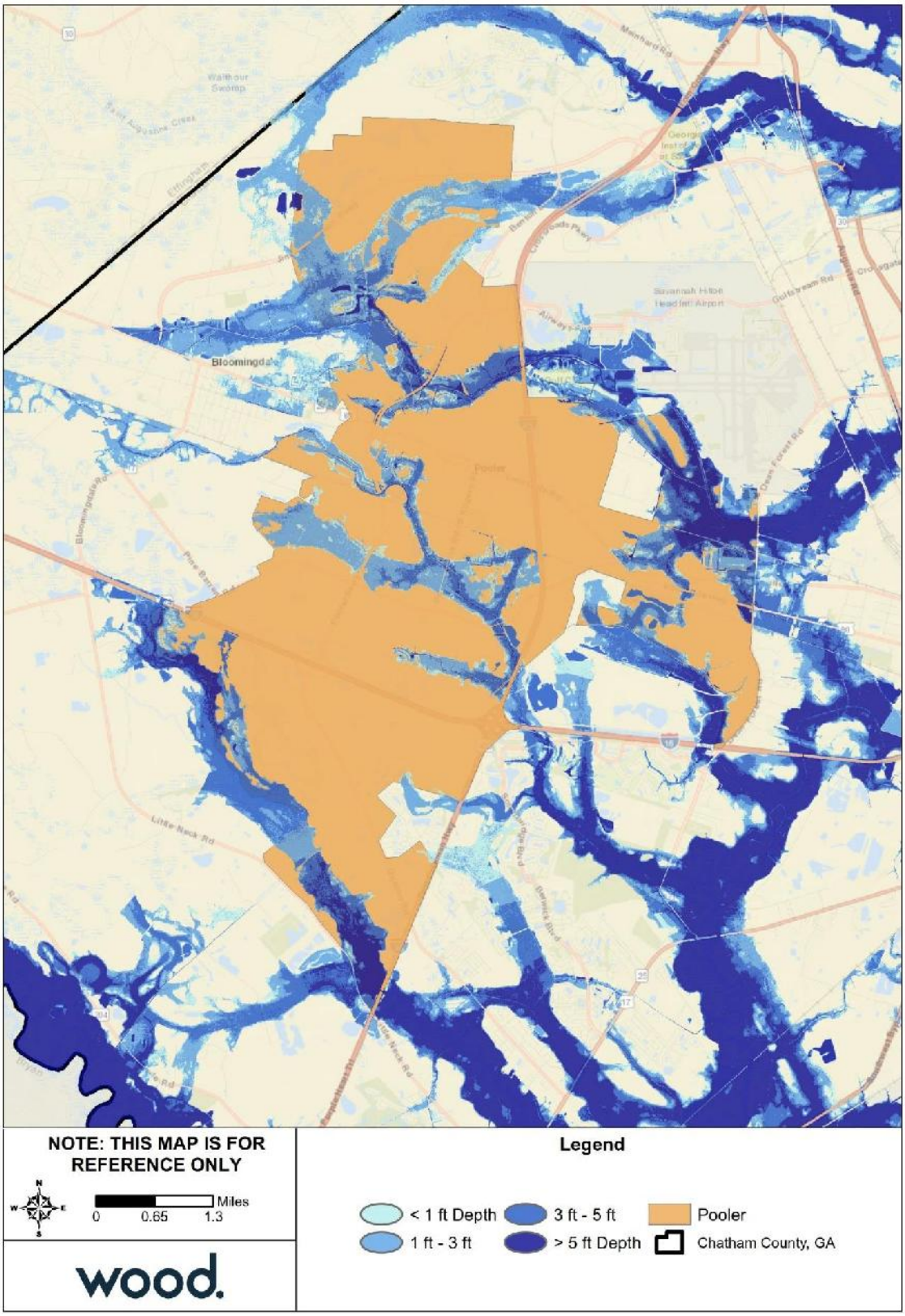
Source: HAZUS

Figure D.9 – FEMA Flood Hazard Areas, City of Pooler



Source: FEMA 2014 DFIRM

Figure D.10 – Flood Depth, 1%-Annual-Chance Floodplain, City of Pooler



Source: FEMA 2014 DFIRM

D.4.2 Wildfire

Table D.12 summarizes the acreage in the City of Pooler that falls within the Wildland Urban Interface (WUI), categorized by housing density. Areas in the WUI are those where development may intermix with flammable vegetation. Nearly 30 percent of the City of Pooler is not included in the WUI.

Table D.12 – Wildland Urban Interface Acreage, City of Pooler

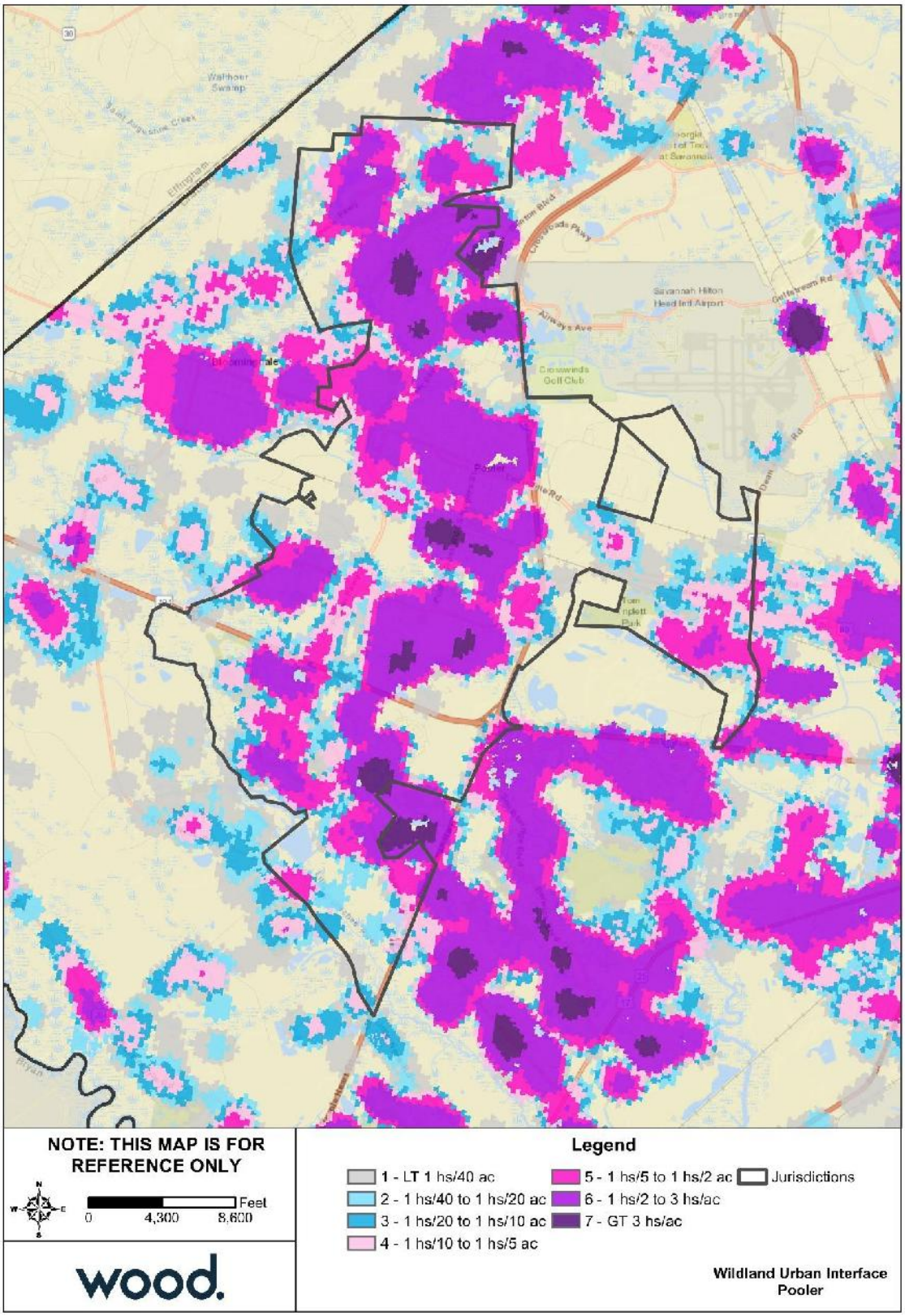
	Housing Density	Total Acreage	Percent of Total Acreage
	Not in WUI	*4,916.5*	*27.6*
	LT 1hs/40ac	1,535.6	8.6
	1hs/40ac to 1hs/20ac	876.3	4.9
	1hs/20ac to 1hs/10ac	1,155.2	6.5
	1hs/10ac to 1hs/5ac	1,708.6	9.6
	1hs/5ac to 1hs/2ac	2,651.4	14.9
	1hs/2ac to 3hs/1ac	4,608.0	25.8
	GT 3hs/1ac	383.7	2.2
	Total	17,835.3	

Source: Southern Wildfire Risk Assessment

Figure D.11 depicts the WUI for the City of Pooler. The WUI is the area where housing development is built near or among areas of vegetation that may be prone to wildfire. Figure D.12 depicts the Fire Intensity Scale, which indicates the potential severity of fire based on fuel loads, topography, and other factors. Figure D.13 depicts Burn Probability based on landscape conditions, percentile weather, historical ignition patterns, and historical prevention and suppression efforts.

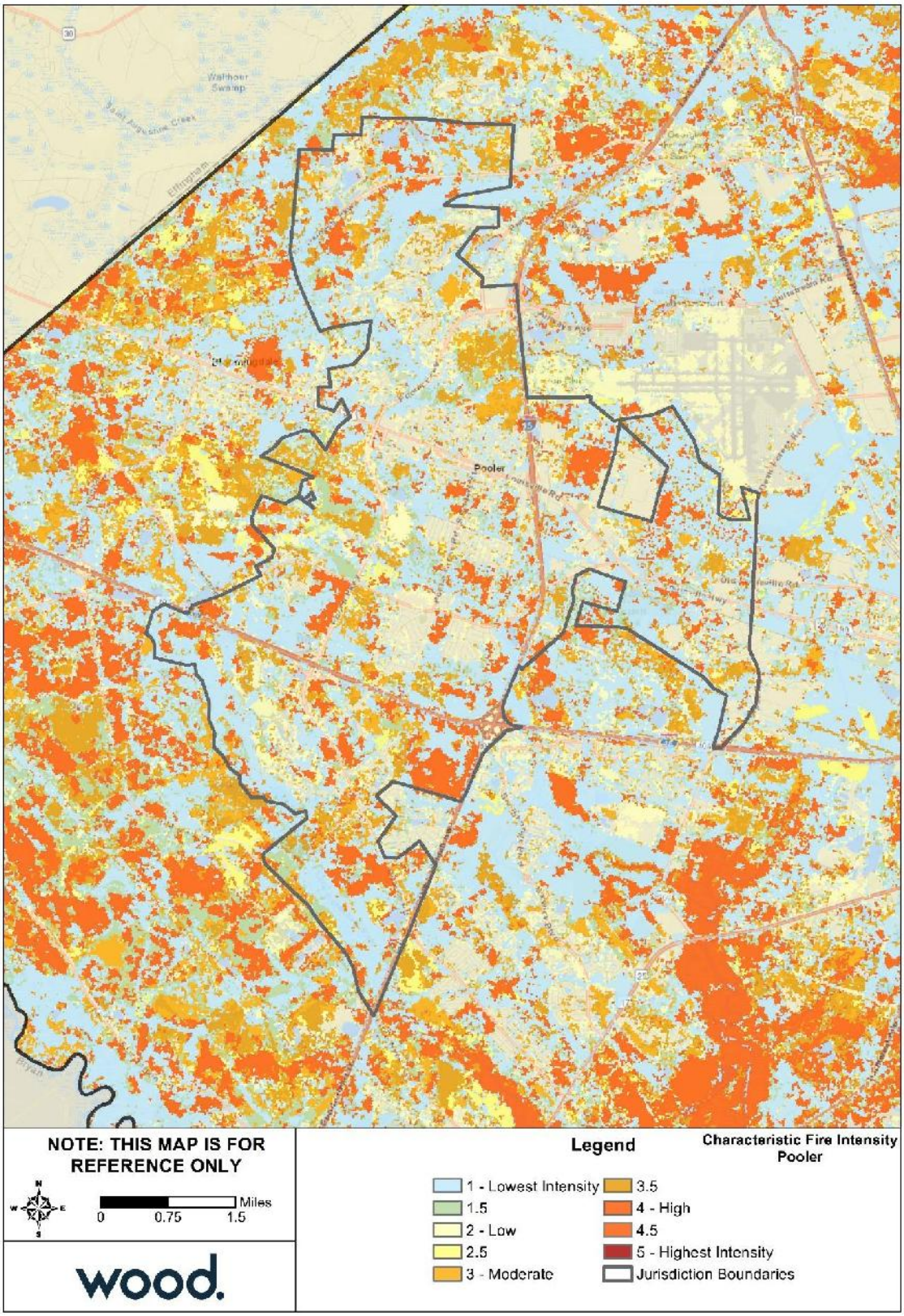
Potential fire intensity is generally low throughout the city, with areas of relatively higher potential intensity scattered throughout. Burn Probability is also low to moderate across the entire city. Areas of greatest risk to wildfire are those where WUI overlays with moderate burn probability and relatively higher fire intensity levels, which are scattered sporadically across the City with no significant concentrations of at-risk areas.

Figure D.11 – Wildland Urban Interface, City of Pooler



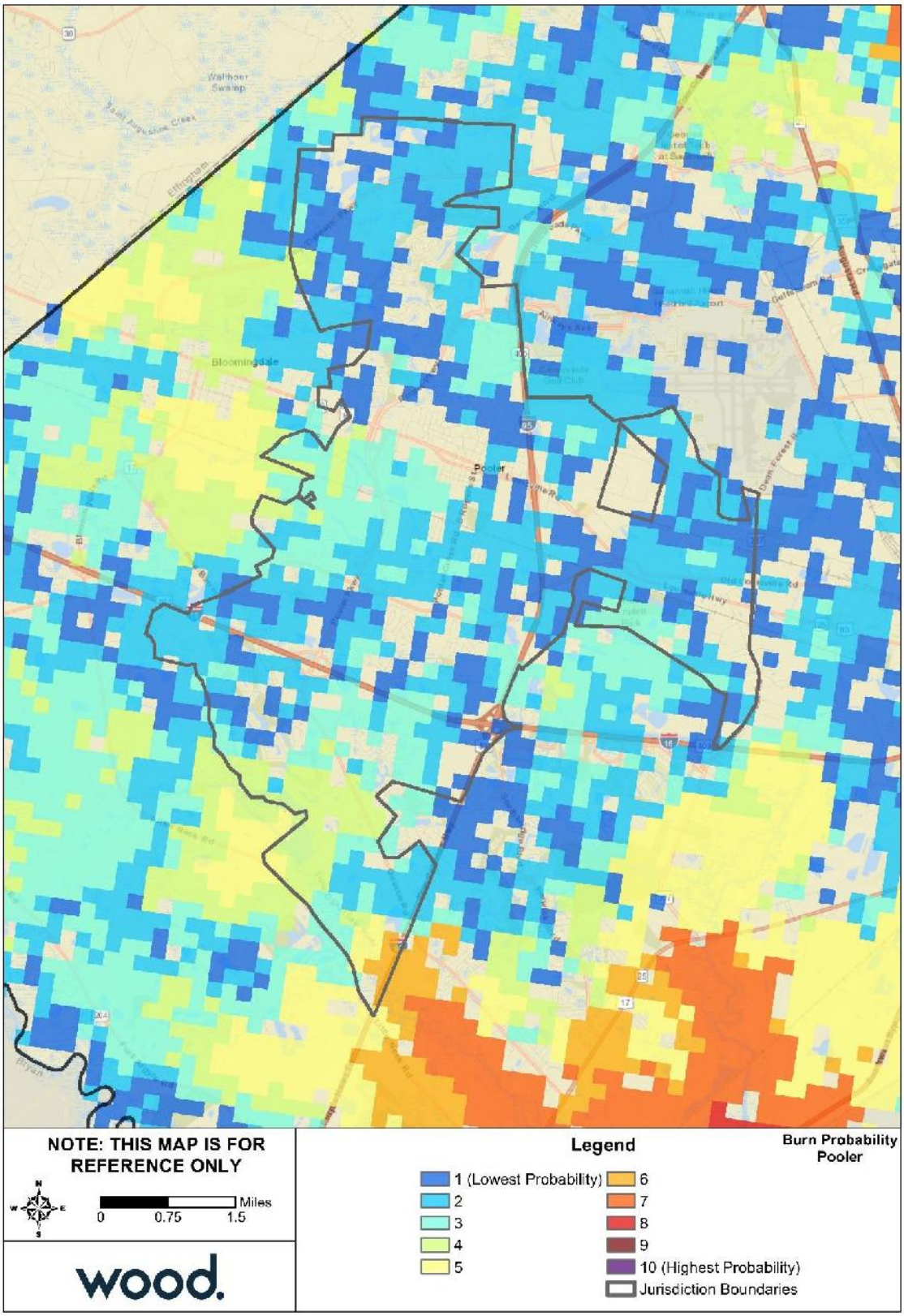
Source: Southern Wildfire Risk Assessment

Figure D.12 – Fire Intensity Scale, City of Pooler



Source: Southern Wildfire Risk Assessment

Figure D.13 – Burn Probability, City of Pooler



Source: Southern Wildfire Risk Assessment

D.1 FLOODPLAIN MANAGEMENT CAPABILITY ASSESSMENT

The City of Pooler joined the NFIP emergency program in 1974 and has been a regular participant in the NFIP since September 1981. The following tables reflect NFIP policy and claims data for the City categorized by structure type, flood zone, Pre-FIRM and Post-FIRM. Zones with no policies or closed paid losses were left out of the tables below.

Table D.13 – NFIP Policy and Claims Data by Structure Type

Structure Type	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
Single Family	1,609	$739,971	$474,031,000	49	$753,996.80
2-4 Family	12	$4,404	$2,677,500	0	$0.00
All Other Residential	51	$48,555	$21,031,000	0	$0.00
Non Residential	82	$125,840	$35,643,500	1	$16,225.89
Total	**1,754**	**$918,770**	**$533,383,000**	**50**	**$770,222.69**

Source: FEMA Community Information System, accessed September 2019

Table D.14 – NFIP Policy and Claims Data by Flood Zone

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	650	$405,396	$187,506,400	19	$346,674.77
A Zones	41	$48,809	$10,892,800	1	$17,580.72
B, C & X Zone					
Standard	81	$69,383	$24,007,800	3	$18,052.31
Preferred	982	$395,182	$310,976,000	26	$385,601.07
Total	**1,754**	**$918,770**	**$533,383,000**	**49**	**$767,908.87**

Source: FEMA Community Information System, accessed September 2019

Table D.15 – NFIP Policy and Claims Data Pre-FIRM

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	18	$18,849	$3,295,400	2	$25,132.26
A Zones	17	$18,970	$3,108,000	0	$0.00
B, C & X Zone	118	$47,721	$34,106,600	22	$237,526.80
Standard	8	$5,132	$2,386,600	3	$18,052.31
Preferred	110	$42,589	$31,720,000	19	$219,474.49
Total	**153**	**$85,540**	**$40,510,000**	**24**	**$262,659.06**

Source: FEMA Community Information System, accessed September 2019

Table D.16 – NFIP Policy and Claims Data Post-FIRM

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	632	$386,547	$184,211,000	17	$321,542.51
A Zones	24	$29,839	$7,784,800	1	$17,580.72
B, C & X Zone	945	$416,844	$300,877,200	7	$166,126.58
Standard	73	$64,251	$21,621,200	0	$0.00

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
Preferred	872	$352,593	$279,256,000	7	$166,126.58
Total	**1,601**	**$833,230**	**$492,873,000**	**25**	**$505,249.81**

Source: FEMA Community Information System, accessed September 2019

D.2 MITIGATION STRATEGY

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Lead Agency / Department	Potential Funding Source	Implementation Timeline	2020 Status	2020 Implementation Status Comments
Property Protection									
PP-1	Purchase and install bypass pumps	Flood, Hurricane	1.1	Moderate	Public Works	Local Funds	2020	New	
PP-2	Protect sewer infrastructure from infiltration from flood water and related debris.	Flood, Hurricane	1.1	Moderate	City Administration	FMA; HMGP	2023	Carry Forward	No update.
PP-3	Protect primary transportation route and maintain groundwater flow at Canal Bridge.	All	1.1	Moderate	City Administration	HMGP; FMA	2020	Carry Forward	Updated Implementation Date
PP-4	Install safe room in critical facilities in the City's jurisdiction.	Tornado, Severe Weather	1.1	Moderate	City Administration	PDM	2023	Carry Forward	No update
PP-5	Harden roof, windows, doors and rooftop units for critical facilities	All	1.1	Moderate	City Administration	HMGP; PDM	2022	New	
PP-6	Anchor HVAC units and Storage Tanks	All	1.1	Moderate	Public Works	TBD	2020	New	
PP-7	Acquire or elevate properties prone to flooding	Flood, Hurricane	1.2 & 3.1	Moderate	Public Works	HMGP	2025	New	
PP-8	Elevate or dry floodproof components or systems vulnerable to flood damage	Flood, Hurricane	1.1	Moderate	Public Works	TBD	2020	New	
Structural Projects									
SP-1	Construct and/or improve drainage systems to alleviate drainage issues.	Flood, Hurricane, Sea Level Rise	3.1	Moderate	Public Works	General fund, grants	2023	New	
Emergency Services									
ES-1	Generators for critical facilities	All	1.1	Moderate	City Administration	HMGP, General Fund	2022	New	
ES-2	Portable generators for critical facilities	All	1.1	Moderate	City Administration	HMGP, General Fund	2022	New	
ES-3	Purchase and install generator quick connects and transfer switches for critical facilities	All	1.1	Moderate	City Administration	HMGP, General Fund	2022	New	

Annex E City of Port Wentworth

E.1 PLANNING PROCESS

The table below lists the HMPC members who represented the City of Port Wentworth.

Table E.1 – HMPC Members

Member Name	Title	Agency/Department
Brian Harvey	Director	Development Services
Phillip Jones	City Administrator	Port Wentworth

E.2 COMMUNITY PROFILE

E.2.1 Overview of the Community

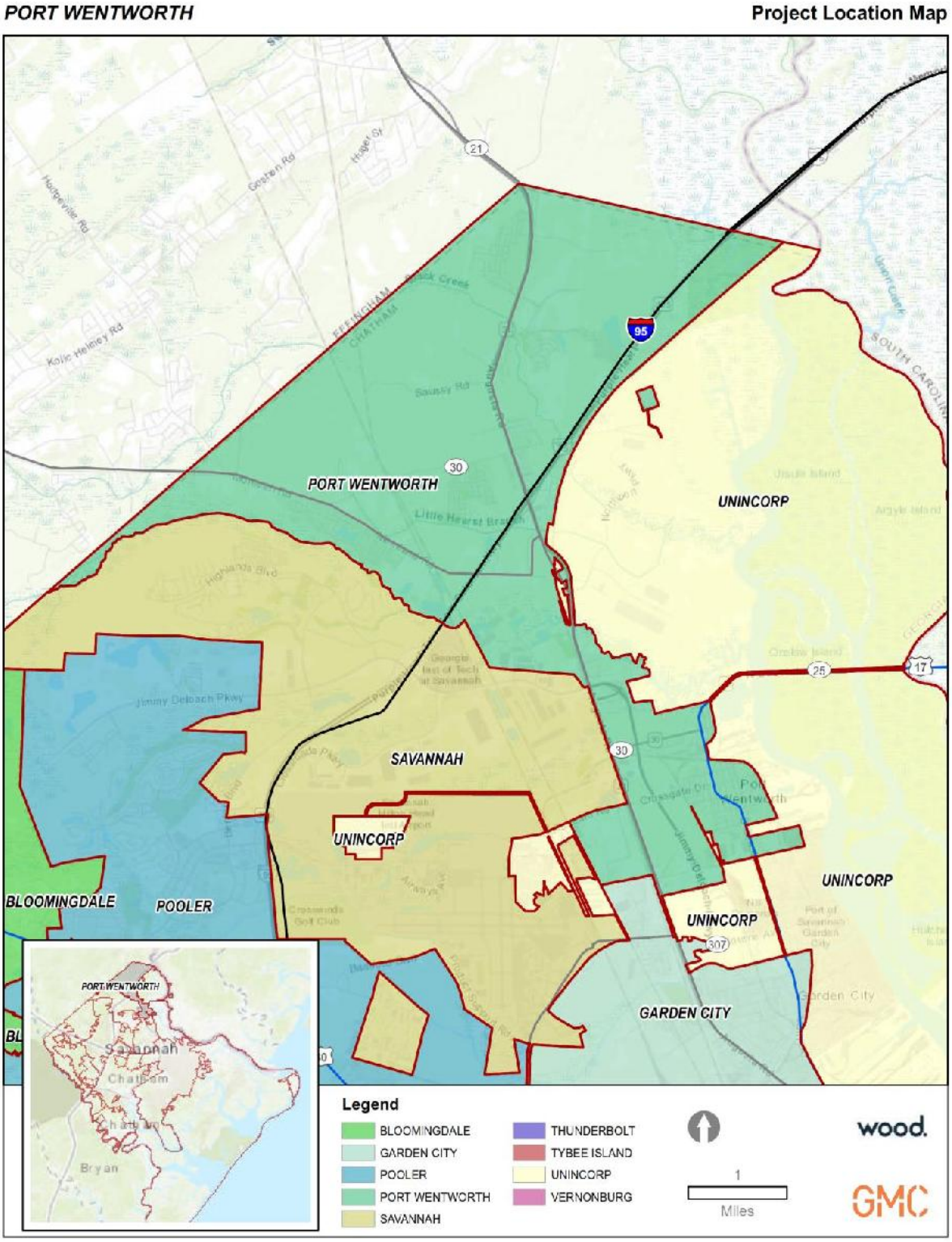
The City of Port Wentworth is located within the northern corner of Chatham County and is bordered by Effingham County to the north, by Garden City to the southeast, and the city limits of the City of Savannah to the southwest.

According to the U.S. Census Bureau, Port Wentworth has a total area of 16.6 square miles of which 16.4 square miles (98.8%) is land and 0.2 square miles (1.2%) is water.

According to the U.S. Census Bureau's American Community Survey (ACS) 5-Year Estimates, the City had a total population of 7,568 in 2017. Therefore, the City's average population density is approximately 455.9 people per square mile.

The map below shows Port Wentworth's boundaries and shows the City's location within the county and in relation to surrounding municipalities.

Figure E.1 – Location Map, Port Wentworth



E.2.2 Geography and Climate

Please refer to the Chatham County Community Profile for a summary of climate for Chatham County.

E.2.3 Watersheds

The City of Port Wentworth lies within the Sea Island Flatwoods Level IV Ecoregion which consists of flat plains on marine terraces. Waterways consists of swamps, bays, and low gradient streams with sandy and silty substrates. Elevations average approximately 20 feet. Typical land cover consists of evergreen forests, pine plantations, and forested wetlands.

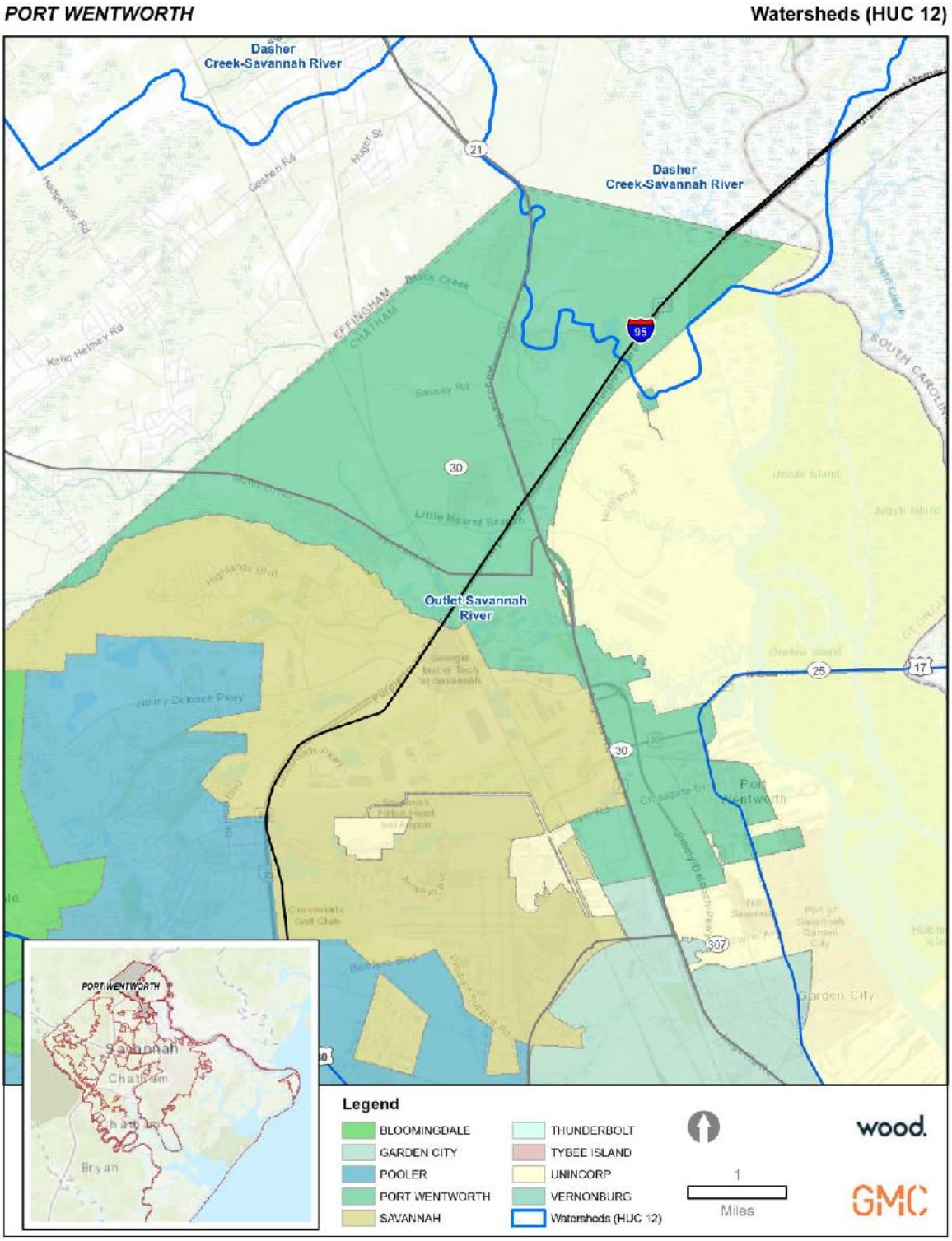
The City of Port Wentworth is located partially within the Outlet Savannah River Basin HUC 12 and the Dasher Creek – Savannah River HUC-12 Basin.

HUC 12 Watersheds

HUC 12 Watershed Name	HUC 12 #
Dasher Creek – Savannah River	030601090305
Outlet Savannah River	030601090307

The figure below illustrates the HUC 12 drainage basins and drainage features in and around Port Wentworth.

Figure E.2 – HUC 12 Drainage Basins



E.2.5 Cultural, Historic and Natural Resources

E.2.5.1 Cultural and Historic Resources

Community Center

The Community Center is located on Appleby Road and is available for rent by any resident of Port Wentworth. The facility will accommodate approximately 100 people and has a fully equipped kitchen with tables and chairs.

Houston Museum

Houston Baptist Church and its adjoining cemetery were organized in 1886 under the leadership of Reverend Ulysses L. Houston, minister of First Bryan Baptist Church in Savannah. A significant leader in the African-American community, Houston attended the meeting at General Sherman's Savannah headquarters in January 1865 that resulted in Special Field Order No. 15 (the redistribution of confiscated coastal land in 40-acre tracts to newly freed blacks). Houston also served a term in Georgia's Reconstruction legislature. Established in the tradition of plantation praise houses intended to Christianize the enslaved populations of plantations, Houston Baptist Church served the African-Americans of Rice Hope Plantation. The church continued to serve the local community until the 1970s. The original structure collapsed in 2007 after a terrible storm in Port Wentworth. Today, the property is owned by the City of Port Wentworth. The city, community organizations and residents have rebuilt the structure into a heritage museum honoring the rich history of the area.

Mulberry Grove Plantation

In 1975, Mulberry Grove was listed on the National Register of Historic Places.

During the period when silk production was an industrial objective for colonization, a mulberry nursery was supported. With failure of the silk industry, Mulberry Grove was among the first estates to have its marsh acreage cultivated for rice production, and to prosper. When the rice market fluctuated, cotton was experimented with. The cotton gin was invented at Mulberry Grove during this time.

Mulberry Grove was a portion of river acreage designated by Oglethorpe as Joseph's Town, prior to John Cuthbert's 500 acre grant in 1735. The settlement failed while Mulberry Grove, as Cuthbert cooperated with the Trustees by starting a mulberry nursery.

Cuthbert's daughter and heiress married Dr. Patrick Graham who rose to the presidency of the Board of President and Assistants of the Colony. Under his direction, the planting of rice was successfully experimented with. After Graham's death in 1755, Mulberry Grove passed through a number of ownerships being bought in 1774 by John Graham, member of the King's Council and later Lieutenant Governor of Georgia. However, pre-Revolutionary disturbances between patriots and loyalists halted plantation work. Graham left Georgia for England in May of 1776.

Mulberry Grove, as a "Gift Deed," was conveyed to Major General Nathanael Greene by the State on April 13, 1785, as a reward for patriotic activities in Georgia. After moving to Mulberry Grove in October of 1785, Greene died in June of 1786. His family continued to reside at Mulberry Grove, receiving President Washington in 1791.

In 1793, Mrs. Greene's guest Eli Whitney, recognized the need for a more expeditious means of preparing cotton for an expanding market. Whitney experimented with various models, developing a working model from which he built a large ginning machine in 1794.

The main house and many of the outbuildings were destroyed by Union troops. The following years never again saw the restoration of Mulberry Grove to its former status, although some of the fields were cultivated by subsequent owners. The property now lies overgrown with weeds and trees.

E.2.5.2 Parks, Preserve, and Conservation

P.B. Edwards, Jr. Gymnasium

The P.B. Edwards, Jr. Gymnasium is located at 101 Turnberry Street and can be rented for many occasions. The gymnasium measures 100 ’by 80’ and seats approximately 300. It has a full kitchen/concession stand with pull out bleachers, tables and chairs, as well as a high school regulation basketball court, volleyball court and skates for skate party rentals.

Basketball Courts

There are two outdoor basketball courts with one located on Warren Drive and the other located behind Fire Station #1 on Cantyre Street. Each court has two goals.

Pavilion

The Pavilion is located near Fire Station #1 on Cantyre Street. It has picnic tables, grills and electricity. The residents of Port Wentworth are encouraged to use this facility for your next outdoor event.

E.2.5.3 Natural Resources

Floodplains and Flood Zones

FEMA flood zone designations within the City of Port Wentworth are identified in the figure below. The flood hazard areas shown are designated by the Federal Emergency Management Agency (FEMA) and

include: Zone A (subject to inundation by the 1% annual-chance flood event with no base flood elevation (BFE) determined), Zone AE (subject to inundation by the 1% annual-chance flood event with BFE determined), Zone VE (subject to inundation by the 1% annual-chance flood event with additional hazards due to storm waves with BFE determined), and Zone X (Moderate Risk and minimal risk areas outside the 1% floodplains with no BFE or base flood depths determined and Minimal Risk areas outside the 0.2% annual chance floodplain).

Table E.2 – Flood Zones, Port Wentworth

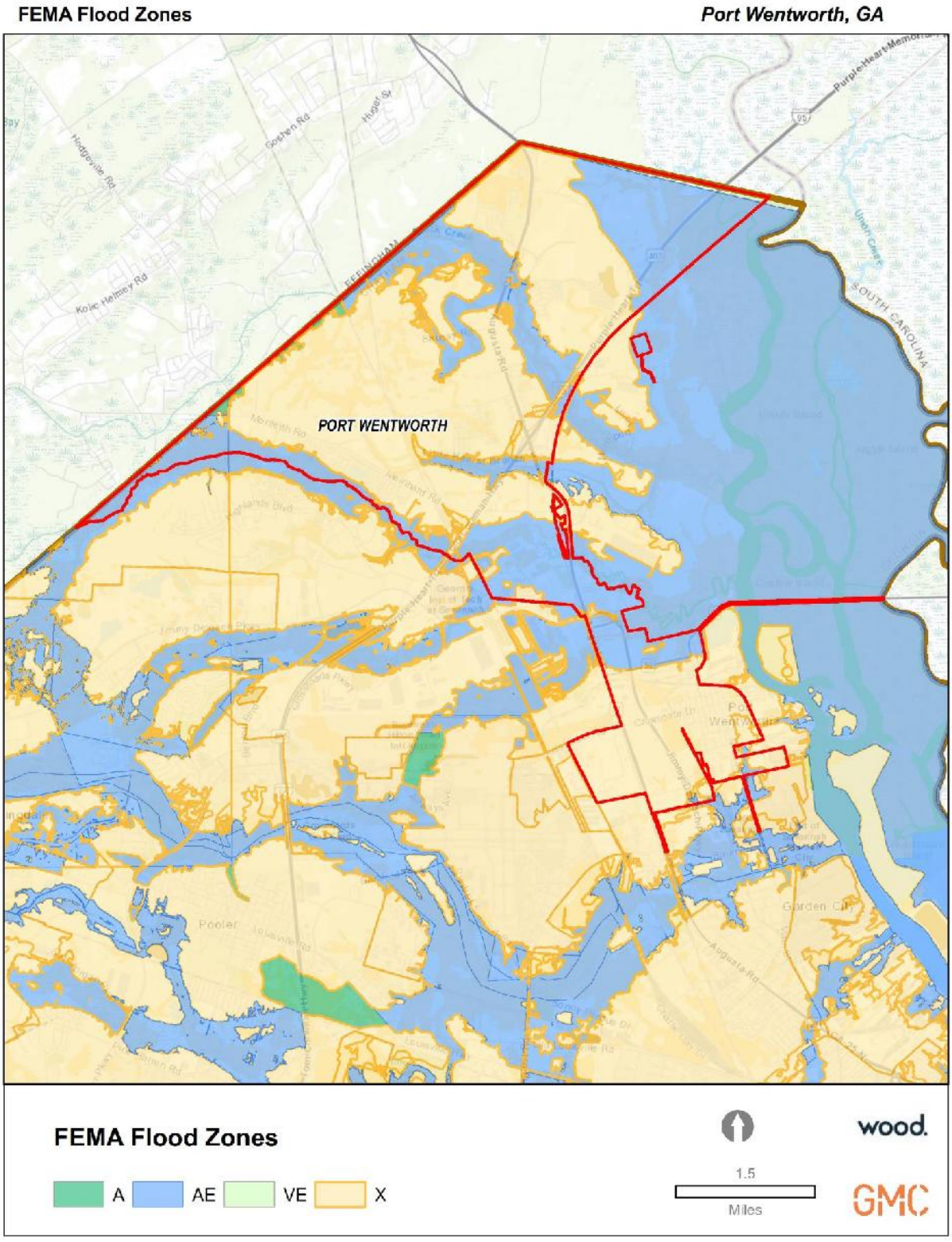
Flood Zone	Area (Acres)	Area (Square Miles)	Percent of City (%)
A	46	0.07	0.4
AE	3,458	5.4	32.5
X	7,120	11.1	67.0
TOTAL	**10,624**	**16.6**	**100.0**

Source: FEMA, 2018

According to the 2018 FEMA data, 3,505 acres of the land within the City is located within a 100-year floodplain (Zone AE and A) which equals 32.9 percent of the City. An additional 7,120 acres are located within moderate or minimal flood hazard areas (67 percent of the City). With nearly 33 percent of the City at high risk to flooding in the Special Flood Hazard Area (SFHA) the City of Port Wentworth should seek ways to balance future development with strategies to preserve sensitive lands and natural drainage features.

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, and the vegetation stabilizes soils during flooding. Natural floodplains in Port Wentworth include wetland areas and low-lying land along the major waterways in and around the City including the Savannah River, Black Creek, and Little Hearst Branch. Natural floodplains reduce damage by allowing flood waters to spread out over large areas, aiding infiltration into the ground, reducing flow rates and acting as a flood storage area to reduce downstream peaks. The City should strive to keep floodplain and floodplain waters free of contaminants such as oil, paint, anti-freeze, pesticides, and plastics and other trash. These chemicals and waste materials pollute local waterways, decreasing the water quality that local wildlife and plants depend upon.

Figure E.3 – FEMA Flood Zones, 2018, Port Wentworth



Wetlands

Wetlands benefit the ecosystem by storing, changing, and transmitting surface water and groundwater. Through these processes pollution is removed, nutrients are recycled, groundwater is recharged, and biodiversity is enhanced. Wetland composition varies extensively, with five distinct categories for classification: Estuarine, Lacustrine, Marine, Palustrine, and Riverine systems. Based on data from the National Wetland Inventory (NWI) wetlands throughout the City of Port Wentworth are summarized in the table below as well as the Wetland Map below.

Table E.3 – Wetland Type

Wetland Type	Area (Acres)	Area (Sq. Miles)	Percent of City
Non-Wetland	7,855	12.3	73.9
Lacustrine	27	0..04	0.3
Palustrine	2,716	4.2	25.6
Riverine	26	0.04	0.2
TOTAL	**10,624**	**16.6**	**100.0**

Source: National Wetland Inventory

The Palustrine System

The Palustrine (freshwater) system includes all non-tidal wetlands dominated by trees, shrubs, persistent emergent plants, emergent mosses or lichens, and all such wetlands that occur in areas where salinity due to ocean-derived salts is below 0.5%. The Palustrine system is bounded by upland.

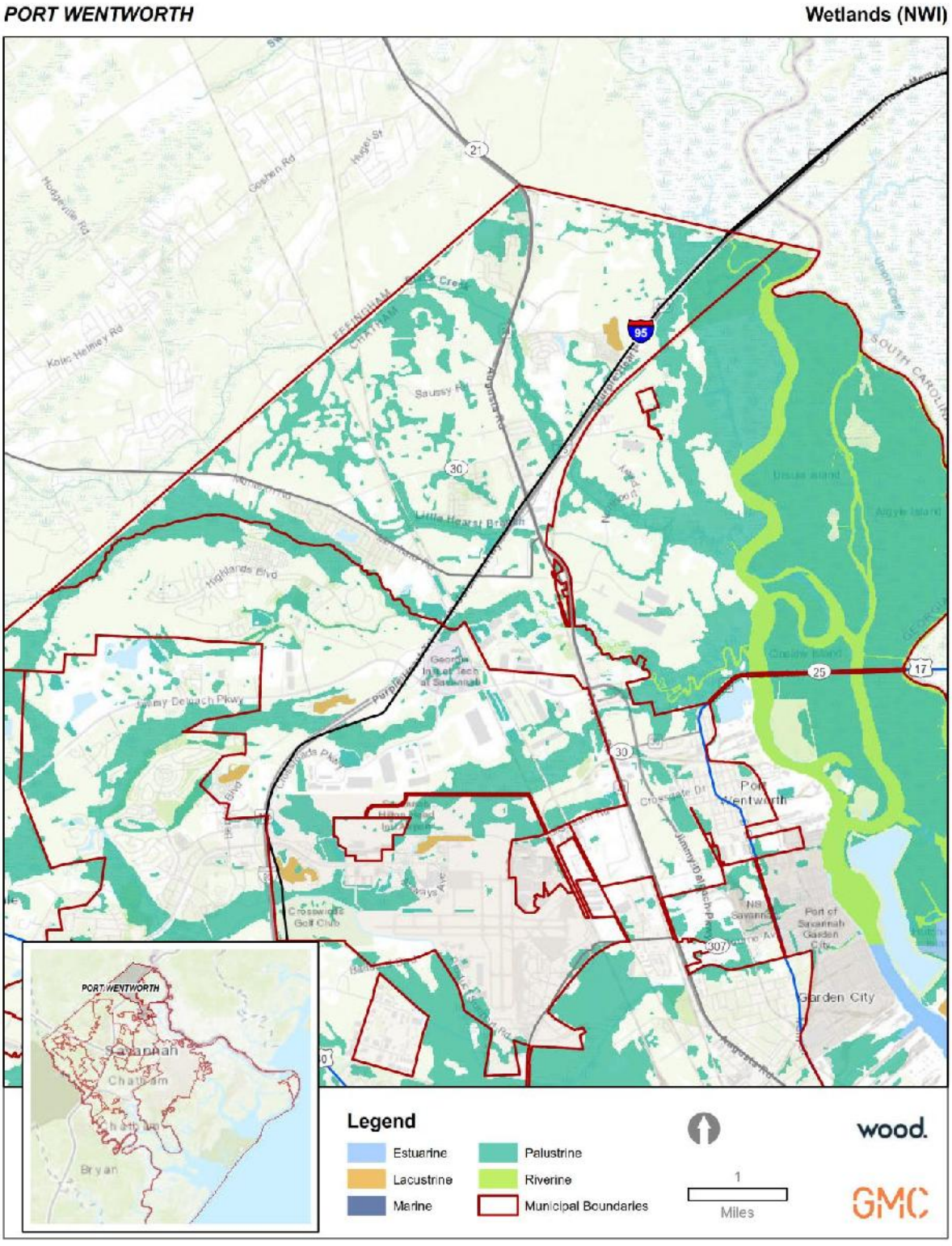
Lacustrine Wetlands

Lacustrine wetlands are large, open, water-dominated systems (e.g. lakes). This definition also applies to modified systems which possess characteristics similar to lacustrine systems (e.g. deep standing or slow-moving waters).

The Riverine System

The Riverine system includes all wetlands and deep-water habitats contained within a channel with two exceptions: (1) wetlands dominated by trees, shrubs, emergent vegetation, emergent mosses, or lichens, and (2) habitats with water containing ocean-derived salts in excess of 0.5%. The Riverine system is bounded on the landward side by upland, by the channel bank (including natural and man-made levees), or by wetlands dominated by trees, shrubs, emergent vegetation, emergent mosses, or lichens. In braided streams, the system is bounded by the banks forming the outer limits of the depression within which the braiding occurs.

Figure E.4 – Wetlands by Type, Port Wentworth



E.2.6 History

Port Wentworth was founded in 1733 but not incorporated until 1957, and its history arises out of the native Indian tribes and first settlers of the Trust Colony of Georgia. What is now Port Wentworth was originally part of several colonial plantations, including Mulberry Grove where Eli Whitney revolutionized the South by inventing the cotton gin in 1793. Today, Port Wentworth's Exit 109 area is a well-placed home base of hotels, motels and restaurants and a convenient lodging spot for tourists. Only 11 miles from Savannah's Historic District, Exit 109 is the closest I-95 exit to Georgia's First City with direct trolley service from all Port Wentworth hotels.

E.2.7 Economy

E.2.7.1 Wages and Employment

Per the 2013-2017 American Community Survey 5-Year Estimates, the median household income for Port Wentworth is $77,038, which is 45 percent higher than the state's median household income ($52,977). Approximately 3.2% of the population is considered to be living below the poverty level. Moreover, 0.0 percent of people under 18 years of age and 0.0 percent of people 65 years and over are living below the poverty level.

The table below shows employment and unemployment rates along with industry employment by major classification for the City.

Table E.4 – Employment and Occupation Statistics for Port Wentworth, GA, 2017

Employment Status	Count	Percentage (%)
In labor force	4,500	79.4
Employed	4,070	71.8
Unemployed	318	5.6
Armed Forces	112	2.0
Not in labor force	1,170	20.6
Occupation		
Management, business, science and arts	1,658	40.7
Service	770	18.9
Sales and office	443	10.9
Natural resources, construction and maintenance	642	15.8
Production, transportation and material moving	557	13.7

Source: U.S. Census Bureau, 2017 American Community Survey (ACS)

Major industry sectors in the City of Port Wentworth include management, business, science, and arts (40.7%); service (18.9%); and sales and office (10.9%); natural resources, construction, and maintenance (15.8%); and production, transportation, and material moving (13.7%).

Major employers are discussed in the Chatham County Community Profile.

E.2.8 Housing

According to the 2013-2017 ACS 5-Year Estimates, there 3,154 housing units in Port Wentworth, of which 91.3 percent are occupied. Approximately 59% of occupied units are owner-occupied (41% occupied by renters). A high percentage of renters is an indicator of higher pre- and post-disaster vulnerability

because, according to Cutter, et al. (2003), renters often do not have the financial resources of homeowners, are more transient, are less likely to have information about or access to recovery aid following a disaster, and are more likely to require temporary shelter following a disaster. Therefore, higher rates of home rentals in Port Wentworth may indicate that residents are not able to implement certain types of mitigation in their homes.

Median home value in Port Wentworth is $163,800. Of the town's owner-occupied housing units, 86.5 percent have a mortgage. Most householders (91.8 percent) moved into their current homes since the year 2000, 33.9 percent moved in between 2000 and 2009, and 38.7 percent moved in between 2010 and 2014. 0 percent of occupied housing units have no vehicle available to them, which suggests no residents should have difficulty in the event of an evacuation.

The majority (68.1%) of housing units in Port Wentworth are detached single family homes. However, 12.1 percent of units are mobile homes which can be more vulnerable to certain hazards, such as tornadoes and windstorms, especially if they aren't secured with tie downs.

The town's housing stock is relatively new, with the majority (75.4%) of occupied housing built after 2000. The table below details housing age in the town.

Table E.5 – Housing Age

Year Structure Built	Percent of Occupied Housing
2014 or later	4.2
2010 to 2013	17.6
2000 to 2009	53.6
1980 to 1999	5.1
1960 to 1979	7.0
1940 to 1959	9.9
1939 or earlier	2.6

Source: U.S. Census Bureau, American Community Survey 2013-2017 5-Year Estimates

Age can indicate the potential vulnerability of a structure to certain hazards. For example, the City of Port Wentworth first entered the National Flood Insurance Program in 1973. Therefore, based on housing age estimates, approximately 16 percent of housing in the City was built before any floodplain development restrictions were required.

E.2.9 Population

According to the U.S. Census Bureau, Port Wentworth had an estimated population of 7,568 residents in 2017 and a population of 4,920 at the time of the 2010 U.S. Census (53.8% increase from 2010-2017). As of 2017, Port Wentworth's population density was 456 persons per square mile. The table below provides demographic profile data from the 2017 American Community Survey 5-Year Estimates.

Table E.6 – Port Wentworth Demographic Profile Data, 2017

Demographic	Port Wentworth	Percent
Gender/Age		
Male	4,034	53.3
Female	3,534	46.7
Under 5 Years	849	11.2
65 Years and Over	500	7.7
Race/Ethnicity (One Race)		
White	3,358	44.4
Black or African American	3,189	42.1
American Indian/Alaska Native	22	0.3
Asian	62	0.8
Two or More Races	97	1.3
Hispanic or Latino[1]	993	13.1
Education		
High School Graduate or Higher	1,742	33.7
Bachelor's Degree or Higher	1,272	24.6

Source: U.S. Census Bureau, 2017 American Community Survey (ACS)
[1]Hispanics may be of any race, so also are included in applicable race categories.

E.2.10 Land Use

Land use information discussed in this section was obtained from the Port Wentworth 2016-2038 Comprehensive Plan (Comp Plan).

E.2.10.1 Existing Land Use

The City developed an existing land use map in 2015 based using GIS and field verification. Existing land use data are summarized in the table, graph, and map provided below.

Figure E.5 – Existing Land Use, Port Wentworth

	Total Percent	Percent of Developed
Agriculture / Forestry	3%	8%
Residential - Single Family	12%	37%
Residential - Multi Family	1%	4%
Parks / Recreation	1%	3%
Greenspace	4%	12%
Public / Institutional	1%	3%
Commercial	2%	5%
Industrial	8%	23%
Trans / Com / Utilities	2%	5%
Undeveloped	68%	N/A

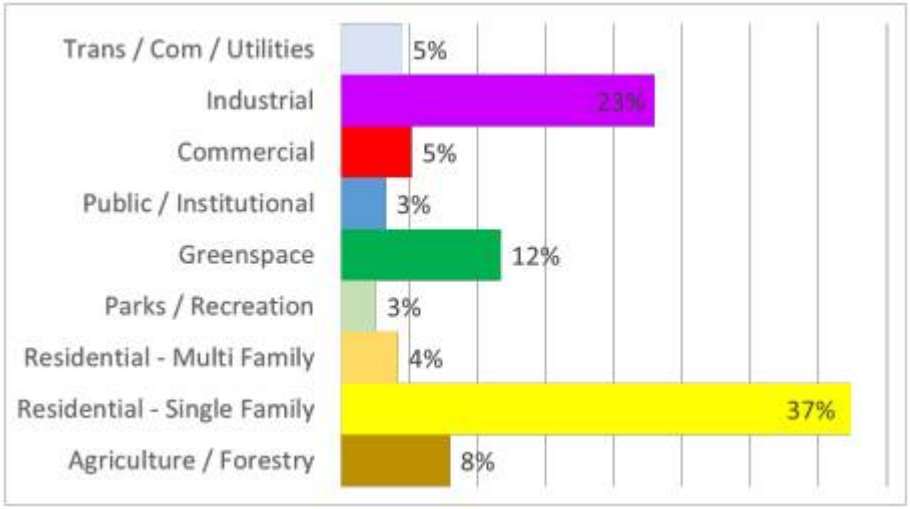
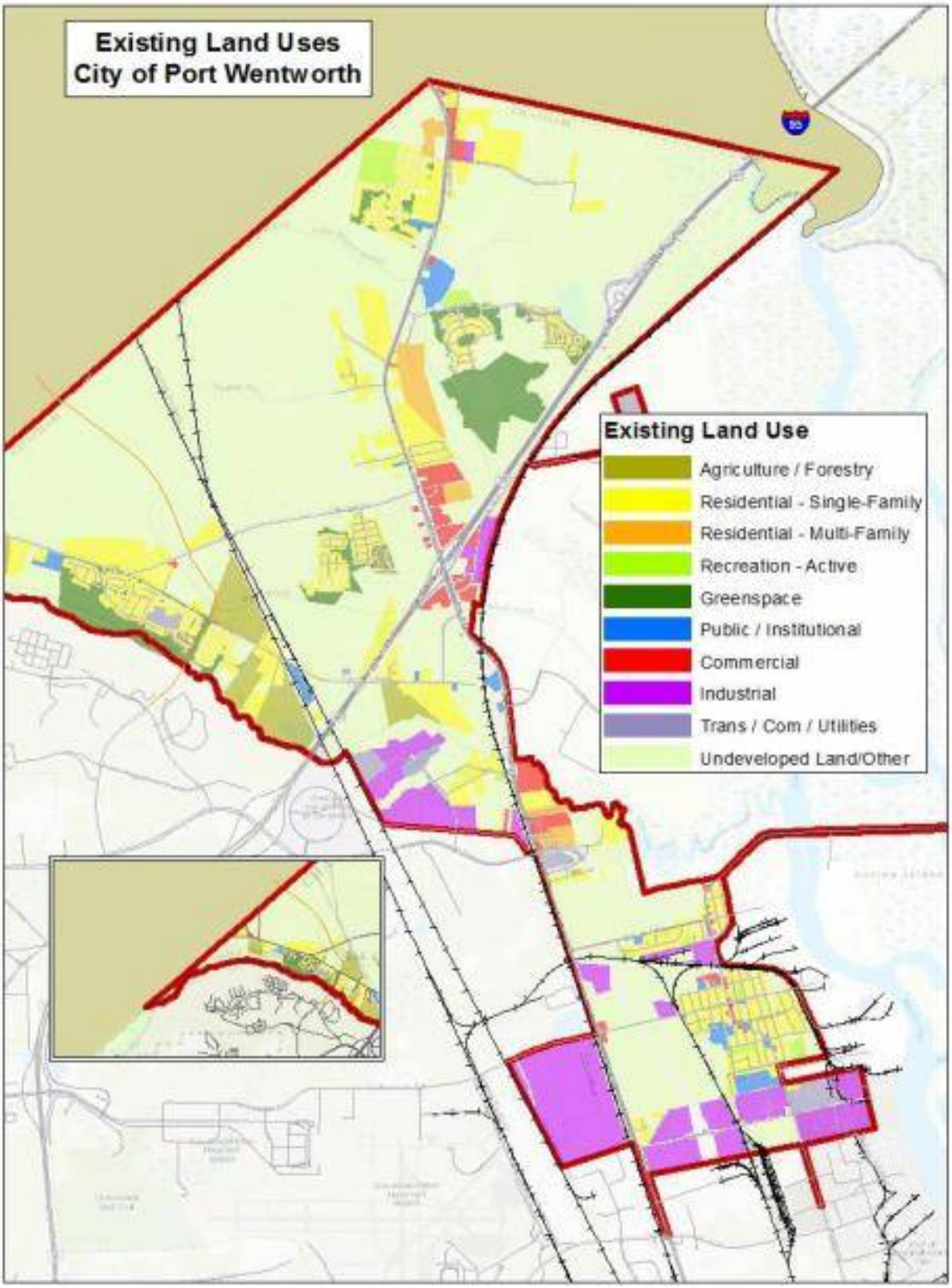


Figure E.6 – Existing Land Use, Port Wentworth



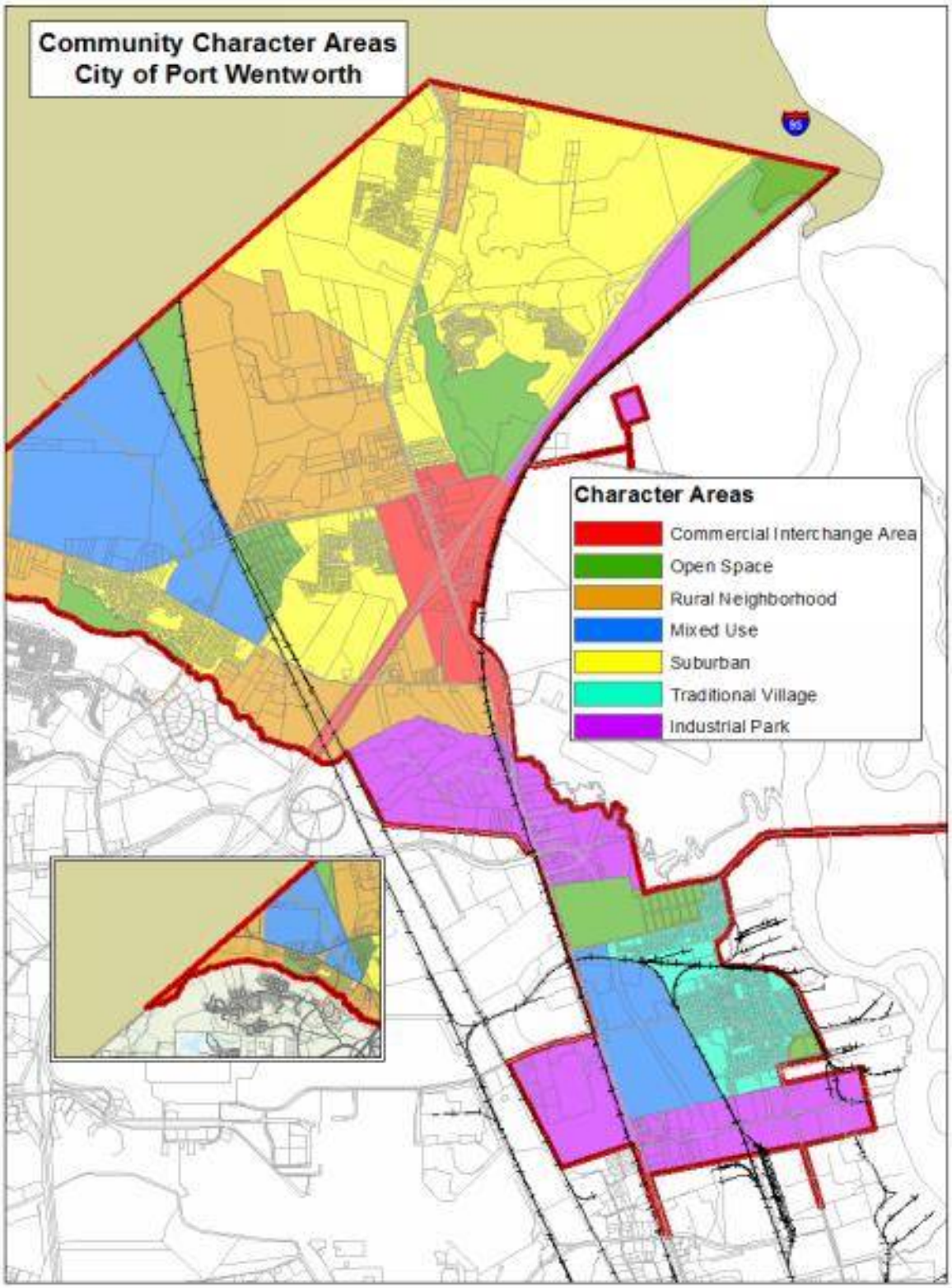
Source: Port Wentworth 2016-2036 Comprehensive Plan

E.2.10.2 Community Character Areas and Future Development Strategy

The City of Port Wentworth identified "character areas" in the City to identify future development patterns in the community. The following Character Areas were established:

- Traditional Village: Comprises the historic downtown district surrounded by older residential areas with more traditional development patterns.
- Mixed Use: Include areas targeted for economic development that will benefit citizens of the City as well as the Savannah metropolitan area and will include a mix of residential, office, and commercial uses
- Rural Neighborhood: Rural, undeveloped land having little development pressure for suburban growth.
- Suburban: Areas where typical types of suburban residential subdivision development have already occurred and will occur in the future.
- Commercial Interchange Area: includes developed and undeveloped lands surrounding the I-95 and Highway 21 intersection that is a significant means of access to the City.
- Industrial Park: Areas include higher intensity manufacturing, assembly, processing, transportation, and warehouse activities.
- Open Space: Area of protected lands established for recreation, alternative transportation, or conservation.

Figure E.7 – Character Areas, Port Wentworth



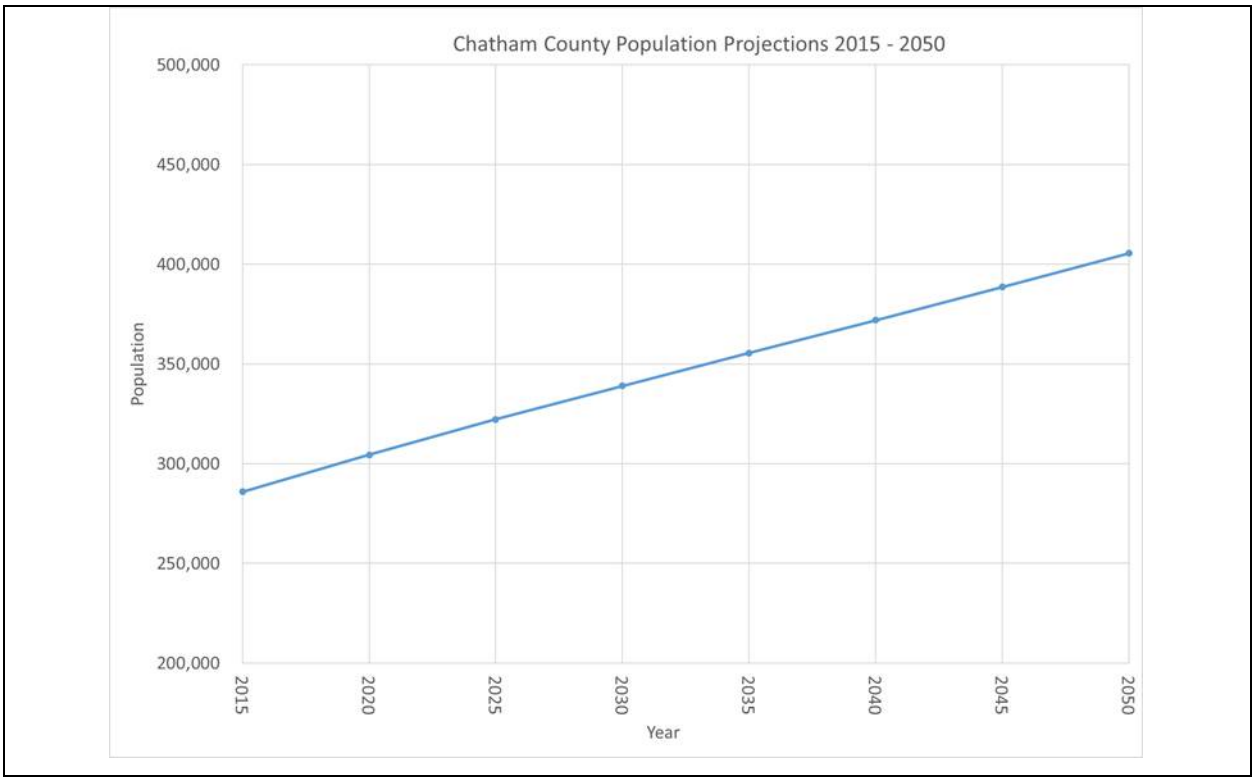
Source: 2016-2036 Comprehensive Plan

E.2.11 Growth and Development Trends

According to the U.S. Census Bureau, Port Wentworth had an estimated population of 7,568 residents in 2017 and a population of 4,920 at the time of the 2010 U.S. Census (53.8% increase from 2010-2017).

According to the Georgia Governor's Office of Planning and Budget (GOPB), Chatham County is projected to reach a population of 405,573 by 2050, which represents a 38% increase from the 2017 population. The population projections from the GOPB estimate the annual growth for the County to be about 1.1% through 2050.

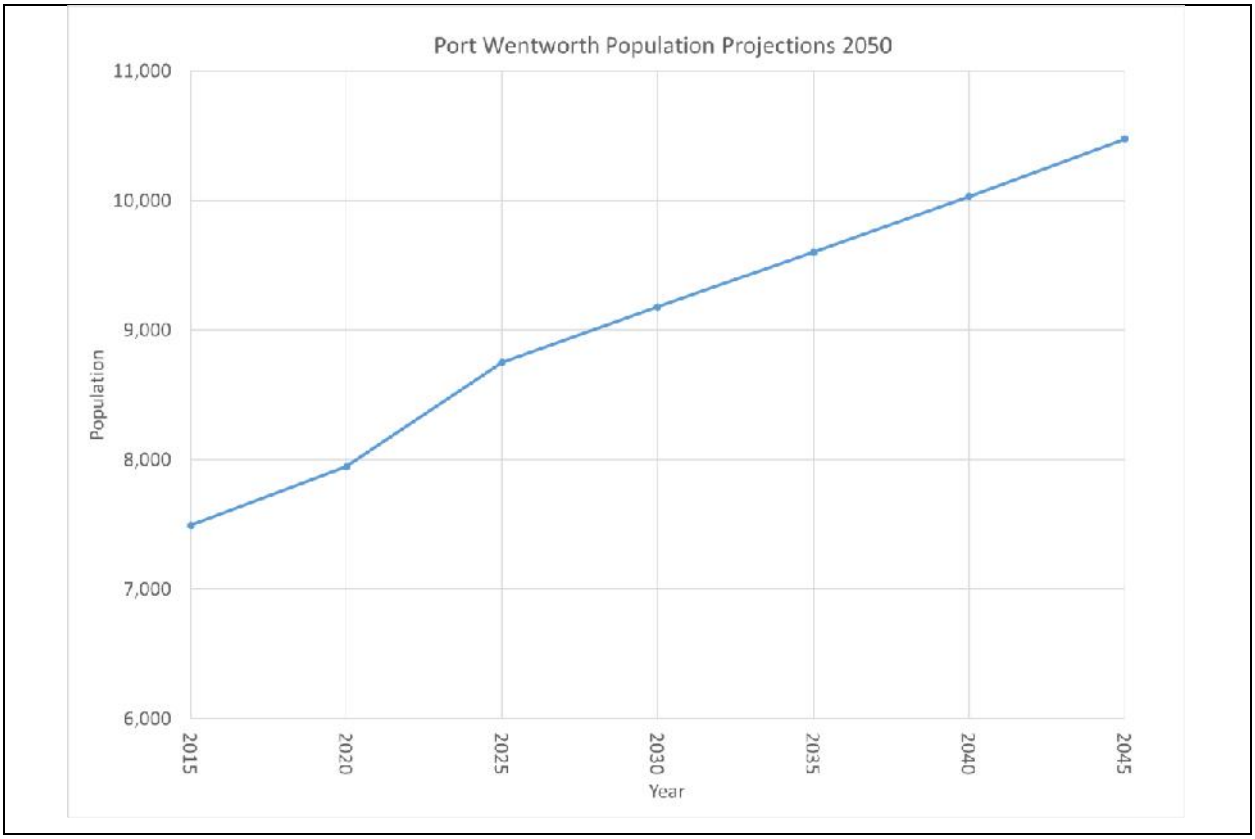
Figure E.8 – Population Projections for Chatham County 2013 – 2050



Source: Georgia Governor's Office of Planning and Budget

Using the projected growth rate for the County, the population of Port Wentworth would increase to 10,475 by 2050 as shown in the graph below.

Figure E.9 - Population Projections for Port Wentworth 2013 – 2050



E.3 ASSET INVENTORY

E.3.1 Property

Table E.7 – City of Port Wentworth Building Exposure

Occupancy Type	Total Number of Buildings	Total Building Value	Estimated Content Value	Total Value
Agricultural	1	$104,500.00	$104,500.00	$209,000.00
Commercial	265	$175,545,873.00	$175,545,873.00	$351,091,746.00
Industrial	76	$140,415,033.30	$210,622,549.95	$351,037,583.25
Residential	3,583	$323,216,382.00	$161,608,191.00	$484,824,573.00
Total	**3,925**	**$639,281,788.30**	**$547,881,113.95**	**$1,187,162,902.25**

Source: Chatham County

E.3.2 Critical Facilities

Table E.8 – Critical Facilities and Infrastructure at Risk

ID	PRIORITY CRITICAL FACILITY NAME	PHYSICAL ADDRESS	LAT	LONG	REASON				
					COG	Life Safety	Debris	Support	Other
PTW-1	Port Wentworth City Hall	7224 GA HWY 21	32.1986	-81.1965	X				
PTW-2	Port Wentworth Police Dept.	323 Cantyre St.	32.1448	-81.1634		X			
PTW-3	Port Wentworth Fire Dept. #1	319 Cantyre St.	32.1452	-81.1634		X			
PTW-4	Port Wentworth Public Works	3 Cantyre St.	32.1515	-81.1645			X		
PTW-5	Well #1 & #2	0 Applebee Rd	32.1555	-81.1637				X	
PTW-6	Port Wentworth Fire Dept. #2	6781 Hwy 21	32.1777	-81.1883		X			
PTW-7	Port Wentworth Recreation Cntr	101 Turnberry St.	32.1505	-81.1617	X				
PTW-8	Pump Station #1	1 Appleby Rd.	32.1463	-81.1538				X	
PTW-9	Pump Station #2	0 Appleby Rd	32.1595	-81.163				X	
PTW-10	Pump Station #3	6941 Hwy 21	32.187	-81.1937				X	
PTW-11	Pump Station #4	7101 Hwy 21	32.1919	-81.1958				X	
PTW-12	Waste Water Plan	1000 Richmond Rd	32.1495	-81.1796				X	

Source: Chatham County

E.4 RISK ASSESSMENT

This section contains a hazard profile and vulnerability assessment for those hazards that were rated with a higher priority for the City of Port Wentworth than for Chatham County as a whole. Risk and vulnerability findings are also presented here for those hazards that are spatially defined and have variations in risk that could be evaluated quantitatively on a jurisdictional level. The hazards included in this section are: Flood and Wildfire.

E.4.1 Flood

Over 30 percent of the City of Port Wentworth falls within the mapped 1%-annual-chance floodplains. Figure E.10 reflects the mapped flood hazard zones for the City of Port Wentworth, and Figure E.11 displays the depth of flooding estimated to occur in these areas during the 1%-annual-chance flood. The data in this risk assessment is based off FEMA's 2014 DFIRM. Minor changes have since been made and the updated 2018 DFIRM can be seen in Figure E.3 for comparison.

Properties at risk are detailed by flood zone in Table E.9, below. Parcel data was used to assess how many buildings are located in hazard areas based on each parcel's centroid.

Table E.9 – Properties at Risk by Flood Zone

Flood Zone	Number of Buildings	Total Building Value
AE	525	$156,432,782.60
0.2% Annual Chance Flood Hazard	653	$62,134,586.30
X	2,747	$420,714,419.30
Total	**3,925**	**$639,281,788.20**
SFHA Total	**525**	**$156,432,782.60**

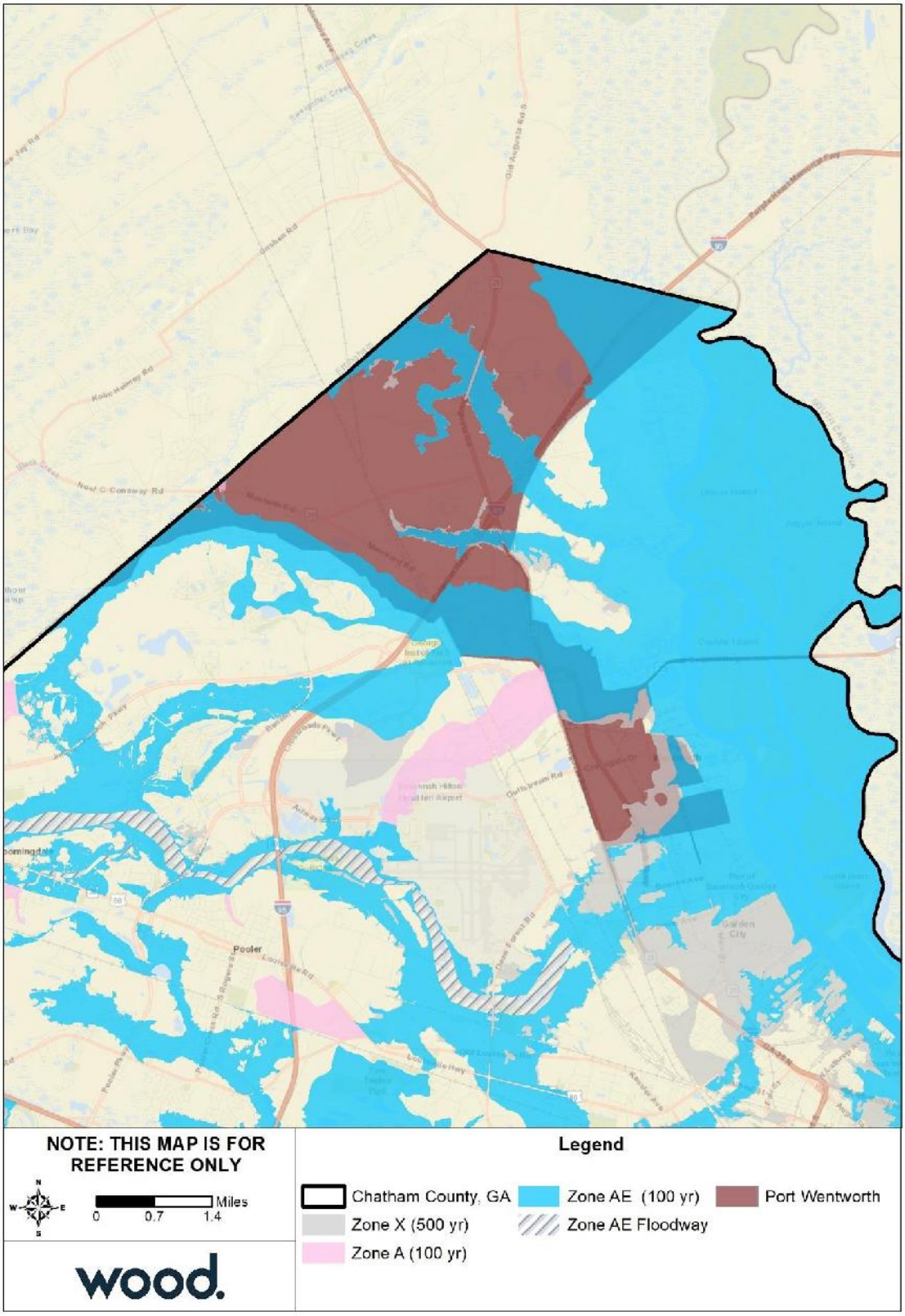
Table E.10 provides building counts and estimated damages by occupancy type for the 1% annual chance flood event.

Table E.10 – Port Wentworth Estimated Building Damage and Content Loss, 1% Annual Chance Flood

Occupancy	Buildings Impacted	Building and Contents Cost	Estimated Building Damages	Estimated Content Damages	Loss Estimate
Commercial	46	$13,898,190.00	$147,103.23	$450,213.15	4.30%
Industrial	3	$69,100,250.00	$462,499.23	$775,910.18	1.79%
Residential	147	$11,661,801.50	$1,676,753.18	$940,273.01	22.44%
Total	**196**	**$94,660,241.50**	**$2,286,355.64**	**$2,166,396.33**	**4.70%**

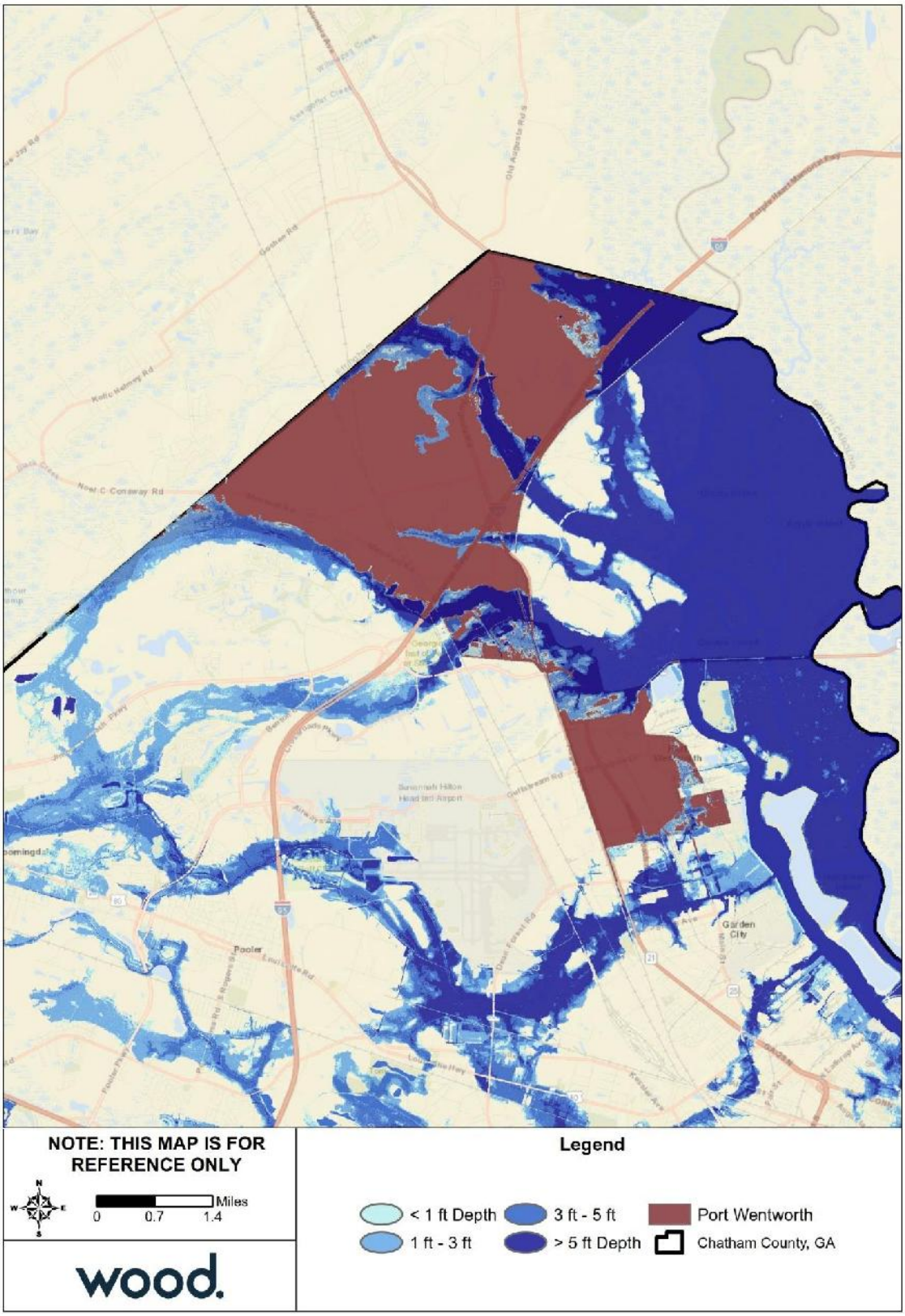
Source: HAZUS

Figure E.10 – FEMA Flood Hazard Areas, City of Port Wentworth



Source: FEMA 2014 DFIRM

Figure E.11 – Flood Depth, 1%-Annual-Chance Floodplain, City of Port Wentworth



Source: FEMA 2014 DFIRM

E.4.2 Wildfire

Table E.11 summarizes the acreage in the City of Port Wentworth that falls within the Wildland Urban Interface (WUI), categorized by housing density. Areas in the WUI are those where development may intermix with flammable vegetation. Approximately 40 percent of Port Wentworth is not included in the WUI.

Table E.11 – Wildland Urban Interface Acreage, City of Port Wentworth

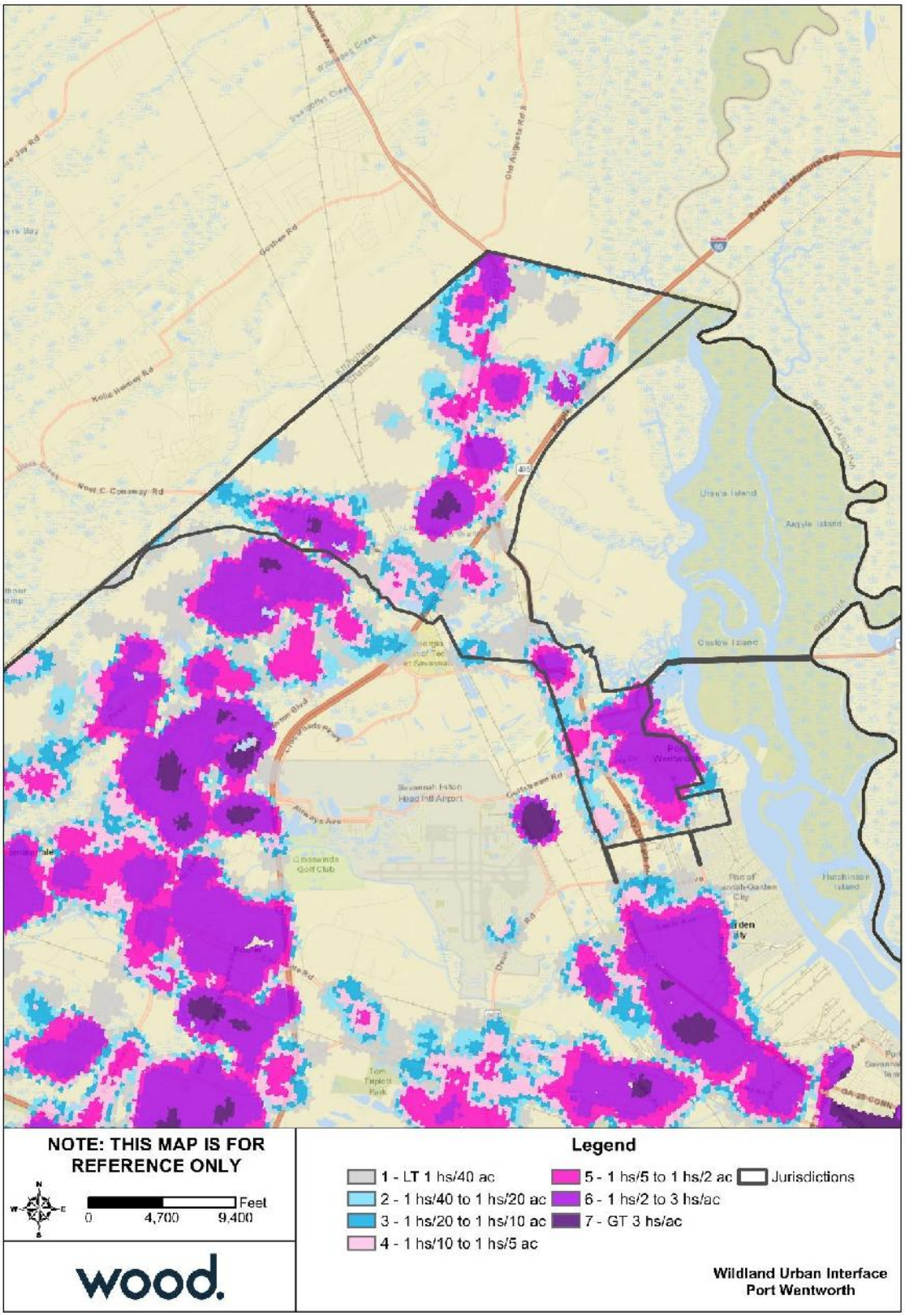
	Housing Density	Total Acreage	Percent of Total Acreage
	Not in WUI	*4,244.8*	*40.4*
	LT 1hs/40ac	1,500.9	14.3
	1hs/40ac to 1hs/20ac	671.1	6.4
	1hs/20ac to 1hs/10ac	803.8	7.6
	1hs/10ac to 1hs/5ac	1,055.9	10.0
	1hs/5ac to 1hs/2ac	884.3	8.4
	1hs/2ac to 3hs/1ac	1,289.1	12.3
	GT 3hs/1ac	61.2	0.6
	Total	**10,511.1**	

Source: Southern Wildfire Risk Assessment

Figure E.12 depicts the WUI for the City of Port Wentworth. The WUI is the area where housing development is built near or among areas of vegetation that may be prone to wildfire. Figure E.13 depicts the Fire Intensity Scale, which indicates the potential severity of fire based on fuel loads, topography, and other factors. Figure E.14 depicts Burn Probability based on landscape conditions, percentile weather, historical ignition patterns, and historical prevention and suppression efforts.

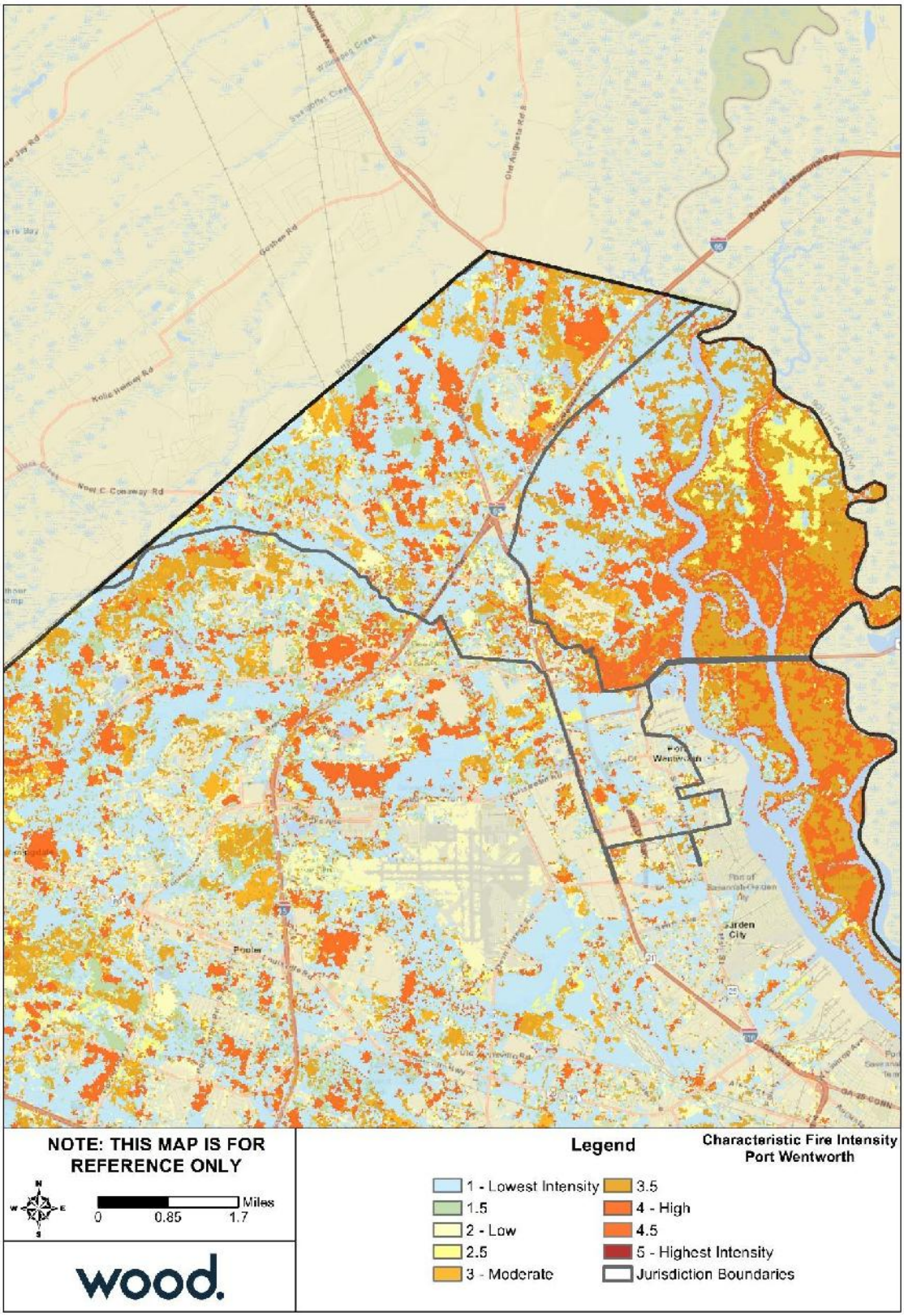
Potential fire intensity is highest in northern Port Wentworth; however, these areas have lower burn probability and/or are largely outside of the WUI, meaning little to no development would be exposed. Small areas in central Port Wentworth have greater exposure to wildfire, where WUI overlays with moderate burn probability and areas of relatively higher potential fire intensity.

Figure E.12 – Wildland Urban Interface, City of Port Wentworth



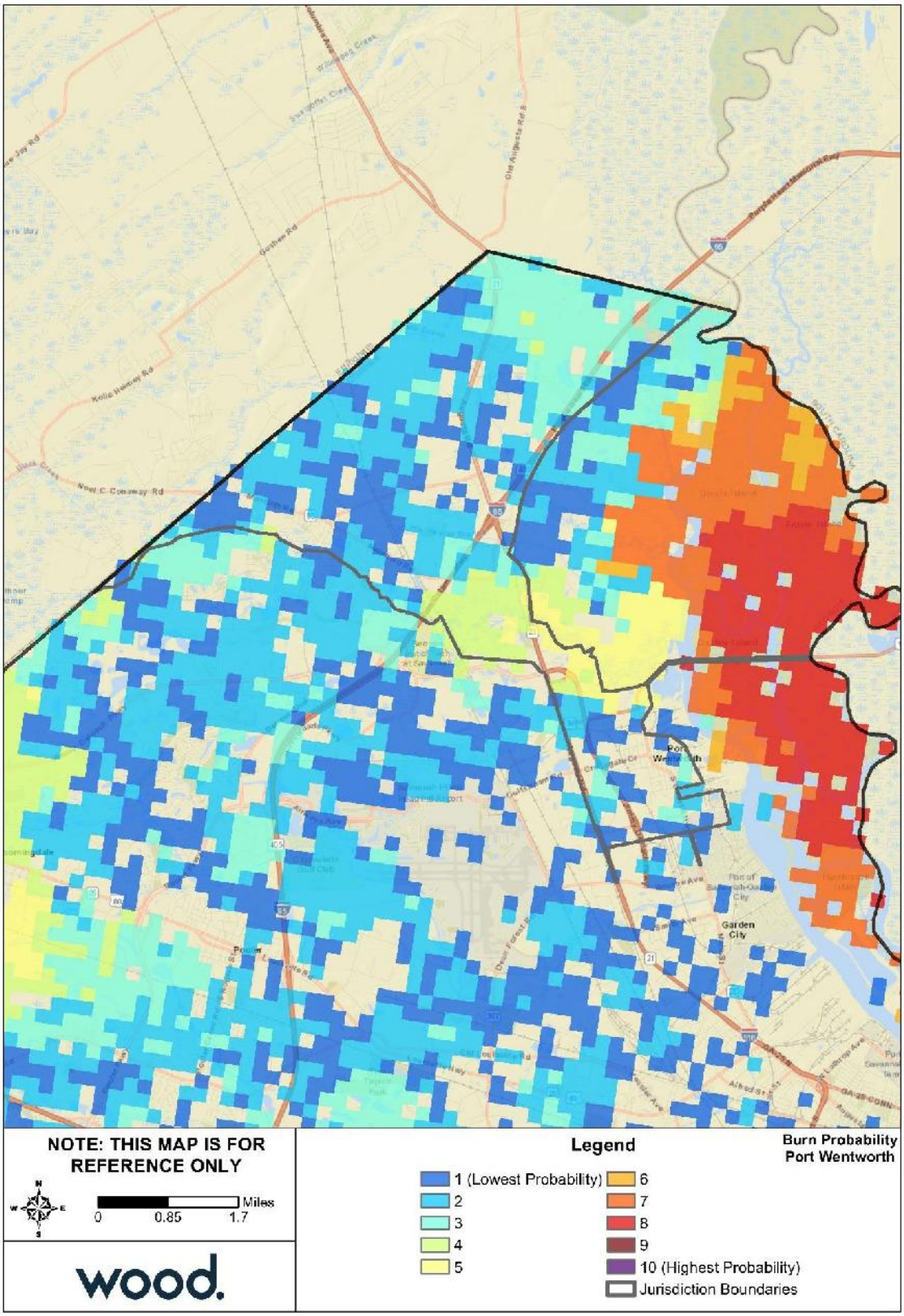
Source: Southern Wildfire Risk Assessment

Figure E.13 – Fire Intensity Scale, City of Port Wentworth



Source: Southern Wildfire Risk Assessment

Figure E.14 – Burn Probability, City of Port Wentworth



Source: Southern Wildfire Risk Assessment

E.1 FLOODPLAIN MANAGEMENT CAPABILITY ASSESSMENT

The City of Port Wentworth joined the NFIP emergency program in 1971 and has been a regular participant in the NFIP since March 1973. The following tables reflect NFIP policy and claims data for the City categorized by structure type, flood zone, Pre-FIRM and Post-FIRM. Zones with no policies or closed paid losses were left out of the tables below.

Table E.12 – NFIP Policy and Claims Data by Structure Type

Structure Type	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
Single Family	213	$112,669	$52,257,000	36	$316,324.50
2-4 Family	1	$315	$175,000	0	$0.00
All Other Residential	5	$4,582	$2,420,000	0	$0.00
Non Residential	15	$16,550	$5,788,100	0	$0.00
Total	**234**	**$134,116**	**$60,640,100**	**36**	**$316,324.50**

Source: FEMA Community Information System, accessed September 2019

Table E.13 – NFIP Policy and Claims Data by Flood Zone

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	57	$66,131	$14,441,300	16	$109,167.70
B, C & X Zone					
Standard	15	$9,044	$3,110,800	14	$174,248.10
Preferred	162	$58,941	$43,088,000	6	$32,908.70
Total	**234**	**$134,116**	**$60,640,100**	**36**	**$316,324.50**

Source: FEMA Community Information System, accessed September 2019

Table E.14 – NFIP Policy and Claims Data Pre-FIRM

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	23	$35,688	$3,513,100	15	$104,447.19
B, C & X Zone	77	$29,809	$18,471,500	19	$206,124.39
Standard	12	$6,711	$2,326,500	14	$174,248.10
Preferred	65	$23,098	$16,145,000	5	$31,876.29
Total	**100**	**$65,497**	**$21,984,600**	**34**	**$310,571.58**

Source: FEMA Community Information System, accessed September 2019

Table E.15 – NFIP Policy and Claims Data Post-FIRM

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	34	$30,443	$10,928,200	1	$4,720.51
B, C & X Zone	100	$38,176	$27,727,300	1	$1,032.41
Standard	3	$2,333	$784,300	0	$0.00
Preferred	97	$35,843	$26,943,000	1	$1,032.41
Total	**134**	**$68,619**	**$38,655,500**	**2**	**$5,752.92**

Source: FEMA Community Information System, accessed September 2019

E.2 MITIGATION STRATEGY

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Lead Agency / Department	Potential Funding Source	Implementation Timeline	2020 Status	2020 Implementation Status Comments
Property Protection									
PP-1	Elevate Lift Stations	Flood, Hurricane, Sea Level Rise	1.1	Moderate	City Administration / Public Works	HMGP	2017	Carried Forward	Revised. Evaluating remaining 16 lift stations for upgrades
PP-2	Structural Hardening for Critical Facilities	All	1.1	Moderate	City Administration	HMGP, General Fund, SPLOST	2021	New	
Structural Projects									
SP-1	Drainage projects for stormwater runoff	Flood, Hurricane, Sea Level Rise	1.1 & 3.1	Moderate	City Administration / Public Works	SPLOST	2019-2020	Carried Forward	Revised.
SP-2	Renovate the sanitary sewage system on the south end of Port Wentworth	Flood	1.1	Moderate	City Administration / Public Works	SPLOST	2017	Carried Forward	Drainage projects Mobley Park I, II, & III and Bonney Bridge Drainage Projects I & II. Engineering completed, acquiring right of way
Emergency Services									
ES-1	Generators for critical facilities	All	1.1	Moderate	City Administration	HMGP, General Fund	2021	New	
ES-2	Portable generators for critical facilities	All	1.1	Moderate	City Administration	HMGP, General Fund	2021	New	
ES-3	Purchase and install generator quick connects and transfer switches for critical facilities	All	1.1	Moderate	City Administration	HMGP, General Fund	2021	New	
Public Education and Awareness									
PEA-1	Increase public education and awareness within the City by including flyers in the water bills and providing documents in the public buildings	All	2.2	Moderate	City Administration	Local Funds	2019-2020	Carried Forward	Ongoing project, requires constant updating

Annex F City of Savannah

F.1 PLANNING PROCESS

The table below lists the HMPC members who represented the City of Savannah.

Table F.1 – HMPC Members

Member Name	Title	Agency/Department
Dave Donnelly	Director	Emergency Management
Bryan Hollis	Risk Management Analyst	Emergency Management
Ben Lewis	Risk Management/Loss Control Coordinator	Emergency Management
Gloria Williams	Citizen	Savannah

F.2 COMMUNITY PROFILE

F.2.1 Overview of the Community

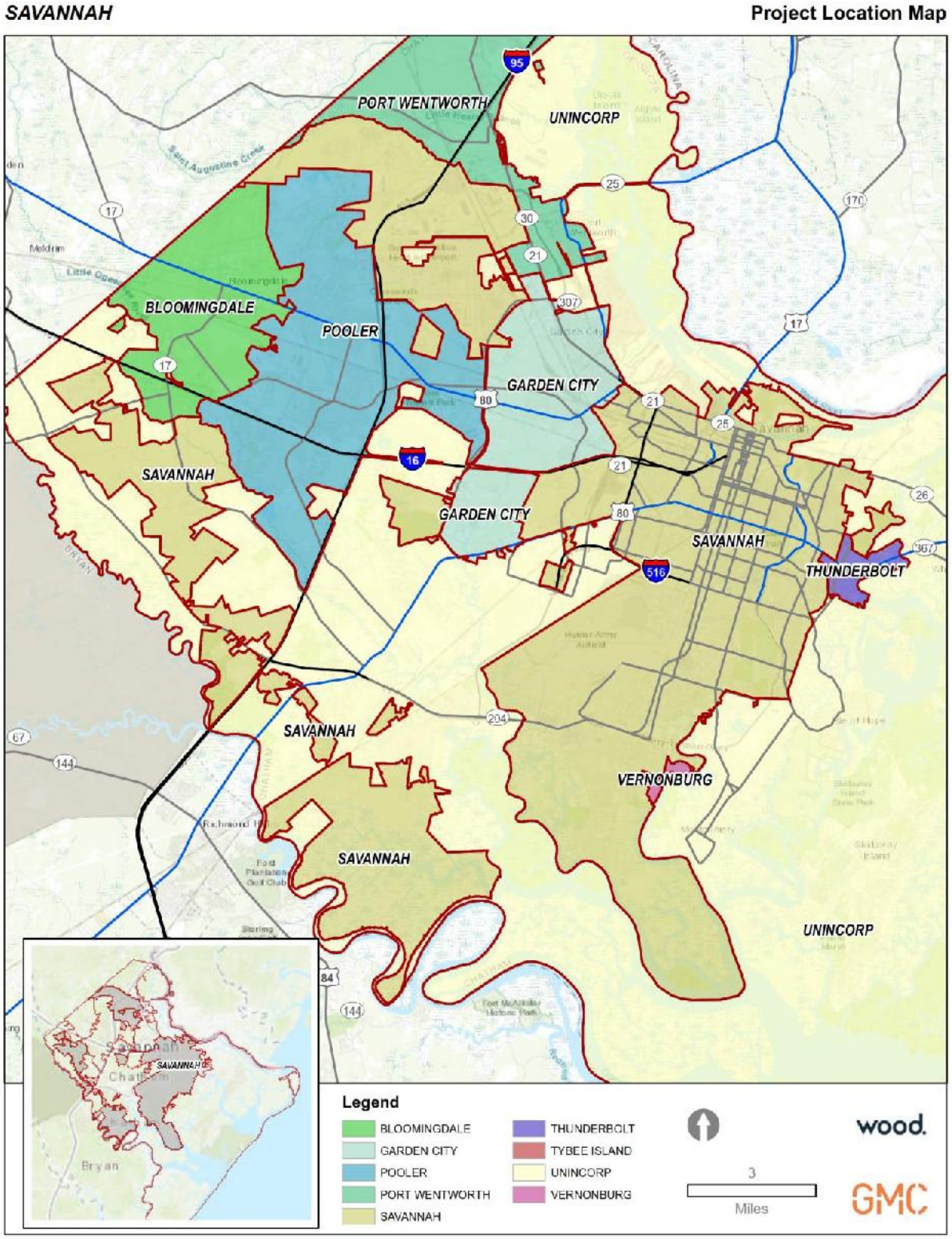
The City of Savannah is centrally located within Chatham County and is bordered by the Savannah River to the north and is approximately 20 miles from the coast of Georgia.

According to the U.S. Census Bureau, Savannah has a total area of 108.7 square miles of which 103.1 square miles (94.8%) is land and 5.6 square miles (5.2%) is water.

According to the U.S. Census Bureau's American Community Survey (ACS) 5-Year Estimates, the City had a total population of 145,094 in 2017. Therefore, the City's average population density is approximately 1,335 people per square mile.

The Location Map below reflects Savannah's boundaries and shows the City's location within the county and in relation to surrounding municipalities.

Figure F.1 – Location Map, Savannah



F.2.2 Geography and Climate

Please refer to Chatham County Community Profile for a summary of climate for Chatham County.

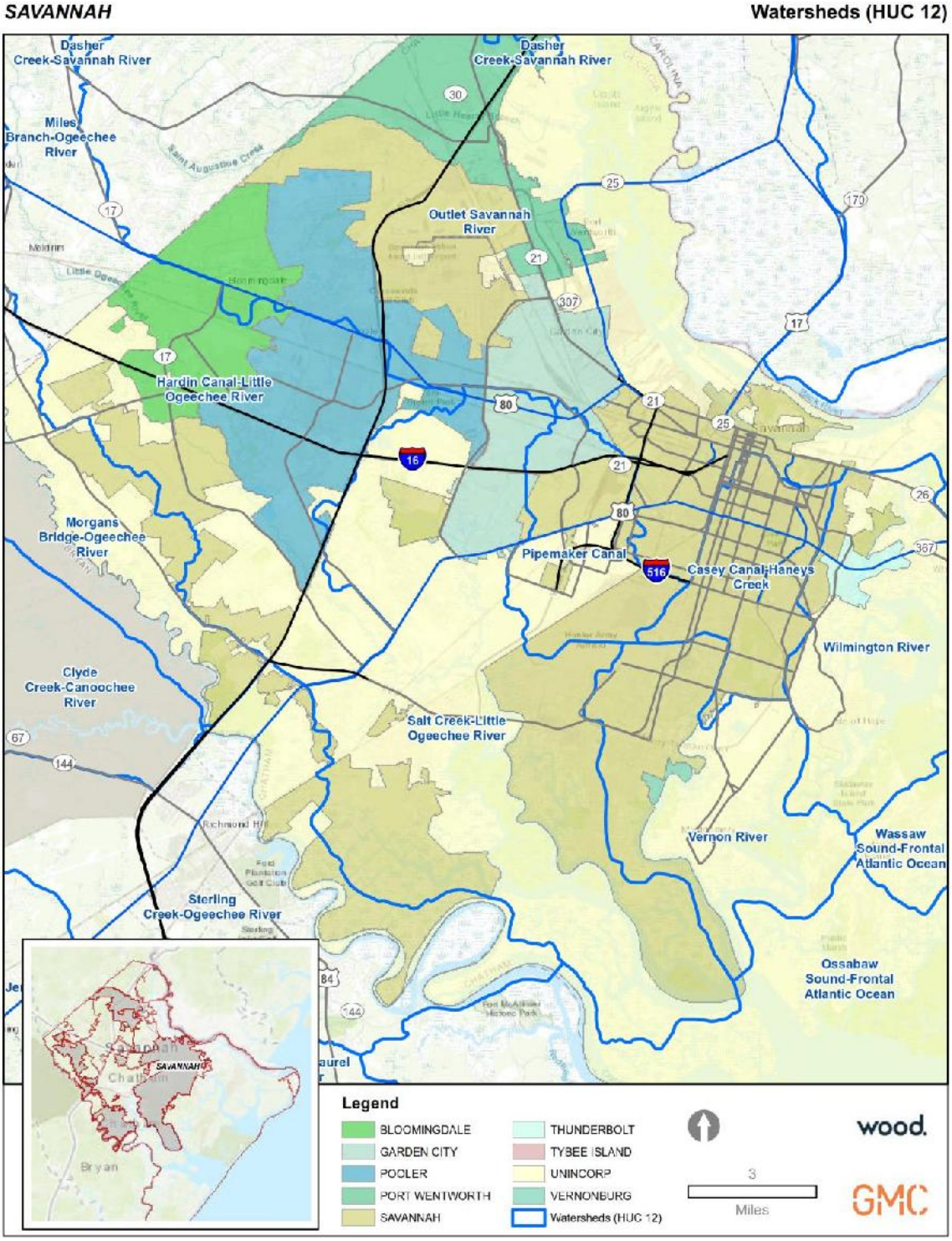
Because the City of Savannah is spread out throughout different areas of the County, portions of the City lie within ten (10) different HUC 12 watersheds. The HUC 12 watersheds that contain portions of the city limits are listed in the table below.

Table F.2 – HUC 12 Watersheds, Savannah

HUC 12 Watershed Name	HUC 12 #
Sterling Creek - Ogeechee River	030602040301
Salt Creek – Little Ogeechee River	030602040203
Vernon River	030602040303
Hardin Canal – Little Ogeechee River	030602040201
Ossabaw Sound – Frontal Atlantic Ocean	030602040304
Wilmington River	030602040101
Casey Canal – Haneys Creek	030602040302
Morgans Bridge – Ogeechee River	030602020605
Outlet Savannah River	030601090307
Pipemakers Canal	030302040202

The HUC 12 Drainage Basin Map illustrates the HUC-12 drainage basins and drainage features in and around the City of Savannah.

Figure F.2 – HUC-12 Drainage Basins



F.2.3 Cultural, Historic and Natural Resources

F.2.3.1 Cultural and Historic Resources

The City of Savannah has numerous cultural and historic resources available to residents and visitors to the City. The City has many museums that cover various topics such as art, preservation, transportation, the military, and others. A sampling of these resources are summarized below.

Civic Center

The Savannah Civic Center is a first-class multi-purpose facility which hosts over 500 annual offerings, including a wide spectrum of entertainment, sports, and cultural events. The Civic Center hosts numerous events such as large-scale concerts, conventions, exhibits, trade shows, theater, ballet, comedy, and all types of music. The wide variety of rooms and spaces make the Savannah Civic Center ideal for corporate and social events, regional galas, parties, wedding receptions, reunions, and other special gatherings.

Savannah Cultural Arts Center

The Savannah Cultural Arts Center, located at 201 Montgomery Street, is one of the most technologically advanced facilities in Savannah and serves as a creative and inspirational space connecting residents, the local arts community and organizations, who will not only be able to experience art but engage with and create art as well. The new center replaces a 10,000-square-foot leased black box theater and gallery called S.P.A.C.E. on Henry Street and the prominent location of the new center serves as a key gateway into Savannah with wonderful proximity to the city's other major art facilities. The facility includes a 464-seat performing arts theater, studio theater, art gallery, as well as five visual arts studios designed for patrons to develop their creative skills. Three of the visual arts studios are specialized, providing a metals/glass room, handbuilding room, and wheel throwing room.

Telfair Academy

The Telfair Academy is the oldest public art museum in the South and the first art museum in America founded by a woman. Formerly the Telfair family mansion, the museum opened its doors to the public in 1886. The Telfair Academy presents a celebrated collection of fine art, decorative art, and period rooms, displayed within the stunning architectural setting designed by European architects William Jay and Detlef Lienau. It is also home to the Bird Girl statue made famous by the book Midnight in the Garden of Good and Evil.

SCAD Museum of Art

The SCAD Museum of Art is a premier contemporary art museum that features emerging and established international artists through commissioned works and rotating exhibitions; engages local communities with special initiatives of an international scope; and serves as a resource for SCAD students and alumni during their academic careers and beyond.

Tricentennial Park

Located at 655 Louisville Road, Tricentennial Park includes three museums at single location: Georgia State Railroad Museum, Savannah Children's Museum, and Savannah History Museum.

Pin Point Heritage Museum

Located at 9924 Pin Point Ave, the Pin Point Heritage Museum, celebrates the life, work and history of this Gullah/Geechee community that calls Pin Point home.

American Prohibition Museum

Located at 209 West. St. Julian St., The first and only museum in the United States dedicated to the history of Prohibition. While here, guests will travel back in time to the early 1900s, as anti-alcohol rallies swept the nation and the "booze problem" was pushed to the fore-front of American politics. The true story of America's struggle with the liquor question, the passing of the 18th Amendment, its impact on the nation, and the far-reaching consequences of the thirteen years of Prohibition all come to life within the walls of the American Prohibition Museum. Through immersive displays and state-of-the-art dioramas, museum goers will learn how Prohibition and Temperance shaped thinking and culture for more than 200 years of American history.

Davenport House Museum

Located at 324 E. State St., The stately Federal-style home, built by master carpenter Isaiah Davenport for his household, provides a glimpse into 1820s domestic life in the urban port city of Savannah. In 1955 the saving of the Davenport House from demolition was the first effort of Historic Savannah Foundation, which has gone on to national prominence as a preservation leader as well as ushering in the preservation renaissance of the coastal city.

F.2.3.3 Parks, Preserve, and Conservation

The following list summarizes the City of Savannah many parks and playgrounds.

Table F.3 – Savannah Parks and Playgrounds

Park Park	Park Address	Acres	Facilities
Alpine	Alpine Drive / White Bluff Road	1.0	Playground, Basketball court, Picnic area
Avondale	Texas / Ohio Ave.	1.2	Playground, Athletic field, Picnic area, Spray pool
Bacon Park Forest	Skidaway Rd./ Bacon Pk Dr	53	Leisure Trails
Baldwin	E. 41st St. / Atlantic Ave.	1.5	Playground
Barjan Terrace	5600 Emory Drive	1.7	Playground, Picnic area
Blackshear	Wheaton / Dundee St.	2.8	Playground, Basketball courts, Spray pool
Bryan, Charlie S.	King St. / Darling St.	1.0	Playground, Basketball court, Picnic area
Cann	46th St. / Bulloch St.	2.5	Playground, Basketball court, Athletic field, Picnic area
Carver Village	Winburn / Bowden St.	1.0	Playground, Basketball court, Athletic field
Cedar Grove	13317 Chesterfield	2.0	Leisure Trail
Clark, Ben	Park Ave. / Live Oak St.	1.6	Playground, Picnic area
Cloverdale	Cloverdale Drive / Eleanor St.	5.0	Playground, Basketball courts, Tennis courts, Athletic field
Coffee Bluff Marina Park	14915 Coffee Bluff Rd	2.1	Playground, Picnic Area
Crossroad Villa	401 W. Montgomery Road	0.6	Playground, Picnic area
Crusader	81 Coffee Bluff Villa	3.7	Playground, Basketball court, Athletic field Neighborhood center, Golden age center Picnic area
Daffin Park	1 Waring Dr. / S.Victory Drive / Washington Ave. / Waters Ave. / Bee Road	77.0	Playground, Basketball courts, Athletic fields, Tennis courts, Volleyball court, Swimming pool, Walking trail, Picnic area lake / pavilion
Davant	Lincoln St. / E Perry Lane	0.6	Playground,Picnic area
Dixon	East Broad / Henry St.	0.1	Playground, Picnic area
Eastside	409 Goebel Ave/ Elgin St	0.5	Playground, Swimming Pool, Regional Center, Golden Age Center
Fellwood	Richards / West St.	1.0	Playground, Picnic area
Ford, Bowles	Cloverdale / Stiles Ave.	16.5	Playground, Picnic area, Swimming pool Walking trail lake / pavilion
Forrest Hills	Skidaway / Berkshire Road	7.2	Playground, Picnic area, Tennis courts,Spray pool
Forsyth	Drayton St. / Gaston St. / Whitaker St. / Park Ave.	19.0	Playground, Basketball courts, Athletic field Tennis courts, Spray pool
Gray, Rebecca	W Lathrop / Hudson Ave.	8.7	Playground, Basketball courts, Athletic fields, Spray pool
Hitch	56th / Boyd St.	2.3	Playground, Basketball court, Athletic field Picnic area
Hull	55th / Atlantic Ave	2.8	Playground, Picnic area, Athletic field

Park Park	Park Address	Acres	Facilities
			Spray pool
Jefferson Street	Jefferson / Wayne St.	0.1	Playground
Kennedy (Carver Heights)	Collat Ave. / Gwinnett St.	6.2	Playground, Picnic area, Basketball courts Athletic field, Tennis courts, Neighborhood center, Golden age center
Kensington	101 Althea Pkwy	4	Playground
Lamara Heights	Atlantic / E. 66th St.	0.9	Open space, Playground
Law, W. W.	Harmon / E. Bolton St.	1.2	Playground, Regional Center, Gymnasium Swimming pool
Liberty City	1401 Millls B. Lane	7.3	Playground, Neighborhood Center, Golden Age Center, Picnic Area, Leisure Trail
Magnolia	Bacon Park Dr/ Morgan St	2.2	Playground
Mayfair	1462 Dale Drive	0.6	Playground
Minick, Guy Complex	Eisenhower / Sallie Mood	13.8	Playground, Athletic fields
Mohawk Lake	1132/1134 Mohawk St	29	Lake
Ogeecheeton	Page St. / Dempsey Ave.	0.5	Playground
Rivers End	Hurst Ave. / Rivers End Drive	0.5	Playground
Robinson, Robbie	Pendleton / Carroll St.	5.0	Playground, Basketball Courts, Picnic Area
Ross, W. C.	Stratford / Abbott St.	3.6	Playground, Swimming Pool, Picnic Area
Savannah Gardens	516 Pennsylvania Ave.		Playground, Pool, Picnic Area
Soldiers Field (Paulsen)	Paulsen / Joe St.	3.0	Playground, Basketball court, Athletic field Swimming pool, Picnic area
Staley Heights	Dillon Ave. / Sherman St.	3.2	Playground, Basketball court, Athletic field Swimming pool, Picnic area
Summerside	4113 Clinch St	0.3	Playground, Basketball Court, Picnic Area
Sunset	Sunset Blvd.	3.9	Playground, Basketball court, Picnic area
Sustainable Fellwood	S. Carolan St/ Kenneth Dunham St/ Fellwood	1.8	Playground, Picnic Area
Thomas	36th / Bull St.	1.3	Passive picnic area
Tompkins	39th St. / Ogeechee Road	3.9	Playground, Regional center, Gymnasium Swimming pool, Picnic area
Treat	Treat Ave / Gable St.	0.3	Playground
Tremont	Plymouth Ave. / Comet	1.7	Playground
Tribble, Joe	Largo Drive	51	Walking trail, Playground, Picnic area, Lake
Victory Heights	E 42nd St / Raskin Ave.	1.0	Playground, Spray pool, Picnic area
Wells	38th St. / MLK Jr. Blvd.	1.4	Playground, Picnic area, Basketball court
Wessels, Fred	East Broad/ Henry St	0.5	Playground, Basketball Courts, Picnic Area
Westside	Rogers / Carolan St.	0.9	Playground, Basketball court
White Bluff Elementary	9902 White Bluff Road	7.5	Basketball court, Athletic field
Windsor Forest	414 Briarcliff Circle	4.0	Playground, Athletic field, Regional center Gymnasium, Golden age center
Yamacraw	349 Bryan St.	1.2	Playground, Picnic area
38th Street	712 E 38th St.(between Paulsen and Atlantic Ave.)	0.3	Playground, Spray pool

Source: City of Savannah website: *www.savannahga.gov*

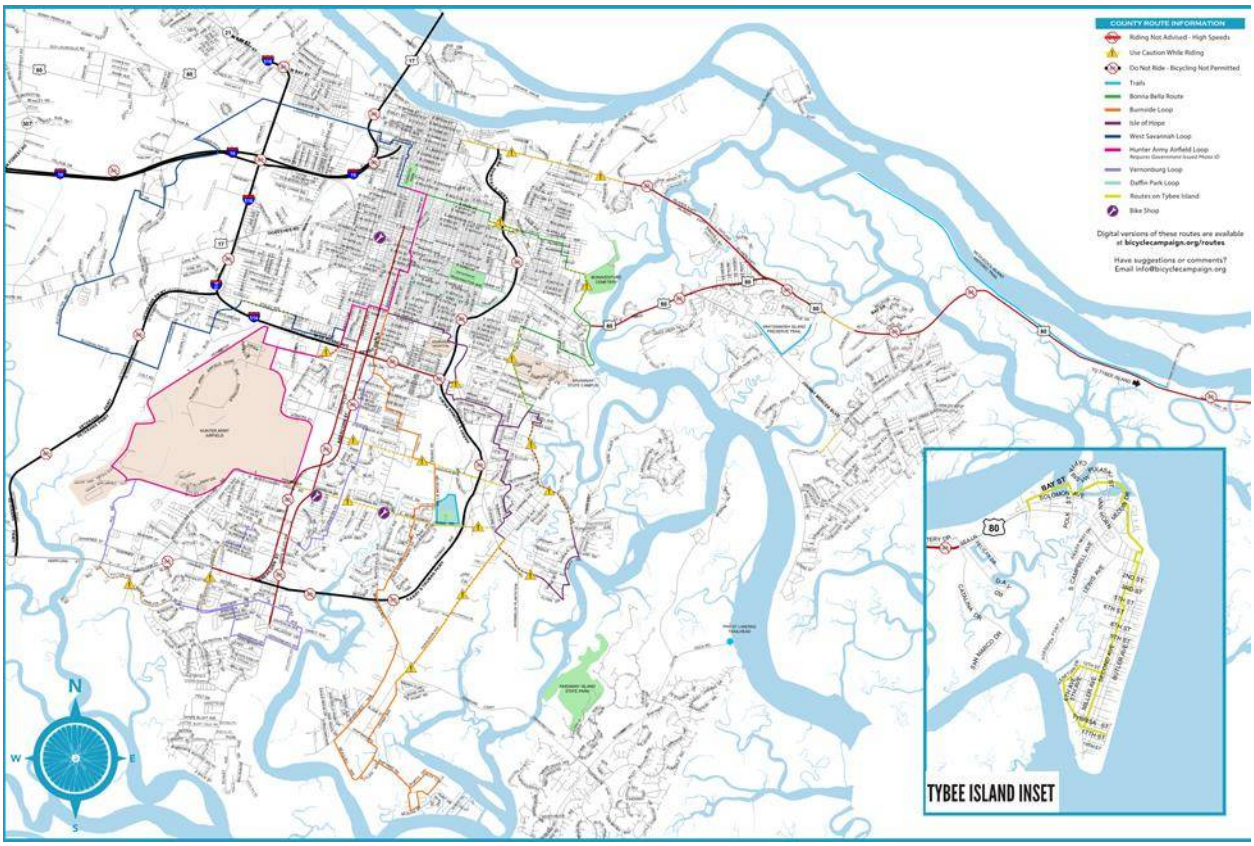
The City of Savannah has nine (9) walking trails as summarized below.

- Daffin Park: A paved sidewalk and a rubberized trail completely outlines the perimeter of Daffin Park and is 1.5 miles around. The rubberized trail, named in honor of Robert Espinoza, is perfect for runners. The concrete sidewalk is eight feet wide and has no incline, which makes it handicapped accessible.
- Forsyth Park: This is the southernmost boundary of the historical district. Paved, lighted sidewalks are handicapped accessible and surround Savannah's most popular walking trail. The distance around the 30-acre park is 1.5 miles. The northern part of the park has 44 trees per acre with the predominant tree being the Live Oak and the predominant shrub being the azalea.
- Bowles Ford: Lighted, paved walking trails surround the 16-acre lake. The distance around is 0.7 miles. Bowles Ford is located just off Stiles Avenue, near the Cloverdale neighborhood.
- Tatemville Park: Lighted, paved walking trails surround the 20-acre lake. The distance around is .7 miles. Tatemville is located just off Staley Avenue, turn right off Staley Avenue on Coleman Street.
- Savannah-Ogeechee Canal: Stroll through scenic river swamp forest along old Jenkes Toll Road. Children are welcome; dogs on a leash are permitted. The Savannah-Ogeechee Canal is off GA 204, 2.3 miles west of I-95. The site includes locks 5 and 6 of the original canal that began operation in 1831.
- Mohawk Lake: The 17-acre lake located at 1132 Mohawk Street offers open space and fishing.
- Joe Tribble Park: This 51-acre park located at 12519 Largo Drive in the Windsor Forest Neighborhood includes an 11-acre lake, 0.568 miles of paved and lighted sidewalk, open space, and the park is handicapped accessible.
- Fernwood/Parkwood Walking Trail: Fernwood/Parkwood walking Trail is located at 2236 N. Fernwood Dr. The newly paved, 0 .2 mile walking trail with lighting was designed as a product of the City's Floodways to Greenways Program which City Council endorsed in 2009. Floodways to Greenways is a new way of addressing drainage issues, combining Storm water infrastructure with community amenities like passive parks and gardens. The City's Water Resources Bureau has planned events throughout the year to introduce the unique ecological benefits of the new Fernwood/Parkwood Trail.
- Liberty City Park: Located at 1401 Mills B Lane Boulevard has a lighted, paved walking trail which surrounds the three-acre lake. The distance around the lake is .331 miles.

The City of Savannah has three biking trails which are summarized below.

- West to East Corridor: 52nd Street to Ward Street to LaRoche Avenue to the entrance of Savannah State University.
- North to South Corridor: Habersham Street to Stephenson Avenue to Hodgson Memorial Drive to Edgewater Drive to Hillyer Drive to Dyches Drive to Lorwood Drive to Tibet Avenue to Largo Drive to Windsor Road to Science Drive.
- McQueens Island Trail: U.S. Highway 80 East, the trail provides 6 miles for hiking and biking between Bull River and Fort Pulaski.

Figure F.3 – Savannah Parks and Playgrounds



Source: City of Savannah website: *www.savannahga.gov*

F.2.3.4 Natural Resources

Floodplains and Flood Zones

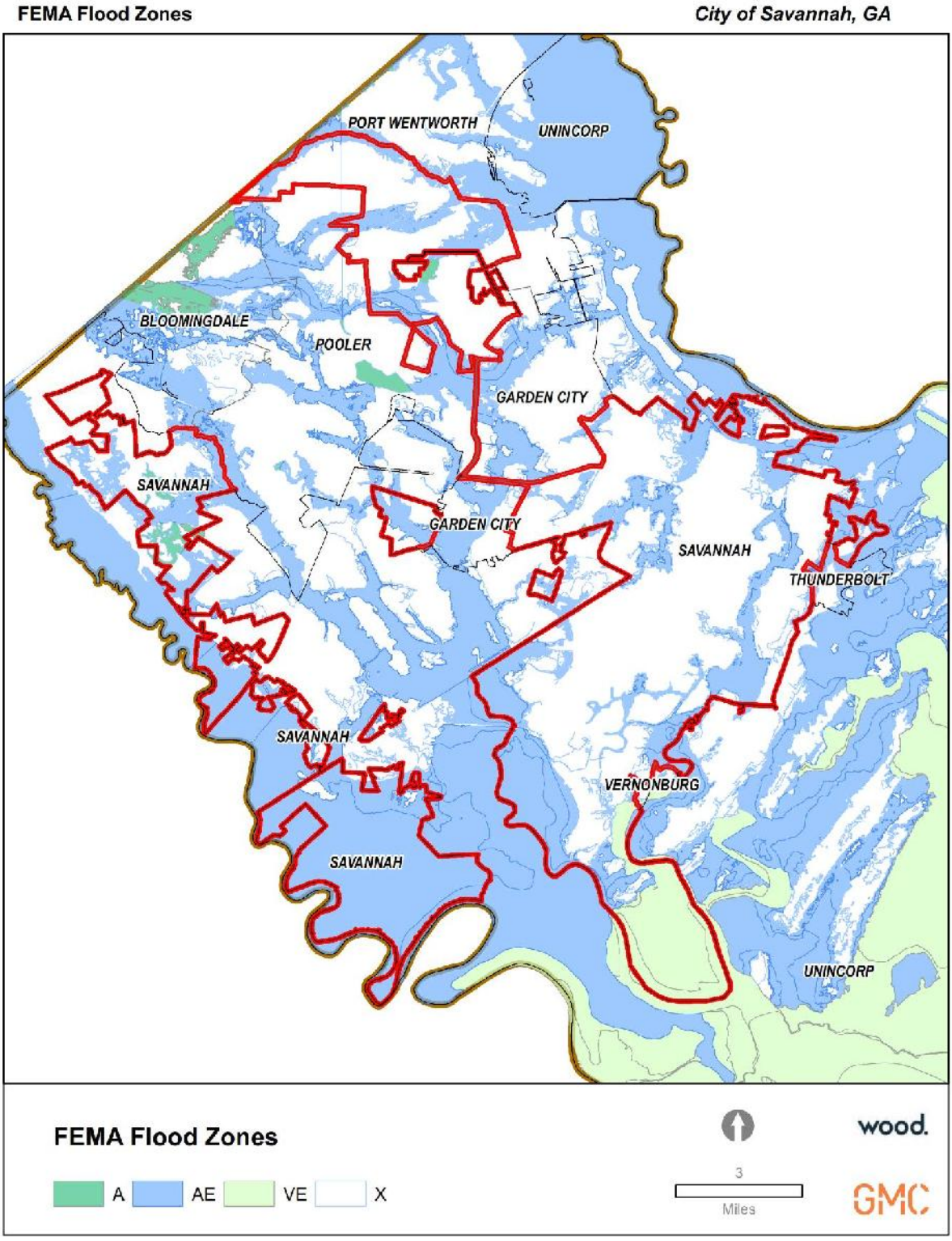
FEMA flood zone designations within the City of Savannah are identified in the figure below. The flood hazard areas shown are designated by the Federal Emergency Management Agency (FEMA) and include: Zone A (subject to inundation by the 1% annual-chance flood event with no base flood elevation (BFE) determined), Zone AE (subject to inundation by the 1% annual-chance flood event with BFE determined), Zone VE (subject to inundation by the 1% annual-chance flood event with additional hazards due to storm waves with BFE determined), and Zone X (moderate or minimal risk areas outside the 1% and 0.2% annual-chance floodplains with no BFE or base flood depths determined)

Table F.4 - Savannah Flood Zones

Flood Zone	Area (Acres)	Area (Square Miles)	Percent of City (%)
A	562.6	0.9	0.8%
AE	24,431.0	38.4	35.2%
VE	4,068.2	6.37	5.9%
X	40,311.0	63.9	59.0%
TOTAL	**69,372.9**	**108.7**	**100.0%**

Source: FEMA, 2018

Figure F.4 – FEMA Flood Zones, 2018, Savannah



According to the 2018 FEMA data, 29,062 acres of the land within the City is located within a 100-year floodplain (Zone AE, A, VE) which equals 41.9% of the City. With over 41 percent of the City at high risk

to flooding in the Special Flood Hazard Area (SFHA), the City of Savannah should seek ways to balance future development with strategies to preserve sensitive lands and natural drainage features.

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, and the vegetation stabilizes soils during flooding. Natural floodplains in Savannah include wetland areas and low-lying land along the major rivers in and around the City including the Ogeechee River, Little Ogeechee River, Vernon River, Wilmington River, and the South Channel of the Savannah River. Natural floodplains reduce damage by allowing flood waters to spread out over large areas, aiding infiltration into the ground, reducing flow rates and acting as a flood storage area to reduce downstream peaks. The City should strive to keep floodplain and floodplain waters free of contaminants such as oil, paint, anti-freeze, pesticides, and plastics and other trash. These chemicals and waste materials pollute local waterways, decreasing the water quality that local wildlife and plants depend upon.

Wetlands

Wetlands benefit the ecosystem by storing, changing, and transmitting surface water and groundwater. Through these processes pollution is removed, nutrients are recycled, groundwater is recharged, and biodiversity is enhanced. Wetland composition varies extensively, with five distinct categories for classification: Estuarine, Lacustrine, Marine, Palustrine, and Riverine systems Based on data from the National Wetland Inventory (NWI) wetlands throughout the City of Savannah include those summarized in the Wetland Types table and Wetland by Type map below.

Table F.5 – Wetland Types, Savannah

Wetland Type	Area (Acres)	Area (Sq. Miles)	Percent of City
Estuarine	14,650.9	22.9	21.1%
Lacustrine	310.5	0.5	0.4%
Palustrine	10,225.7	16.0	14.7%
Riverine	27.9	0.0	0.0%
Non-Wetland	44,353.0	69.3	63.8%
TOTAL	**69,568**	**108.7**	**100.0%**

Source: National Wetland Inventory

The Palustrine System

The Palustrine (freshwater) system includes all non-tidal wetlands dominated by trees, shrubs, persistent emergent plants, emergent mosses or lichens, and all such wetlands that occur in areas where salinity due to ocean-derived salts is below 0.5%. The Palustrine system is bounded by upland.

The Estuarine System

The Estuarine system consists of deep-water tidal habitat and adjacent tidal wetlands that are usually semi-enclosed by land but have open, partly obstructed, or sporadic access to the open ocean, and in which ocean water is at least occasionally diluted by freshwater runoff from the land. The Estuarine system extends (1) upstream and landward to where ocean-derived salts measure less than 0.5% during the period of average annual low flow; (2) to an imaginary line closing the mouth of a river, bay, or sound; and (3) to the seaward limit of emergent wetlands, shrubs, or trees where they are not included in (2). It also includes offshore areas of continuously diluted sea water. It contains two sub-systems: subtidal

(where the substrate is continuously submerged) and intertidal (where the substrate is exposed and flooded by tides including the associated splash zone).

The Riverine System

The Riverine system includes all wetlands and deep-water habitats contained within a channel with two exceptions: (1) wetlands dominated by trees, shrubs, emergent vegetation, emergent mosses, or lichens, and (2) habitats with water containing ocean-derived salts in excess of 0.5%. The Riverine system is bounded on the landward side by upland, by the channel bank (including natural and man-made levees), or by wetlands dominated by trees, shrubs, emergent vegetation, emergent mosses, or lichens. In braided streams, the system is bounded by the banks forming the outer limits of the depression within which the braiding occurs.

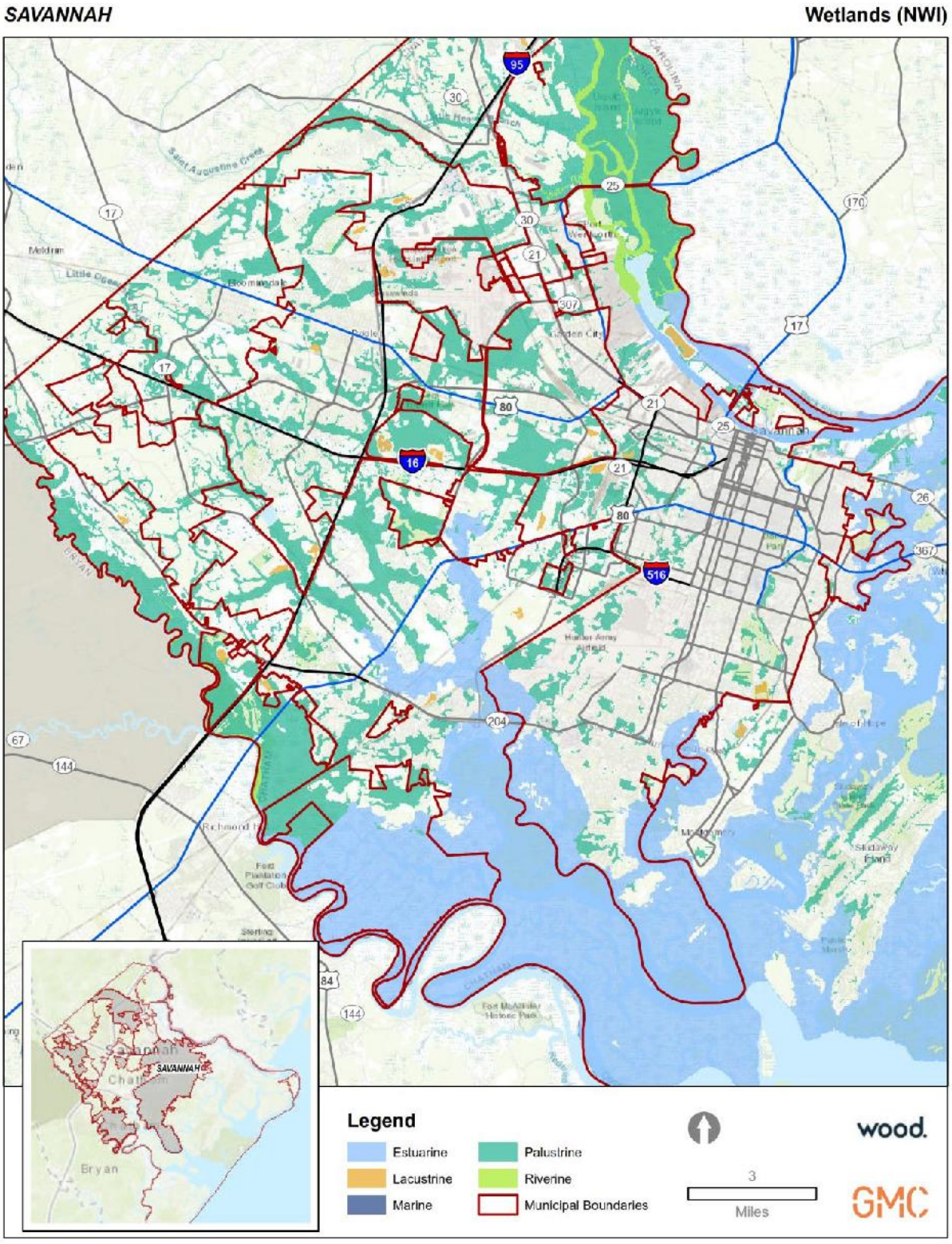
F.2.3.5 Lacustrine Wetlands

Lacustrine wetlands are large, open, water-dominated systems (e.g. lakes). This definition also applies to modified systems which possess characteristics similar to lacustrine systems (e.g. deep standing or slow-moving waters).

Waterbodies

Approximately 5.2 percent of the City's area is open water, and another 36.3 percent is wetlands. These areas are primarily associated the main waterways surrounding the City including the Ogeechee River, Little Ogeechee River, Vernon River, Wilmington River, South Channel of the Savannah River.

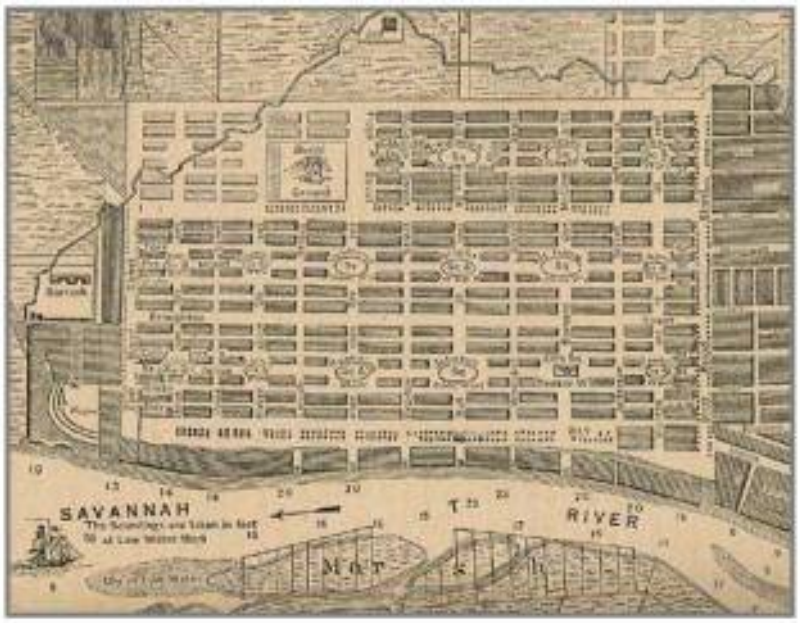
Figure F.5 – Wetlands by Type, Savannah



Source: National Wetland Inventory

F.2.4 History

Permanent European settlement came to the Chatham County – Savannah region in1733 when the British settled the Colony of Georgia to buffer their northern colonies from the Spanish in Florida. James Edward Oglethorpe founded Savannah as the seat of the thirteenth English colony near a Creek Indian village called Yamacraw. Oglethorpe forged friendly relations with the Indians which enabled him to establish a successful town 18 miles inland from the Atlantic Ocean. Oglethorpe devised a colonial settlement plan that set it apart from other cities in the New World.



The nucleus of the plan was the ward. Each ward had a name and was a part of a larger integrated regional land system that included town commons, gardens, farms, estates, agricultural villages and fortified outposts. The plan informed the architecture, resulting in a dense urban pattern of townhouses and carriage houses in the old town and a more and more suburban pattern as development advanced into the former farm lots. Modern-day street patterns closely follow the old land divisions between the farm lots.

Savannah's regional plan with its town lots and squares, garden lots, and farm lots formed a blueprint for growth that is evident in the street patterns even today. Major boulevards such as 37th Street, Victory Drive, Bull Street and Waters Avenue follow the former divisions between the farm lots.

Beyond the farms were agricultural villages such as Hampstead and Highgate (now occupied by Hunter Army Airfield) and private estates on the water such as Wormsloe and Beaulieu. The plan was completed by fortified farming villages such as those at Thunderbolt and Modena on Skidaway Island.

The outlying settlements were connected to the City of Savannah by waterways and colonial road systems. These colonial roads followed the high ground (usually the ridges of old barrier island dune structures). Early development naturally occurred along these routes including the Western Road (Louisville Road), the White Bluff Road (an extension of Bull Street), the Great Ogeechee Road (Southern Road), Wheaton Street (to Thunderbolt and the ferry to Skidaway Island), and the Augusta or River Road. Plantations were established along the Savannah and Ogeechee Rivers and on the islands such as Ossabaw, Skidaway and Wassaw.

After the Civil War, street railroads, also known as streetcars, encouraged suburban and river resort development. With the arrival of the automobile, many of these summer resorts became year-round residential suburbs and palm-lined causeways connected these communities to the mainland. Street railroads enabled urban expansion into the former farm lots where larger lots and deeper setbacks were the norm and are today desirable residential neighborhoods.

Industrial development replaced the Savannah River plantations in the Twentieth Century. Like the Nineteenth Century canals and railroads, industries spurred the development of industrial worker

communities like Woodville and West Savannah. Prior to World War II, the Savannah urban area was bounded roughly by DeRenne Avenue on the South, Pennsylvania Avenue on the East, and Lathrop Avenue and Laurel Grove Cemetery on the West. Outside of several smaller municipalities, the remaining areas were rural in character, dominated by dairy farms, timber and truck farming.

Since World War II, automobile-related mobility enabled urban expansion and suburbanization, which spread to all quadrants of the County. With the exception of the estates of Wormsloe, Beaulieu, Grove Point, Oakland, Lebanon and the islands of Wassaw and Ossabaw, there is little rural landscape left in modern day Chatham County.

F.2.5 Economy

F.2.5.1 Wages and Employment

Per the 2013-2017 American Community Survey 5-Year Estimates, the median household income for Savannah is $39,386, which is 24 percent lower than the state's median household income ($52,977). Approximately 24% of the population is considered to be living below the poverty level. Moreover, 34.8 percent of people under 18 years of age and 11.7 percent of people 65 years and over are living below the poverty level.

The table below shows employment and unemployment rates along with industry employment by major classification for the City.

Table F.6 - Employment and Occupation Statistics for Savannah, GA, 2017

Employment Status	Count	Percentage (%)
In labor force	73,982	63.2
Employed	64,329	54.9
Unemployed	8,017	6.8
Armed Forces	1,636	1.4
Not in labor force	43,157	36.8
Occupation		
Management, business, science and arts	20,067	31.2
Service	16,432	25.5
Sales and office	15,500	24.1
Natural resources, construction and maintenance	4,505	7.0
Production, transportation and material moving	7,825	12.2

Source: U.S. Census Bureau, 2013-2017 American Community Survey 5-Year Estimates

Major industry sectors in the City of Savannah include management, business, science, and arts (31.2%); service (25.5%); and sales and office (24.1%); natural resources, construction, and maintenance (7%); and production, transportation, and material moving (1.2%).

Major employers are discussed in the Chatham County Community Profile.

F.2.6 Housing

According to the 2013-2017 ACS 5-Year Estimates, there are 62,775 housing units in Savannah, of which 85.5 percent are occupied. Approximately 43.7 percent of occupied units are owner-occupied (56.3 percent occupied by renters). A high percentage of renters is an indicator of higher pre- and post-disaster vulnerability because renters often do not have the financial resources of homeowners, are more transient, are less likely to have information about or access to recovery aid following a disaster, and are

more likely to require temporary shelter following a disaster. Therefore, higher rates of home rentals in Savannah may indicate that residents are not able to implement certain types of mitigation in their homes.

Median home value in Savannah is $146,600. Of the City's owner-occupied housing units, 64.9 percent have a mortgage. Most householders (78.1 percent) moved into their current homes since the year 2000, 21.3 percent moved in between 2000 and 2009, and 40.3 percent moved in between 2010 and 2014. 13.4 percent of occupied housing units have no vehicle available to them, which suggests these residents may have difficulty in the event of an evacuation.

The majority (57.1 percent) of housing units in Savannah are detached single family homes. However, 1.9 percent of units are mobile homes which can be more vulnerable to certain hazards, such as tornadoes and windstorms, especially if they aren't secured with tie downs.

The town's housing stock is old, with the majority (84.6%) of occupied housing built before 2000. Table below details housing age in Savannah.

Table F.7 – Housing Age

Year Structure Built	Percent of Occupied Housing
2014 or later	1.0%
2010 to 2013	3.6%
2000 to 2009	10.9%
1980 to 1999	17.6%
1960 to 1979	26.7%%
1940 to 1959	23.1%
1939 or earlier	16.9%

Source: U.S. Census Bureau, American Community Survey 2013-2017 5-Year Estimates

Age can indicate the potential vulnerability of a structure to certain hazards. For example, the City of Savannah first entered the National Flood Insurance Program in 1971. Therefore, based on housing age estimates approximately 53 percent of housing in the City was built before any floodplain development restrictions were required.

F.2.7 Population

According to the U.S. Census Bureau, Savannah had an estimated population of 145,094 residents in 2017 and a population of 134,348 at the time of the 2010 U.S. Census (7.9% increase from 2010-2017). As of 2017, Savannah's population density was 1,335 persons per square mile. The table below provides demographic profile data from the 2017 American Community Survey 5-Year Estimates.

Table F.8 – City of Savannah Demographic Profile Data, 2017

Demographic	Savannah	Percent
Gender/Age		
Male	68,627	47.3
Female	76,467	52.7
Under 5 Years	9,484	6.5
65 Years and Over	18,560	12.8
Race/Ethnicity (One Race)		
White	56,759	39.1
Black or African American	79,315	54.7
American Indian/Alaska Native	328	0.2

Demographic	Savannah	Percent
Asian	3,155	2.2
Two or More Races	3,832	2.6
Hispanic or Latino[1]	6,946	4.8
Education		
High School Graduate or Higher	24,060	26.1
Bachelor's Degree or Higher	26,052	28.2

Source: U.S. Census Bureau, 2013-2017 American Community Survey 5-Year Estimates
1Hispanics may be of any race, so also are included in applicable race categories.

F.2.8 Land Use

Land use data was obtained from the 2016 Update to the Chatham County – Savannah Comprehensive Plan (Comp Plan). The intent of the Comp Plan is to serve as a comprehensive planning document that guides Chatham County's and Savannah's collective growth and development decisions over the next 20 years. The Comp Plan serves both participating communities as a general statement of intent to promote local goals related to economic development, land use, transportation, housing, quality of life and other related topics.

F.2.8.1 Existing Land Use

The City of Savanah includes a total area of 69,568 acres (108.7 square miles) as calculated from GIS and obtained from the U.S. Census. According to the Chatham County – Savannah Comp Plan, existing land use is summarized in the table below.

Existing Land Use

Land Use	Savannah Area (Acres)	Percent of City
Residential - Single Family	10,836	11.5%
Residential – Multi Family	762	0.8%
Public / Institutional	7,078	7.5%
Commercial – Office	12,587	13.4%
Commercial – Retail	1,483	1.6%
Trans / Com / Utilities	759	0.8%
Agriculture / Forestry	3,746	4.0%
Industry / Light	5,017	5.3%
Industry / Heavy	829	0.9%
Recreation - Active	89	0.1%
Greenspace	527	0.6%
Right-of-Way	7,152	7.6%
Tidal Marsh	5,824	6.2%
Open Water	2,505	2.7%
Undeveloped Land / Other	34,881	37.1%
TOTAL	**94,075** [(1)]	**100.0%**

(1) 147 square miles

The Chatham County – Savannah Comprehensive Plan shows the total area for the City of Savannah to be 147 square miles which is higher than the 108.7 square miles used for this report. The difference is likely

due to the Comp Plan using an alternate City boundary that incorporates more of the surrounding waterways and marsh included in the land use categories for Tidal Marsh, Open Water, and/or Undeveloped Land/Other.

F.2.8.2 Future Land Use

The 2016 Chatham County – Savannah Comprehensive Plan includes a Future Land Use Map (FLUM) that serves as a guide for zoning decisions. The FLUM represents the City's and County's future development policy and is taken into consideration for all zoning requests, local policy reviews, and land development decisions. The FLUM's Future Land Use Categories include those listed below and shown in the following maps.

Table F.9 – Future Land Use Categories

Future Land Use Category	Definition
Downtown	Traditional Central Business District including retail, office, entertainment, institutional, civic, and residential uses.
Downtown Expansion	Areas in close proximity to the Central Business District that are identified for growth.
Traditional Commercial	Business areas in close proximity to downtown having development patterns characteristic of the Planned Town, Streetcar, and Early Automobile eras.
Traditional Neighborhood	Residential areas in close proximity to downtown or in outlying historically settled areas having development patterns characteristic of the Planned Town, Streetcar, and Early Automobile eras.
Civic / Institutional	Areas identified as employment hubs that may consist of office buildings, medical offices, banks, hospitals, and ancillary commercial uses the support the office economy.
Commercial - Neighborhood	Nodal and strip business areas that are within predominately residential areas and are developed at a scale and intensity compatible with adjacent residential uses.
Commercial - Suburban	Business areas supporting shopping centers and corridor commercial uses at a scale and intensity capable of serving regional markets.
Commercial - Regional	Business areas supporting most retail, service, office, and institutional uses.
Commercial - Marine	Land dedicated to marina operations including those ancillary uses that are both marine-related and an integral part of the marina complex.
Industry - Light	Areas supporting warehouses, wholesale facilities, and the manufacturing, assembly or production of parts and products that may require intensive truck traffic and outdoor storage but that do not produce noise, odor, dust, or waterborne contaminants above ambient levels.
Industry - Heavy	Areas supporting uses that are involved in the large-scale production of finished or semi-finished products from raw materials and that may produce noise, odor, dust, and waterborne contaminants measurably above ambient levels.
Residential - General	Areas with a wide range of residential uses including multi-family dwellings, attached dwellings, small lot single-family dwellings at densities greater than 10 units per gross acre.
Residential – Suburban Single Family	Areas identified for single-family detached residential dwellings at a density not to exceed five (5) units per gross acre.
Planned Development	Master planned areas accommodating cluster development, neotraditional development, or mixed residential, commercial, or civic uses.
Planned Campus	Areas designated for research & development, educational, and business campuses, where landscaping, greenspace, open space, and open water area exceeds impervious areas structures and parking lots.

Future Land Use Category	Definition
Agriculture / Forestry	Areas principally used for farming, silviculture, dairy or livestock production, and resources extraction.
Transportation / Communication / Utility	Areas dedicated principally to railroad facilities, airports and similar uses that produce intensive or obtrusive activities that are not readily assimilated into other districts.
Parks / Recreation	Land dedicated to open space that is accessible to the public or land that is dedicated to sports, exercise, or other types of leisure activities.
Conservation	Land that is publicly or privately held and designated for preservation in a natural state or for use for passive recreation.
Conservation - Residential	This category is for back barrier islands that are in private ownership and have uplands exceeding two acres on a contiguous land mass.
Tidal Marsh	Areas of estuarine influence that are inundated by tidal waters on a daily basis and are characterized by spartina (cord grass) habitat.
Transition	Areas having established residential character that due to their arterial location are confronted with potential commercial intrusion.

Figure F.6 – Future Land Use Map – Northwest Quadrant

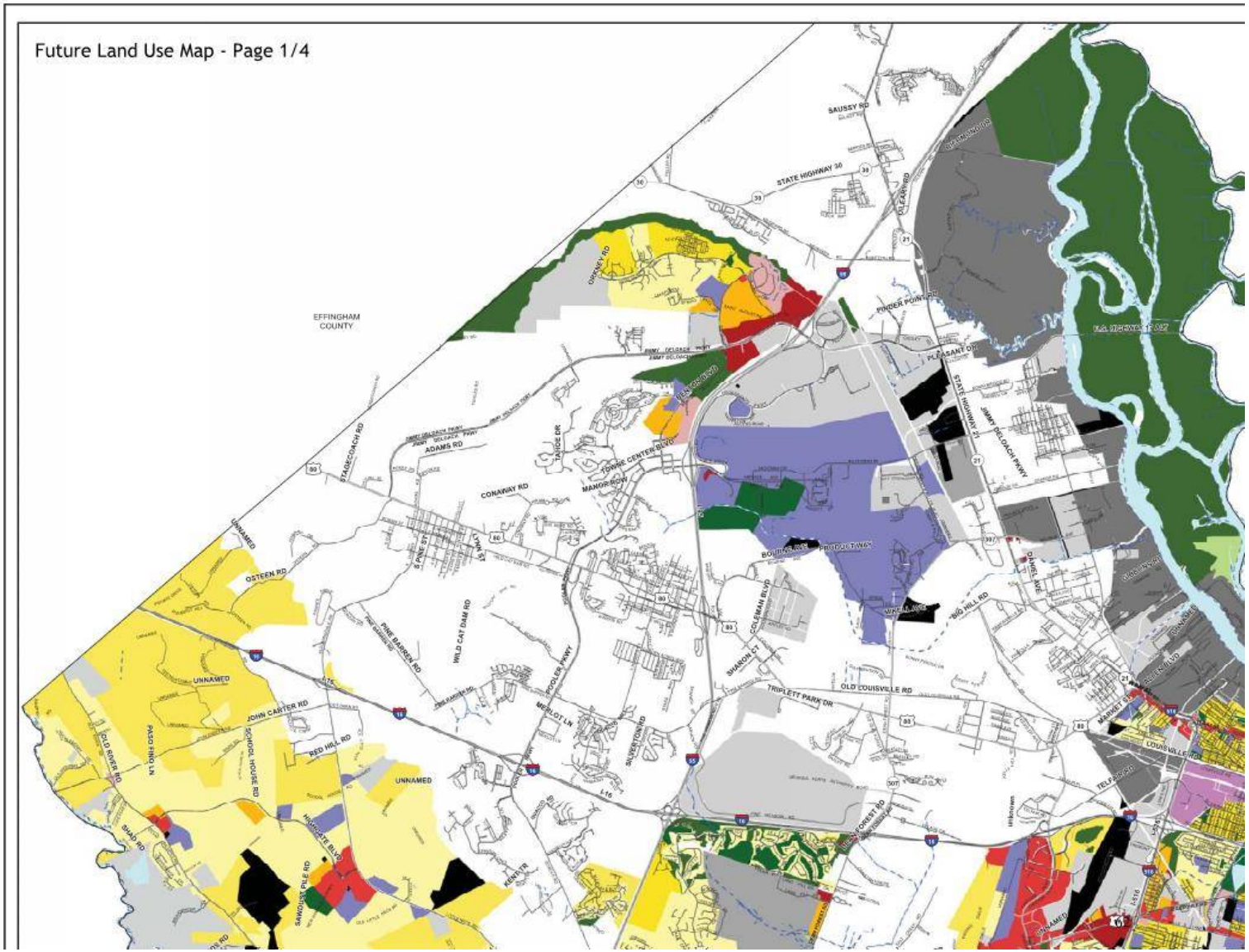


Figure F.7 – Future Land Use Map – Northeast Quadrant

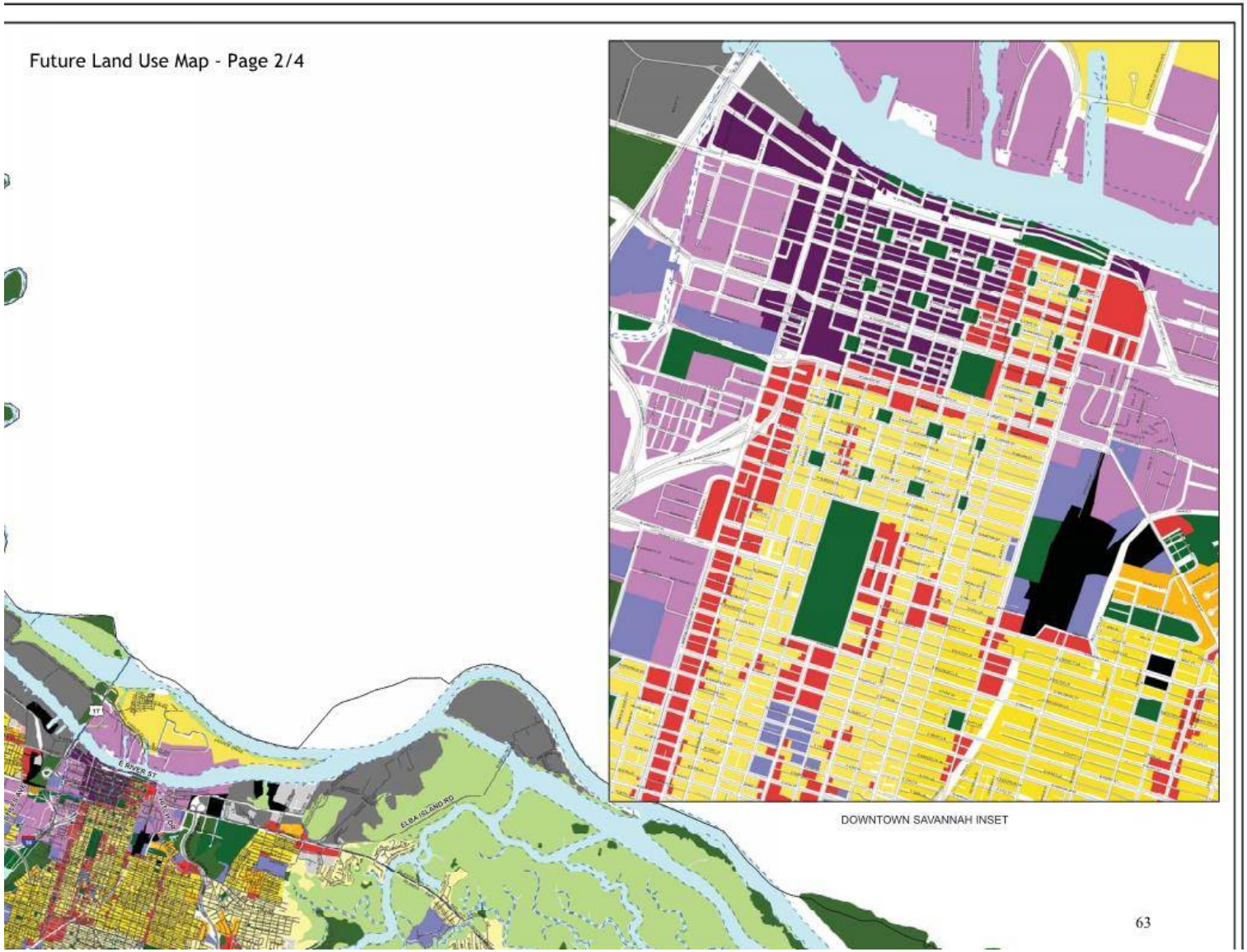


Figure F.8 – Future Land Use Map – Southwest Quadrant

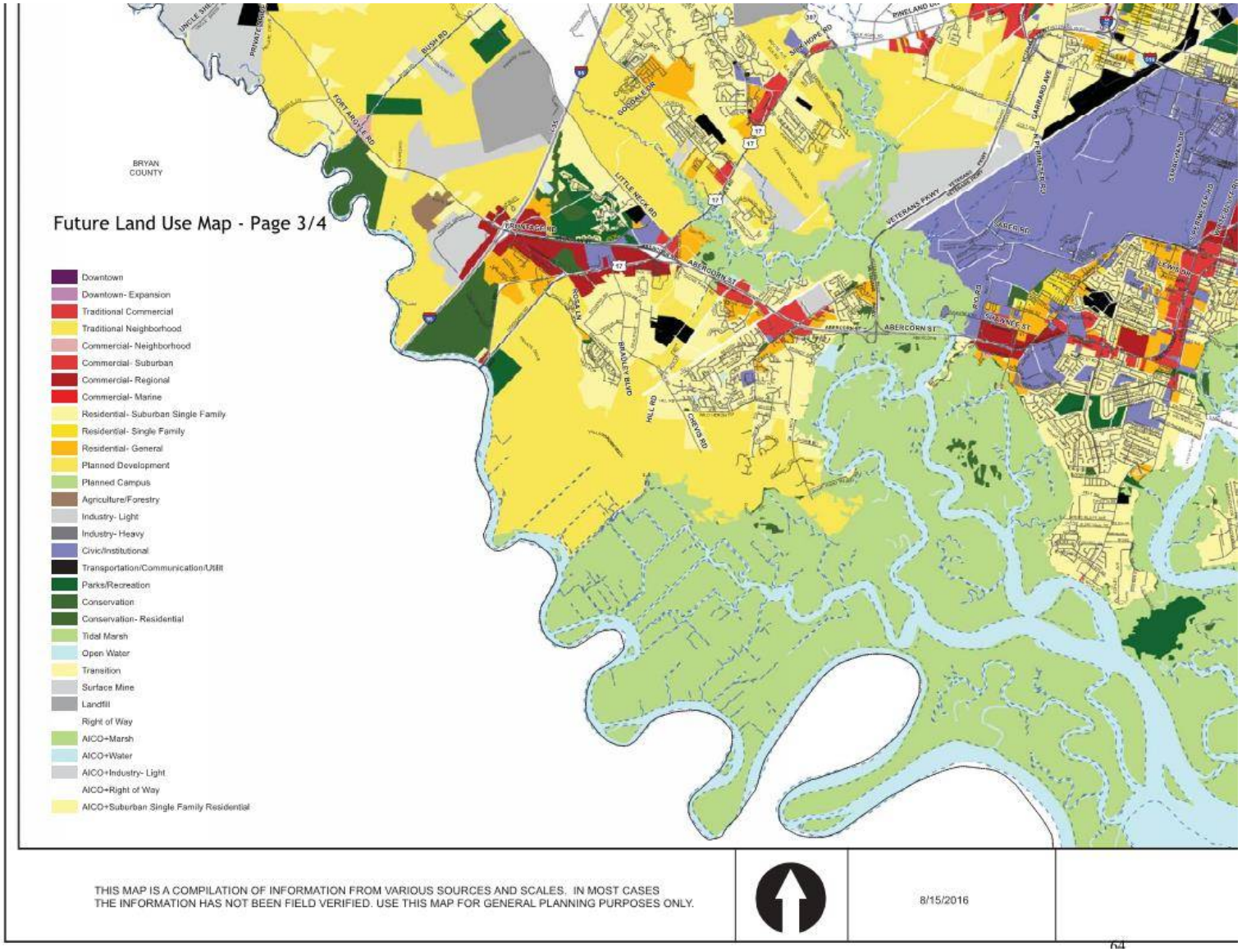
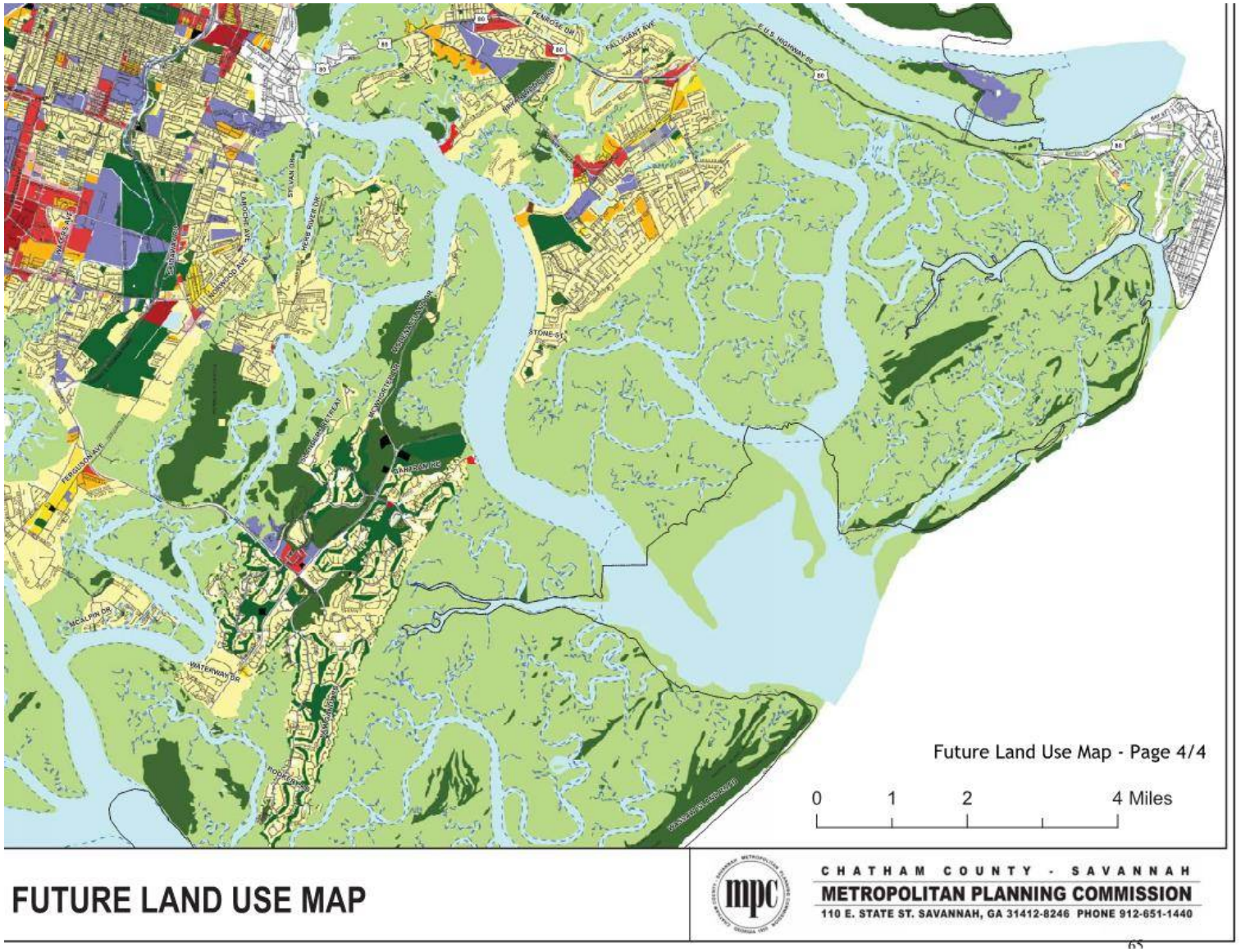


Figure F.9 – Future Land Use Map – Southeast Quadrant

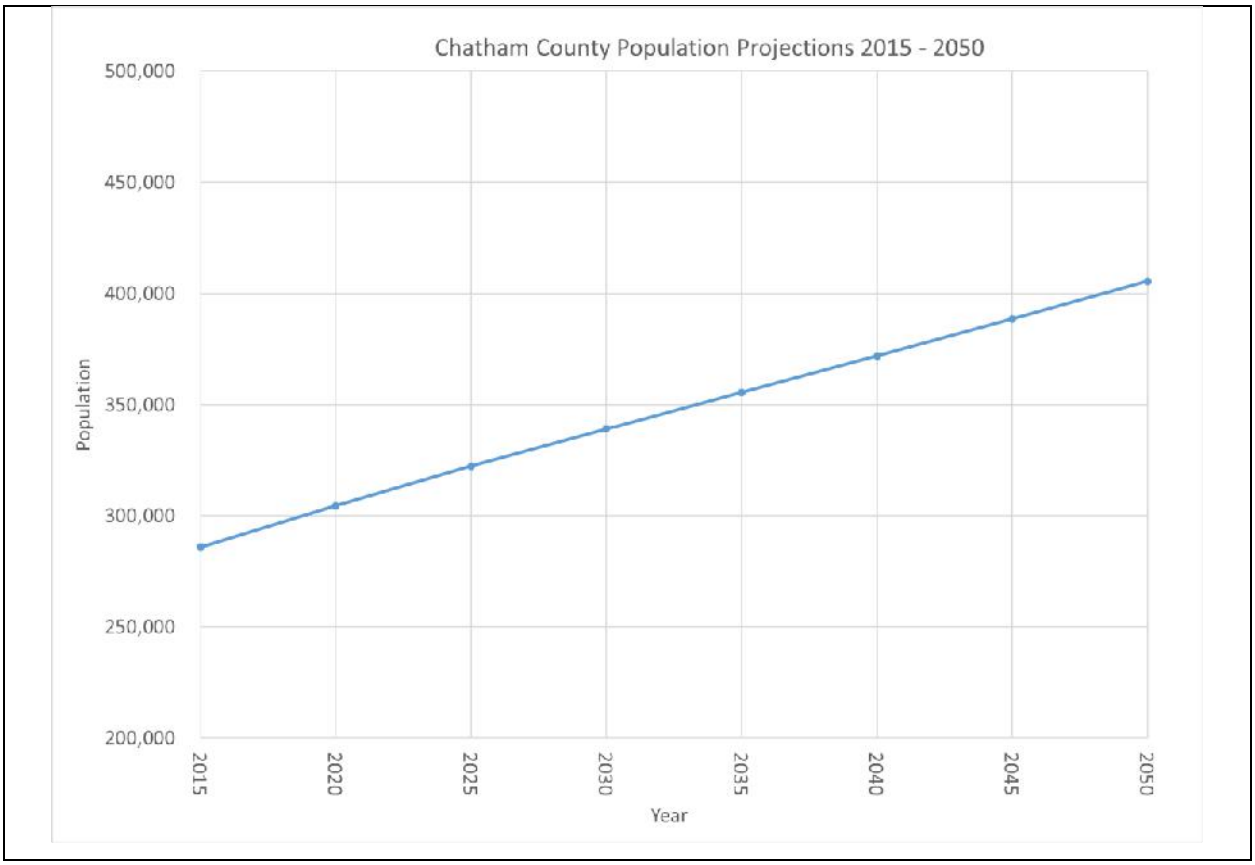


F.2.9 Growth and Development Trends

According to U.S. Census and American Community Survey population estimates, the City of Savannah population has increased from 134,348 in 2010 to 145,094 in 2017 representing a total increase of 9.2% and an annual increase of 1.3%.

According to the Georgia Governor's Office of Planning and Budget (GOPB), Chatham County is projected to reach a population of 405,573 by 2050, which represents a 38% increase from the 2017 population. The population projections from the GOPB estimate the annual growth for the County to be about 1.1% through 2050.

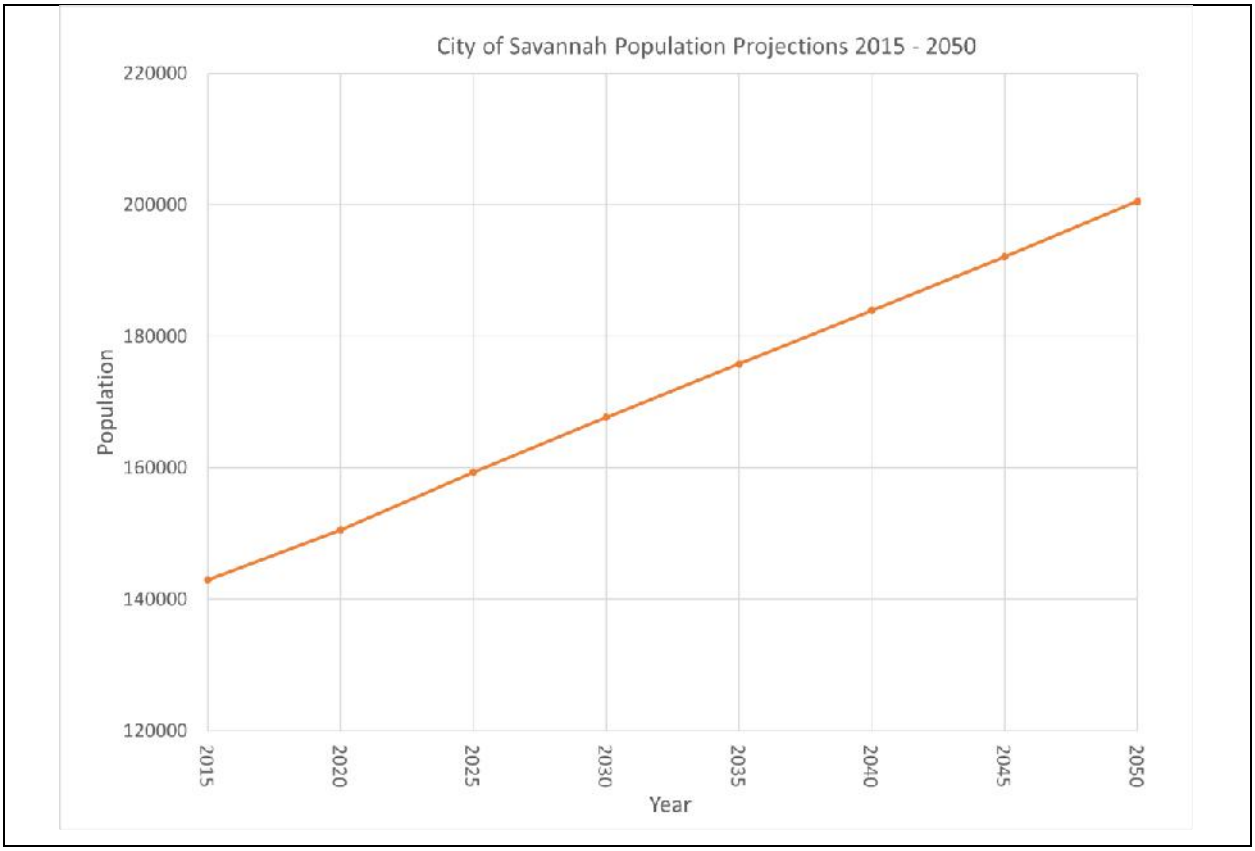
Figure F.10 – Population Projections for Chatham County 2015 - 2050



Source: Georgia Governor's Office of Planning and Budget

Using the projected growth rate for the County, the population of the City of Savannah is expected to increase from 145,094 in 2017 to 200,510 in 2050 as shown in the table below.

Figure F.11 - Population Projections for City of Savannah 2015 - 2050



F.3 ASSET INVENTORY

F.3.1 Property

Table F.10 – City of Savannah Building Exposure

Occupancy Type	Total Number of Buildings	Total Building Value	Estimated Content Value	Total Value
Agricultural	4	$3,600.00	$3,600.00	$7,200.00
Commercial	7,618	$5,038,642,795.90	$5,038,642,795.90	$10,077,285,591.80
Industrial	1,248	$1,426,158,321.90	$2,139,237,482.85	$3,565,395,804.75
Residential	41,816	$4,143,939,530.60	$2,071,969,765.30	$6,215,909,295.90
Total	**50,686**	**$10,608,744,248.4**	**$9,249,853,644.05**	**$19,858,597,892.45**

Source: Chatham County

F.3.2 Critical Facilities

Table F.11 – Critical Facilities and Infrastructure at Risk

ID	PRIORITY CRITICAL FACILITY NAME	PHYSICAL ADDRESS	LAT	LONG	REASON				
					COG	Life Safety	Debris	Support	Other
S-1	Civic Center	301 W. Oglethorpe Ave	32.0767	-81.097	X	X	X	X	X
S-2	Savannah City Hall	1 East Bay Street	32.0811	-81.0911	X			X	X
S-3	Police Headquarters	201 Habersham Street	32.0753	-81.0888		X			
S-4	Fire Station # 03	121 E. Oglethorpe Ave.	32.07615	-81.090837		X			
S-5	Fire Station # 09	2235 Capital Street	32.063037	-81.052999		X			
S-6	Fire Station # 05	10 W. 33rd Street	32.060935	-81.099584		X			
S-7	Fire Station # 13	11 McKenna Drive	32.138964	-81.226197		X			
S-8	I&D Water	6183 Hwy 21 North	32.1488	-81.1805	X	X	X	X	X
S-9	Radio Tower	1801 Kerry Street	32.0414	-81.0733				X	
S-10	Radio Tower – South	500 Locust Drive, Lot # 55						X	
S-11	DeRenne Station #A1	Southside DeRenne Ave, W of Truman Pkwy	32.0192	-81.0894				X	
S-11	DeRenne Station #A2	Southside DeRenne Ave, W of Truman Pkwy	32.0192	-81.0894				X	
S-11	DeRenne Station #B1	Southside DeRenne Ave, W of Truman Pkwy	32.0192	-81.0894				X	
S-11	DeRenne Station #B2	Southside DeRenne Ave, W of Truman Pkwy	32.0192	-81.0894				X	
S-11	DeRenne House	Southside DeRenne Ave, W of Truman Pkwy	32.0192	-81.0894				X	
S-12	Montgomery Xroads #01	End of Madrid Ave, E of Waters Ave	31.995	-81.1006				X	
S-12	Montgomery Xroads #02	End of Madrid Ave, E of Waters Ave	31.995	-81.1006				X	
S-12	Montgomery Xroads House	End of Madrid Ave, E of Waters Ave	31.995	-81.1006				X	
S-13	Springfield Station #01	Oglethorpe and Canal St, foot of Talmadge Bridge	32.0811	-81.1034				X	
S-13	Springfield Station #02	Oglethorpe and Canal St, foot of Talmadge Bridge	32.0811	-81.1034				X	

ID	PRIORITY CRITICAL FACILITY NAME	PHYSICAL ADDRESS	LAT	LONG	REASON				
					COG	Life Safety	Debris	Support	Other
S-13	Springfield Station #03	Oglethorpe and Canal St, foot of Talmadge Bridge	32.0811	-81.1034				X	
S-13	Springfield Station House	Oglethorpe and Canal St, foot of Talmadge Bridge	32.0811	-81.1034				X	
S-14	Kayton Station #01	President St, NE corner of WQC Plant Complex	32.0754	-81.0671				X	
S-14	Kayton Station #02	President St, NE corner of WQC Plant Complex	32.0754	-81.0671				X	
S-14	Kayton Station #03	President St, NE corner of WQC Plant Complex	32.0754	-81.0671				X	
S-15	Fell Street Station #01	E Lathrop near GPA Gate and Colonial Oil	32.097	-81.1169				X	
S-15	Fell Street Station #02	E Lathrop near GPA Gate and Colonial Oil	32.097	-81.1169				X	
S-16	Lathrop St Station #01	Southside of Lathrop Ave, next to NW Precinct	32.097	-81.1173				X	
S-16	Lathrop St Station #02	Southside of Lathrop Ave, next to NW Precinct	32.097	-81.1173				X	
S-17	Crossroads Treatment	125-A Gulfstream Rd	32.1475	-81.1887				X	
S-18	President Street Plant WPCP	1400 E President St	32.0734	-81.0691				X	
S-19	Lift Station #16	11015 Largo Drive	31.9898	-81.1455				X	
S-20	Georgetown Treatment Plant	14 Beaver Run Road	31.9829	-81.2322				X	
S-21	Lift Station # 148	400 Airways Ave	32.1377	-81.2276				X	
S-22	Lift Station #149	Agate Drive//I-95 Savannah Airport Drive	32.1304	-81.2112				X	
S-23	Lift Station #040	End of Mikell Ave, 400 Airways Ave	32.1129	-81.1876				X	
S-24	Lift Station #115	Chatham Pkwy behind Southern Oaks	32.0607	-81.1616				X	
S-25	Lift Station #116	1000 Chatham Pkwy at Hwy 17	32.0677	-81.1622				X	
S-26	Lift Station #023	Louisville Rd and 121 W. Boundary Street	32.081	-81.1071				X	
S-27	Lift Station #065	Agonic Road and Eisenhower Driver	32.0133	-81.0893				X	

ID	PRIORITY CRITICAL FACILITY NAME	PHYSICAL ADDRESS	LAT	LONG	REASON				
					COG	Life Safety	Debris	Support	Other
S-28	Lift Station #064	Bee Road and Frost Drive	32.0605	-81.0733				X	
S-29	Lift Station #083	11705 Mercy Blvd	31.9846	-81.1532				X	
S-30	Lift Station #063	2212 Elgin Street	32.0629	-81.0611				X	
S-31	Lift Station #134	Wedgefield Crossing at 415 Southbridge	32.0656	-81.2141				X	
S-32	Lift Station #21	River Street and Lincoln Street	32.0805	-81.0855				X	
S-33	Well #05	Whitaker Street and Park Ave	32.0805	-81.0981				X	
S-34	Well #08	Edgewood Road and Pierpoint Ave	32.0569	-81.0677				X	
S-35	Well #10	Augusta Ave and Old West Lathrop Ave	32.0906	-81.1304				X	
S-36	Well #11	Pennsylvania Ave and Harrison Street	32.0644	-81.0597				X	
S-37	Well #29	Barksdale Drive and Red Fox Drive	31.908	-81.2275				X	
S-38	Police Training	3104 Edwin Street	32.0317	-81.0659		X			
S-39	Police Precinct – Central	1512 Bull Street	32.034	-81.0555		X			
S-40	Police Precinct – Eastside	2250 E. Victory Drive	32.038007	-81.057918		X			
S-41	Police Precinct – Northwest	602 E. Lathrop Ave	32.086875	-81.111045		X			
S-42	Police Precinct – Southside	7804 Abercorn Street, Unit 5	32.002938	-81.116729		X			
S-43	Police Professional Standards	5313 Paulsen Street	32.0134	-81.0551					
S-44	Police Savannah Impacts	1700 Drayton Street	32.0336	-81.0552					
S-45	Police Traffic Operations	38th and Bull Street	32.0336	-81.0551					
S-46	Fire Station #01	535 E. 63rd Street	32.032475	-81.095528		X			
S-47	Fire Station #02	5 Skyline Drive	31.988369	-81.128215		X			
S-48	Fire Station #04	2402 Augusta Ave	32.090298	-81.130037		X			
S-49	Fire Station #06	3000 Liberty Pkwy	32.054249	-81.135266		X			
S-50	Fire Station #07	6902 Sallie Mood Drive	32.004098	-81.089936		X			
S-51	Fire Station #08	2824 Bee Road	32.044086	-81.076982		X			
S-52	Fire Station #10	13710 Coffee Bluff Road	31.955712	-81.143024		X			
S-53	Fire Station #11	11844 Apache Road	31.988547	-81.165949		X			
S-54	Fire Station #12	6053-A Ogeechee Road	31.994501	-81.264669		X			
S-55	Fire Station #14	480 Highlands Drive	32.181892	-81.247947		X			

ID	PRIORITY CRITICAL FACILITY NAME	PHYSICAL ADDRESS	LAT	LONG	REASON				
					COG	Life Safety	Debris	Support	Other
S-56	Fire Station #15	1751 Grove Point Road	31.989518	-81.227086		X			
S-57	Fire Marshalls	10 W. 33rd Street	32.061003	-81.099471		X			
S-58	Savannah Morning News	1375 Chatham Pkwy	32.074543	-81.161614	X				
S-59	Fire Training Center	380 Agonic Road	32.010812	-81.09017					
S-46	Fire Station #01	535 E. 63rd Street	32.032475	-81.095528		**X**			
S-47	Fire Station #02	5 Skyline Drive	31.988369	-81.128215		**X**			
S-58	Savannah Morning News	1375 Chatham Pkwy	32.074543	-81.161614	X				
S-59	Fire Training Center	380 Agonic Road	32.010812	-81.09017					

Source: Chatham County

F.4 RISK ASSESSMENT

This section contains a hazard profile and vulnerability assessment for those hazards that were rated with a higher priority for the City of Savannah than for Chatham County as a whole. Risk and vulnerability findings are also presented here for those hazards that are spatially defined and have variations in risk that could be evaluated quantitatively on a jurisdictional level. The hazards included in this section are: Flood and Wildfire.

F.4.1 Flood

Over 40 percent of the City of Savannah falls within the mapped 1%-annual-chance floodplains. Figure F.12 reflects the mapped flood hazard zones for the City of Savannah, and Figure F.13 displays the depth of flooding estimated to occur in these areas during the 1%-annual-chance flood. The data in this risk assessment is based off FEMA's 2014 DFIRM. Minor changes have since been made and the updated 2018 DFIRM can be seen in Figure F.4 for comparison.

Properties at risk are detailed by flood zone in Table F.12 below. Parcel data was used to assess how many buildings are located in hazard areas based on each parcel's centroid.

Table F.12 – Properties at Risk by Flood Zone

Flood Zone	Number of Buildings	Total Building Value
A	79	$102,874,062.00
AE	4,380	$977,223,634.00
AH	1	$135,200.00
VE	70	$7,769,870.00
0.2% Annual Chance Flood Hazard	2,915	$482,755,096.50
X	43,242	$9,038,037,486.00
Total	**50,687**	**$10,608,795,348.50**
SFHA Total	**4,530**	**$1,088,002,766.00**

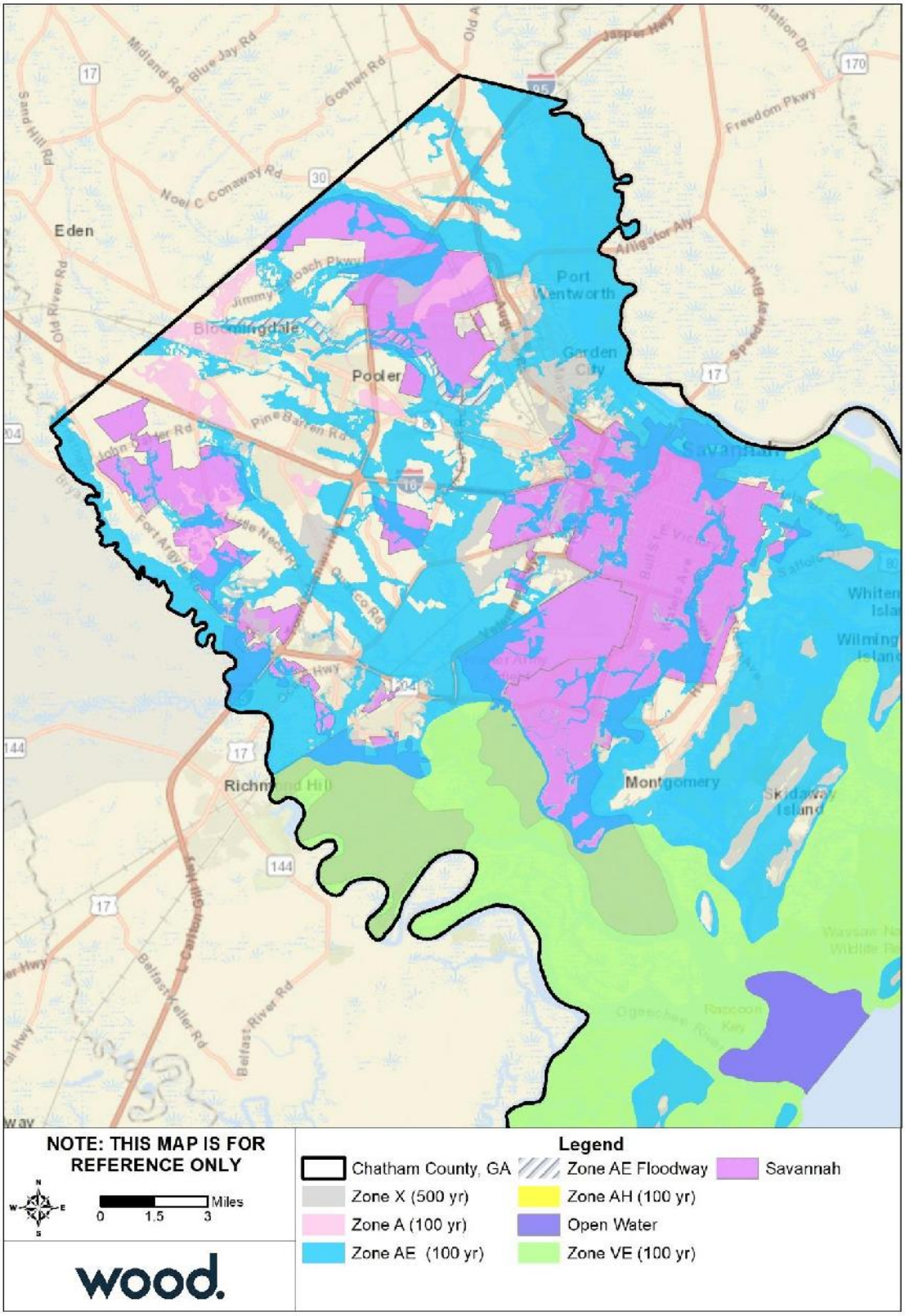
Table F.13 provides building counts and estimated damages by occupancy type for the 1% annual chance flood event.

Table F.13 – Savannah Estimated Building Damage and Content Loss, 1% Annual Chance Flood

Occupancy	Buildings Impacted	Building and Contents Cost	Estimated Building Damages	Estimated Content Damages	Loss Estimate
Commercial	390	$704,081,401.20	$24,834,865.10	$87,917,406.00	16.01%
Industrial	154	$140,893,789.70	$5,974,541.40	$17,406,478.40	16.59%
Residential	2,430	$257,964,776.20	$38,544,070.21	$21,984,663.17	23.46%
Total	**2,974**	**$1,102,939,967.10**	**$69,353,476.71**	**$127,308,547.57**	**17.83%**

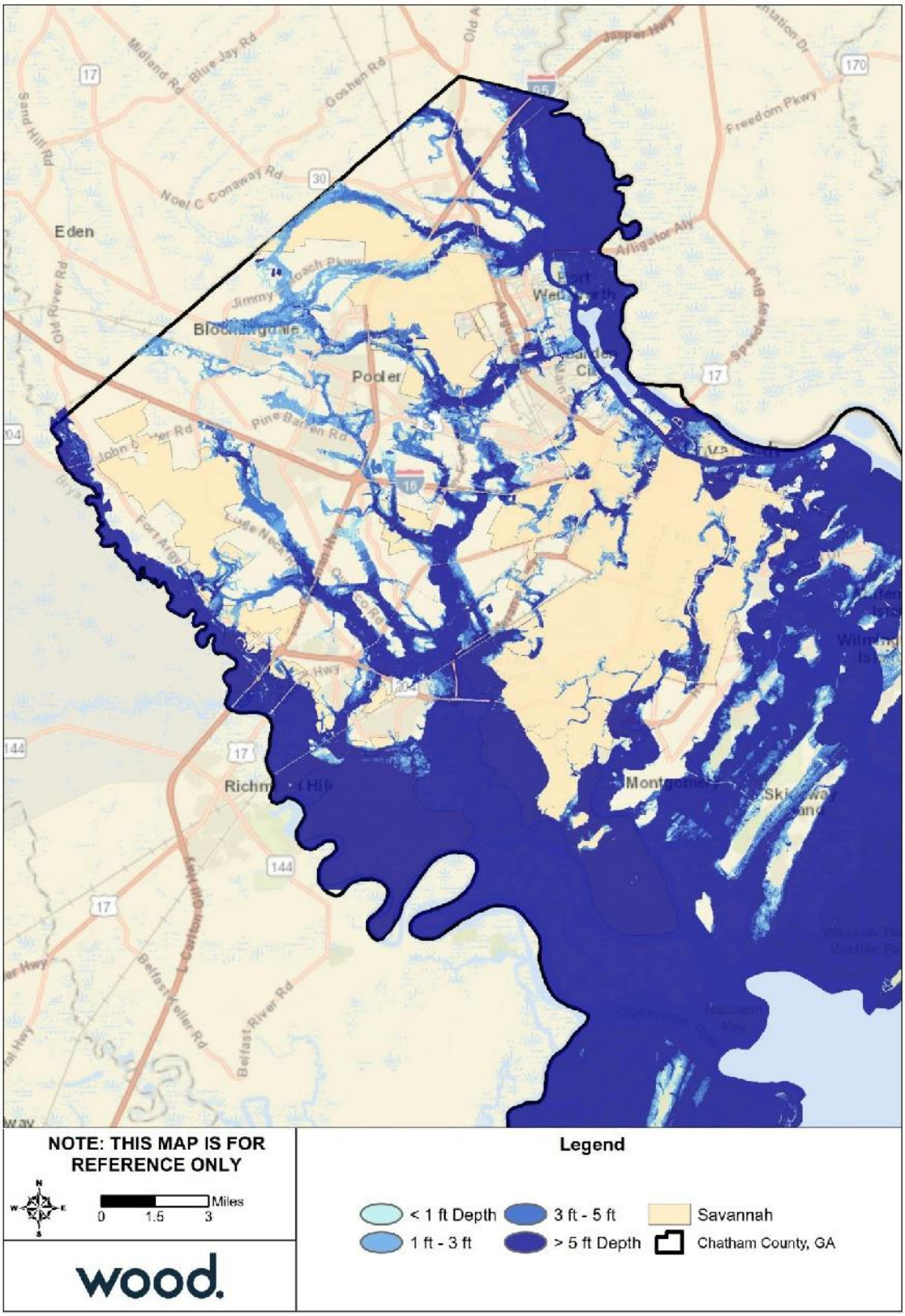
Source: HAZUS

Figure F.12 – FEMA Flood Hazard Areas, City of Savannah



Source: FEMA 2014 DFIRM

Figure F.13 – Flood Depth, 1%-Annual-Chance Floodplain, City of Savannah



Source: FEMA 2014 DFIRM

F.4.2 Wildfire

Table F.14 summarizes the acreage in the City of Savannah that falls within the Wildland Urban Interface (WUI), categorized by housing density. Areas in the WUI are those where development may intermix with flammable vegetation. Approximately 55 percent of Savannah is not included in the WUI.

Table F.14 – Wildland Urban Interface Acreage, City of Savannah

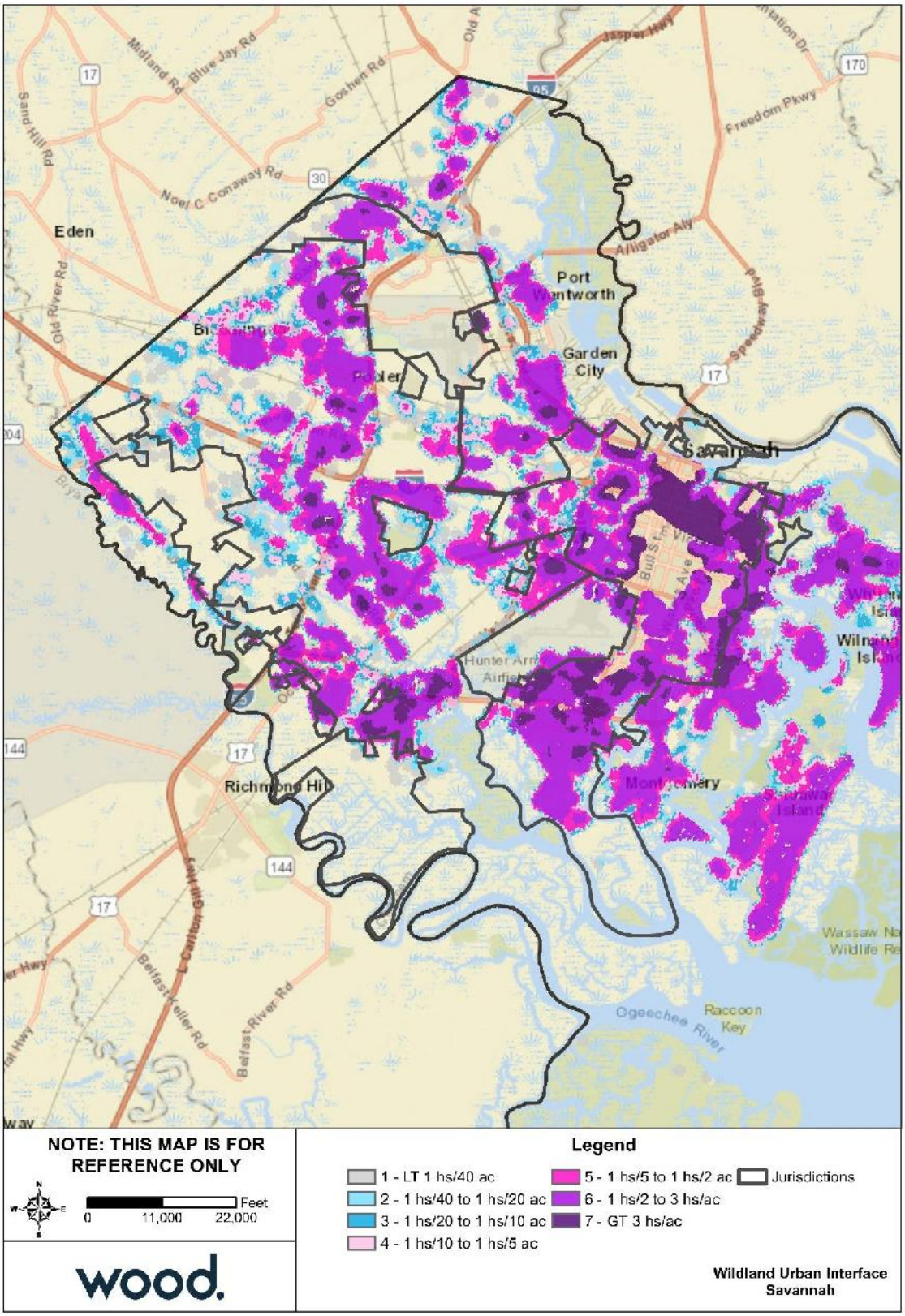
	Housing Density	Total Acreage	Percent of Total Acreage
	Not in WUI	*38,443.0*	*55.3*
	LT 1hs/40ac	3,956.7	5.7
	1hs/40ac to 1hs/20ac	1,454.0	2.1
	1hs/20ac to 1hs/10ac	1,631.3	2.3
	1hs/10ac to 1hs/5ac	2,065.0	3.0
	1hs/5ac to 1hs/2ac	3,641.9	5.2
	1hs/2ac to 3hs/1ac	12,520.0	18.0
	GT 3hs/1ac	5,788.2	8.3
	Total	**69500.1**	

Source: Southern Wildfire Risk Assessment

Figure F.14 depicts the WUI for the City of Savannah. The WUI is the area where housing development is built near or among areas of vegetation that may be prone to wildfire. Figure F.15 depicts the Fire Intensity Scale, which indicates the potential severity of fire based on fuel loads, topography, and other factors. Figure F.16 depicts Burn Probability based on landscape conditions, percentile weather, historical ignition patterns, and historical prevention and suppression efforts.

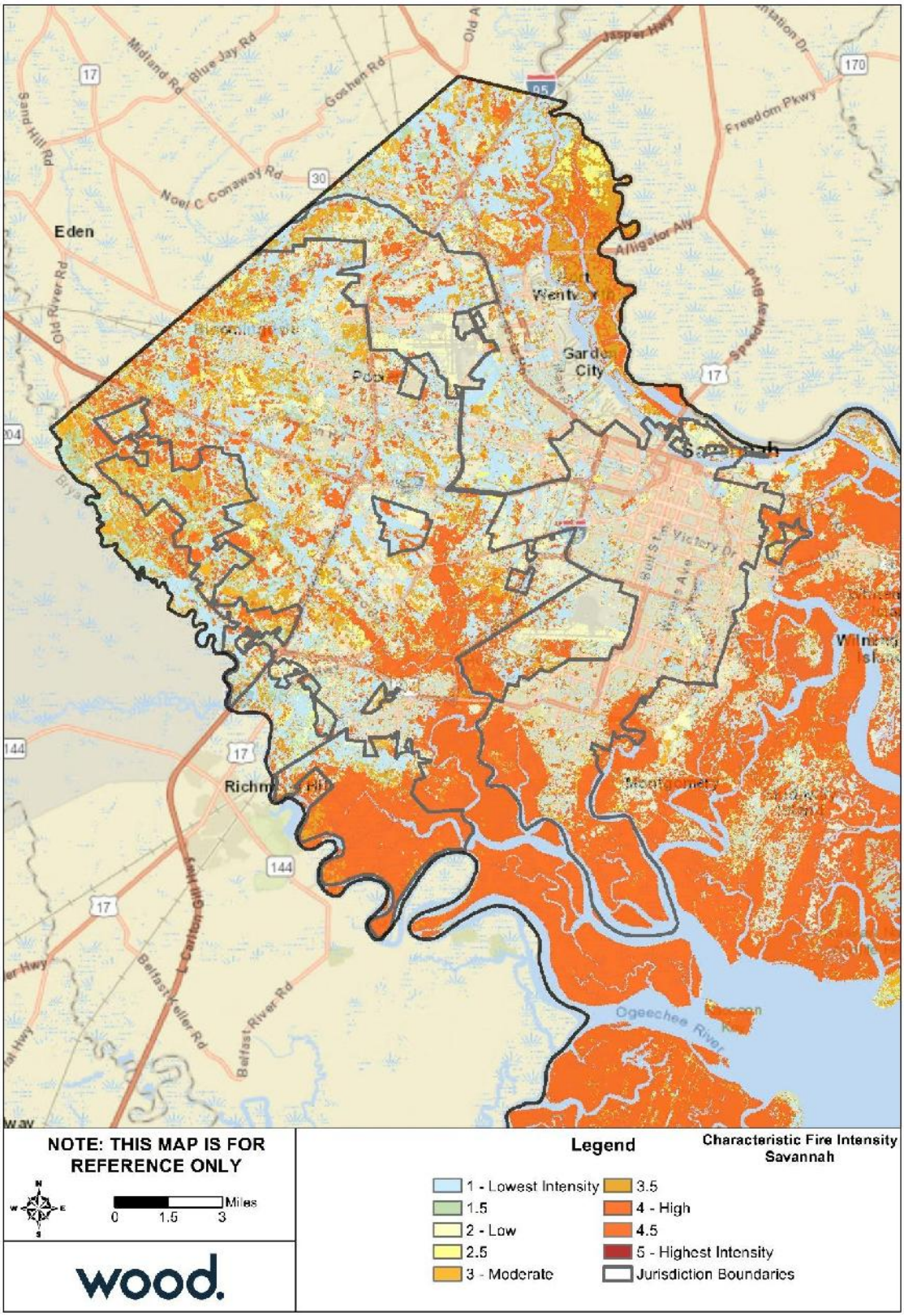
Potential fire intensity is highest in southern and western Savannah; however, these areas are outside of the WUI, meaning little to no development would be exposed. While northwestern Savannah has lower burn probability, southwestern areas have relatively high burn probabilities.

Figure F.14 – Wildland Urban Interface, City of Savannah



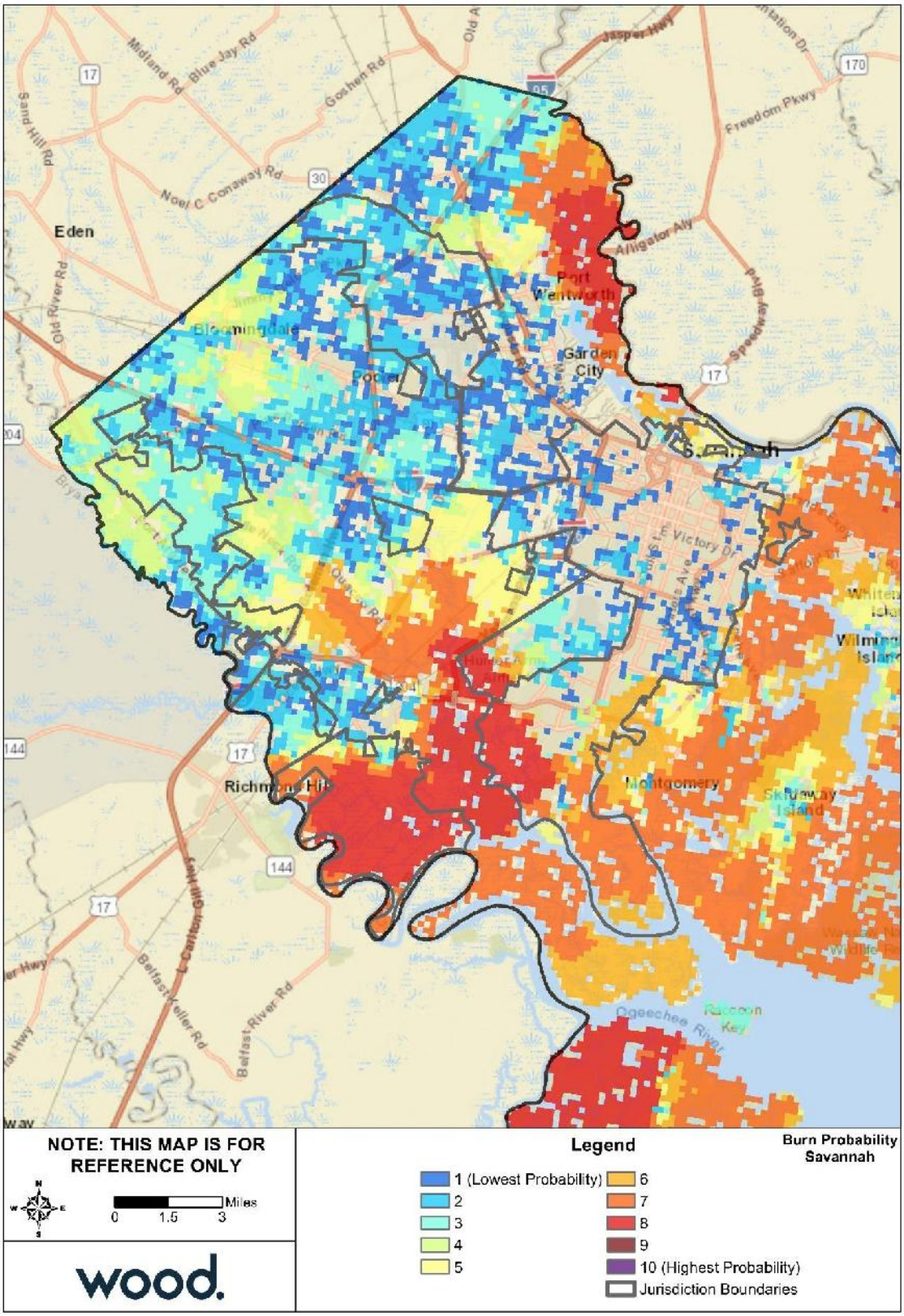
Source: Southern Wildfire Risk Assessment

Figure F.15 – Fire Intensity Scale, City of Savannah



Source: Southern Wildfire Risk Assessment

Figure F.16 – Burn Probability, City of Savannah



Source: Southern Wildfire Risk Assessment

F.5 FLOODPLAIN MANAGEMENT CAPABILITY ASSESSMENT

The City of Savannah joined the NFIP emergency program in 1970 and has been a regular participant in the NFIP since May 1971. The following tables reflect NFIP policy and claims data for the City categorized by structure type, flood zone, Pre-FIRM and Post-FIRM. Zones with no policies or closed paid losses were left out of the tables below.

Table F.15 – NFIP Policy and Claims Data by Structure Type

Structure Type	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
Single Family	5,388	$2,687,600	$1,435,620,600	1,556	$23,781,164.37
2-4 Family	218	$93,485	$54,881,500	53	$1,172,265.71
All Other Residential	630	$215,174	$125,157,100	61	$3,943,152.64
Non Residential	556	$1,073,650	$277,775,000	94	$3,668,693.83
Total	**6,792**	**$4,069,909**	**$1,893,434,200**	**1,764**	**$32,565,276.55**

Source: FEMA Community Information System, accessed September 2019

Table F.16 – NFIP Policy and Claims Data by Flood Zone

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	1,997	$1,853,005	$474,854,300	720	$14,850,085.26
A Zones	6	$12,220	$1,847,500	20	$300,310.89
AH Zones	2	$655	$415,000	0	$0.00
V01-30 & VE Zones	2	$3,746	$266,300	14	$870,659.95
D Zones	1	$2,120	$224,500	65	$619,082.70
B, C & X Zone					
Standard	478	$343,689	$98,577,700	386	$8,527,709.01
Preferred	4,285	$1,841,874	$1,316,516,000	558	$7,395,313.93
Total	**6,771**	**$4,057,309**	**$1,892,701,300**	**1,763**	**$32,563,161.74**

Source: FEMA Community Information System, accessed September 2019

Table F.17 – NFIP Policy and Claims Data Pre-FIRM

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	863	$1,150,887	$162,798,900	558	$10,633,451.99
A Zones	1	$1,632	$80,000	20	$300,310.89
V01-30 & VE Zones	2	$3,746	$266,300	13	$869,852.92
D Zones	0	$0	$0	63	$498,346.91
B, C & X Zone	2,529	$1,105,647	$753,644,700	685	$9,703,668.09
Standard	120	$143,231	$34,128,700	293	$4,946,804.99
Preferred	2,409	$962,416	$719,516,000	392	$4,756,863.10
Total	**3,395**	**$2,261,912**	**$916,789,900**	**1,339**	**$22,005,630.80**

Source: FEMA Community Information System, accessed September 2019

Table F.18 – NFIP Policy and Claims Data Post-FIRM

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	1,134	$702,118	$312,055,400	162	$4,216,633.27
A Zones	5	$10,588	$1,767,500	0	$0.00
AH Zones	2	$655	$415,000	0	$0.00
V01-30 & VE Zones	0	$0	$0	1	$807.03
D Zones	1	$2,120	$224,500	2	$120,735.79
B, C & X Zone	2,234	$1,079,916	$661,449,000	258	$6,208,351.35
Standard	358	$200,458	$64,449,000	92	$3,569,900.52
Preferred	1,876	$879,458	$597,000,000	166	$2,638,450.83
Total	**3,376**	**$1,795,397**	**$975,911,400**	**423**	**$10,546,527.44**

Source: FEMA Community Information System, accessed September 2019

F.6 MITIGATION STRATEGY

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Lead Agency / Department	Potential Funding Source	Implementation Timeline	2020 Status	2020 Implementation Status Comments
Prevention									
P-1	Modify Flood Damage Prevention Ordinance (FDPO) to include LiMWA criteria.	Flood	1.2	High	City Development Services	City Operating Budget	2020	Carried Forward	Under review. FDPO has been reviewed by City attorney. Awaiting final Local Flood Study decision
P-2	Study potential storm surge effects on cemeteries	Storm Surge	3.2	Moderate	Cemeteries	Local funds (CIP); estimated cost $30,000	2024	Carried Forward	No progress as funds are not available locally at this time. Funding for this project is expected to be available in 2024.
P-3	2019: Update the CRS Flood Mitigation Plan (FMP 510), Repetitive Loss Area Analysis (RLAA) and Natural Floodplain Functions Plan	Flood	1.3 & 3.1	High	City Development Services	FEMA Pre-Disaster Mitigation Grant; estimated cost $50,000	2020	New	Sending out a RFP to complete the work.
P-4	Acquire, elevate or mitigate properties prone to flooding	Flood	3.1	High	City Development Services	HMGP	2025	New	
P-5	Relocate fiber cable supporting all City facilities to below ground	All	1.1	Moderate	Public Works	TBD	2025	New	
Property Protection									
PP-1	Coordinate with the Chatham County Resource Protection Commission (RPC) to acquire lands vulnerable to flooding through SPLOST funds and other grant opportunities.	Flood	1.2 & 3.1	Moderate	Development Services	SPLOST Funding	2023	Carried Forward	Waiting for info from Tom McDonald
PP-2	Harden roof, windows, doors, and/or rooftop units for critical facilities	Tornado, Thunderstorm, Hurricane, High Winds	1.1	Low	Civic Center	PDM, HMGP	2025	Carried Forward	Revised. Mitigation actions for the Civic Center should remain on the list as the new arena isn't built yet. This should not be addressed until the City decides what the fate of the Civic Center is. Low priority.
PP-3	Install signage in train trestle area at Anderson Street to indicate water depth	Flood	3.1	Moderate	Mobility Services	HMGP	2021-2022	Carried Forward	This needs to be amended to Henry Street, not Anderson Street per Stephen Henry at Mobility Services and Tom McDonald at Development Services. Need to identify a more appropriate lead agency for signage.
PP-4	Elevate or dry flood proof components or systems vulnerable to flood damage	Flood	1.1	High	Public Works	TBD	2020	New	
Structural Projects									
SP-1	Construct and/or improve drainage systems to alleviate drainage issues	Flood	3.1	Moderate	Stormwater Department	City SPLOST funding	2016	Carried Forward	Revised from: Drainage Project at Luisville Road and Hwy 17. 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, and Placentia basin. Notes from existing list: "Let's plan to add the following in accordance with the information provided by Roger and the request by the CM for projects in the 5th District: 51st between Hopkins and Edwin St, Champion St and Tumor St, Upson and Vassar St, Springfield South Basin Hydraulic Modeling, Widening of the Springfield Canal and expansion of the existing Pump Station in Springfield North Basin (existing Springfield Stormwater pump station under the Talmadge Bridge)."
Emergency Services									
ES-1	Emergency power to Wells, Lift Stations and Pumps (portable generators). Estimated size ranges from 60 kw and 100 kw	All	1.1	High	Public Works	HMGP, General Fund	2022	Carried Forward	NEW POST-MATTHEW: Various sites across the city to include both water wells and lift stations. Citywide implementation approx. 240 lift stations and 50 water wells. Approximate down time due to Matthew was 96 hours.
ES-2	Portable generators for fixed critical facilities	All	4.1	High	Public Works	HMGP, General Fund	2022	New	
ES-3	Purchase and install generator quick connects and transfer switches for critical facilities	All	1.1	High	Public Works	HMGP, General Fund	2022	New	

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Lead Agency / Department	Potential Funding Source	Implementation Timeline	2020 Status	2020 Implementation Status Comments
Public Education and Awareness									
PEA-1	Remove building code/insurance disconnect through education of builders/realtors and modification of technical review checklist (cross-check NFIP/Insurance/Ordinance/IBC). Provide documents that clearly display the difference with the 2018 International Building Codes, NFIP 44 CFR, and Local Flood Damage Prevention Ordnance.	Flood	2.2 & 3.1	High	City Development Services	City Operating Budget	2021	Carried Forward	Revised. Need to continue to have open communications with the Development community. Need to ensure smart floodplain construction is relayed to the development community through workshops and information fliers.
PEA-2	Implement FEMA's High Water Mark Initiative	Flood	2.2	Moderate	City Development Services	City Operating Budget	2023	Carried Forward	On 1/10/2016 at the Coastal Georgia CRS User Group meeting in City of Savannah conference room, Lynn Keating of FEMA presented a webinar of FEMA's High Water Mark Initiative. (HWMI). Waiting on personal and funds
PEA-3	Purchase a Ward's® Stormwater Floodplain Simulation System and cargo case.	Flood	2.2	Moderate	City Development Services	PDM; estimated cost $3,000	2021	New	This system helps students understand the critical role that floodplains play in the life of a watershed and the impact of unplanned development and human activity in key areas through innovative hands-on simulations. The City will have the model in the school system and at neighborhood or other community meetings
PEA-4	Provide outreach to vulnerable populations via various outreach methods (print, tv, radio, social media, etc.)	All	2.1 & 2.2	High	City Development Services	TBD	2020	New	

Annex G Town of Thunderbolt

G.1 PLANNING PROCESS

The table below lists the HMPC members who represented the Town of Thunderbolt.

Table G.1 – HMPC Members

Member Name	Title	Agency/Department
Andrew Bateman	Fire Chief	Fire Department
Sean Clayton	Police Chief	Police Department
Molly Sims	Town Clerk	Thunderbolt
Frank Neal	Town Administrator	Thunderbolt
John Henry	Citizen	Thunderbolt

G.2 COMMUNITY PROFILE

G.2.1 Overview of the Community

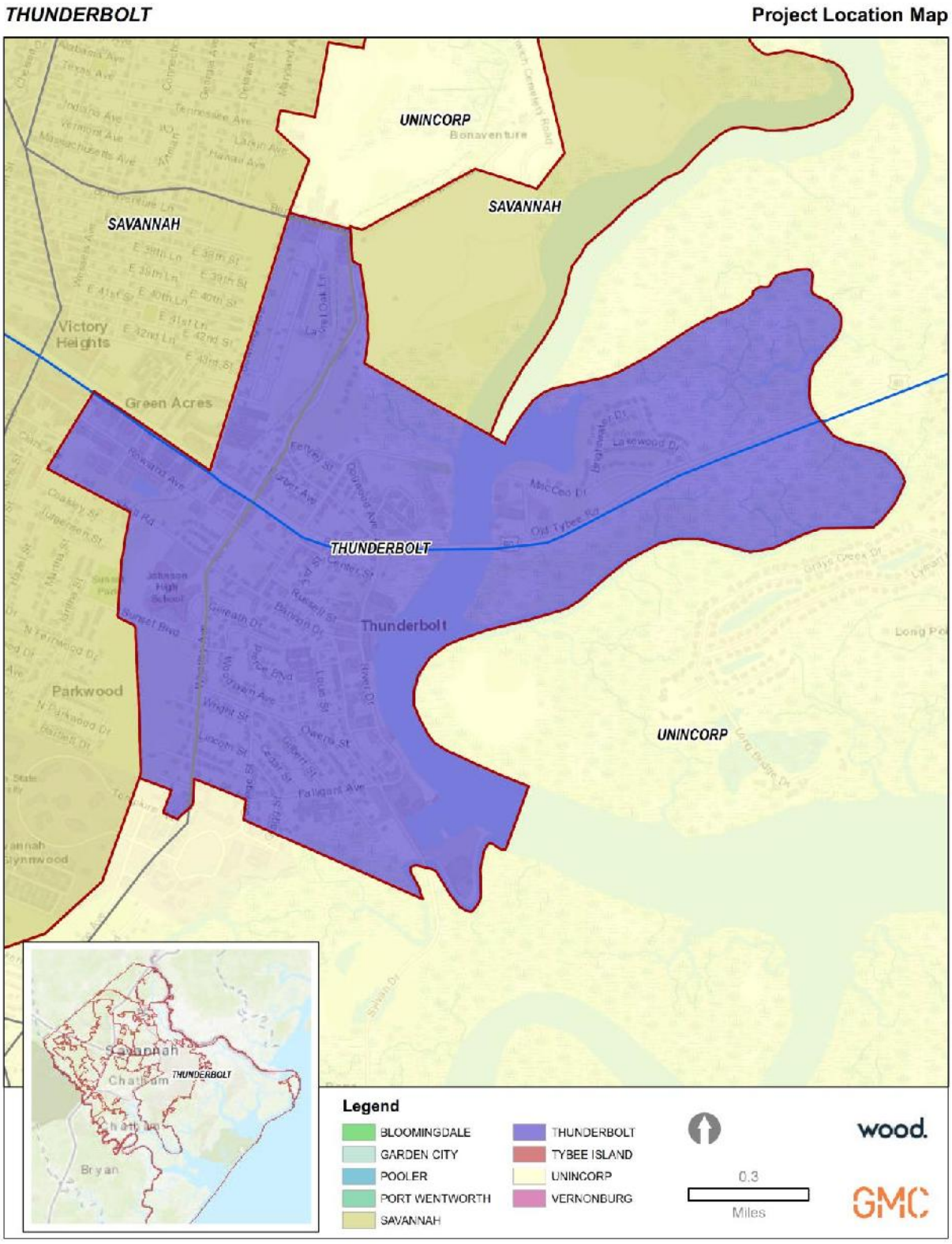
The Town of Thunderbolt is located approximately five miles southeast of downtown Savannah and is bordered to the east by the Wilmington River (part of the intercoastal waterway).

According to the U.S. Census Bureau, Thunderbolt has a total area of 1.5 square miles of which 1.3 square miles (86.7%) is land and 0.2 square miles (3.3%) is water.

According to the U.S. Census Bureau's American Community Survey (ACS) 5-Year Estimates, the town had a total population of 2,637 in 2017. Therefore, the town's average population density is approximately 1,758 people per square mile.

The map below reflects the Town of Thunderbolt boundaries and shows the City's location within the county and in relation to surrounding municipalities.

Figure G.1 – Location Map, Thunderbolt



G.2.2 Geography and Climate

Please refer to Chatham County Community Profile for a summary of climate for Chatham County.

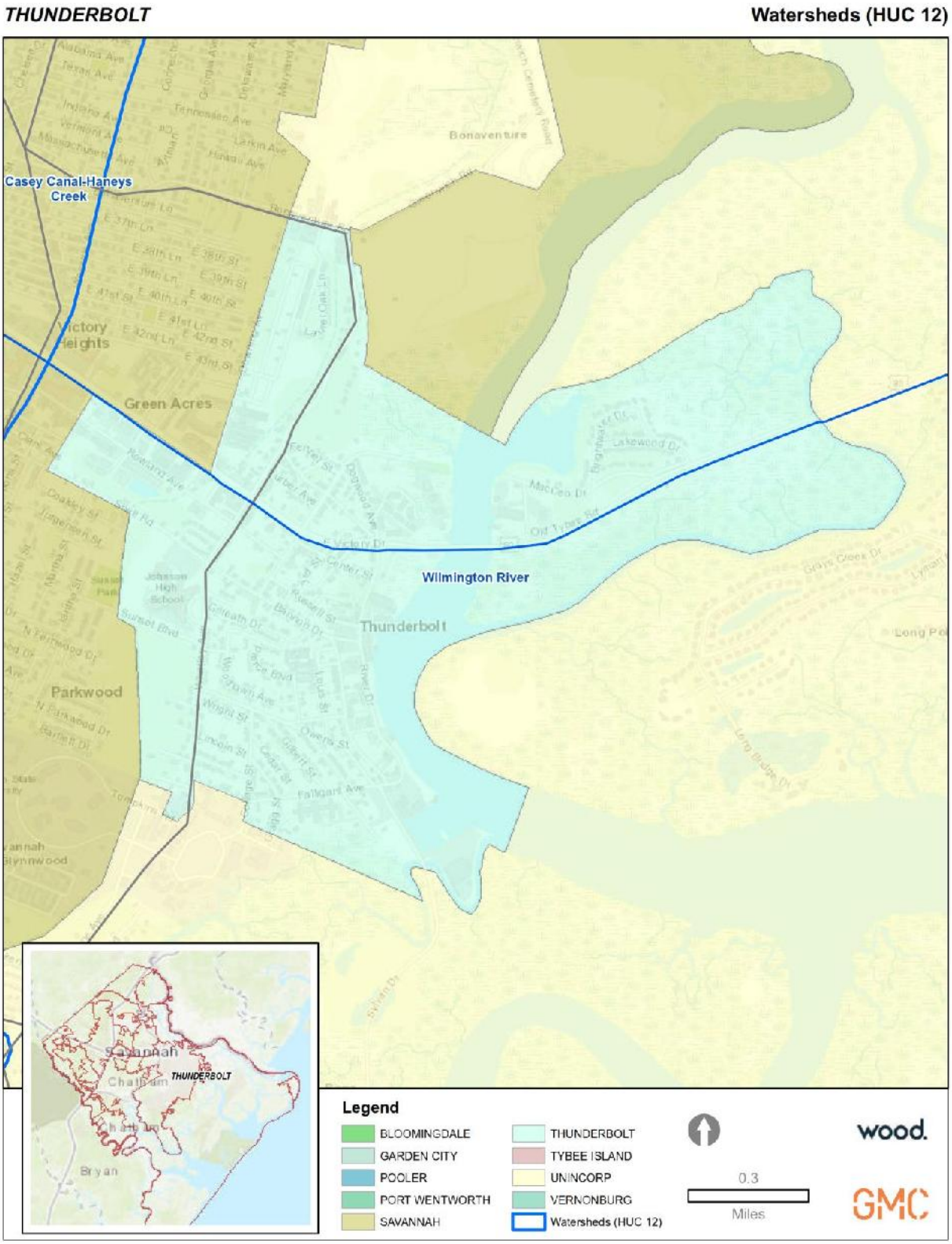
Thunderbolt is located partially within the Casey Canal-Haney's Creek HUC 12 Basin and the Wilmington River HUC-12 Basin.

Table G.2 – HUC 12 Watersheds

HUC 12 Watershed Name	HUC 12 #
Casey Canal – Haney's Creek	030602040101
Wilmington River	030602040302

The figure below illustrates the HUC 12 drainage basins and drainage features in and around Thunderbolt.

Figure G.2 – HUC-12 Drainage Basins, Thunderbolt



G.2.3 Cultural, Historic and Natural Resources

G.2.3.1 Cultural and Historic Resources

The Town of Thunderbolt's Museum is located at the corner of Victory Drive and Mechanics Ave.

The Thunderbolt Senior Citizens' Center is located at 3236 Russell Street and provides local senior citizens a place for fellowship and entertainment.

G.2.3.2 Parks, Preserve, and Conservation

The town of Thunderbolt has three public parks as summarized in the table below.

Table G.3 – Public Parks, Thunderbolt

Name	Amenities	Photo
Nellie Johnson Park	• Swing • Basketball Court • Covered Picnic Area • Slide and playground • Restrooms	
W.E. Honey Park	• Pavilion • Fishing Pier • Playground • Restrooms	
Thomson Park	• Pavilion • Scenic view of Wilmington River	

G.2.3.3 Natural Resources

Floodplains and Flood Zones

FEMA flood zone designations within the Town of Thunderbolt are identified in the figure below. The flood hazard areas shown are designated by the Federal Emergency Management Agency (FEMA) and include: Zone A (subject to inundation by the 1% annual-chance flood event with no base flood elevation (BFE) determined), Zone AE (subject to inundation by the 1% annual-chance flood event with BFE determined), Zone VE (subject to inundation by the 1% annual-chance flood event with additional hazards due to storm waves with BFE determined), and Zone X (Moderate Risk areas outside the 1% and inside the 0.2% annual-chance floodplains with no BFE or base flood depths determined and Minimal Risk areas outside the 0.2% annual chance floodplain).

Table G.4 – Flood Zones, Thunderbolt

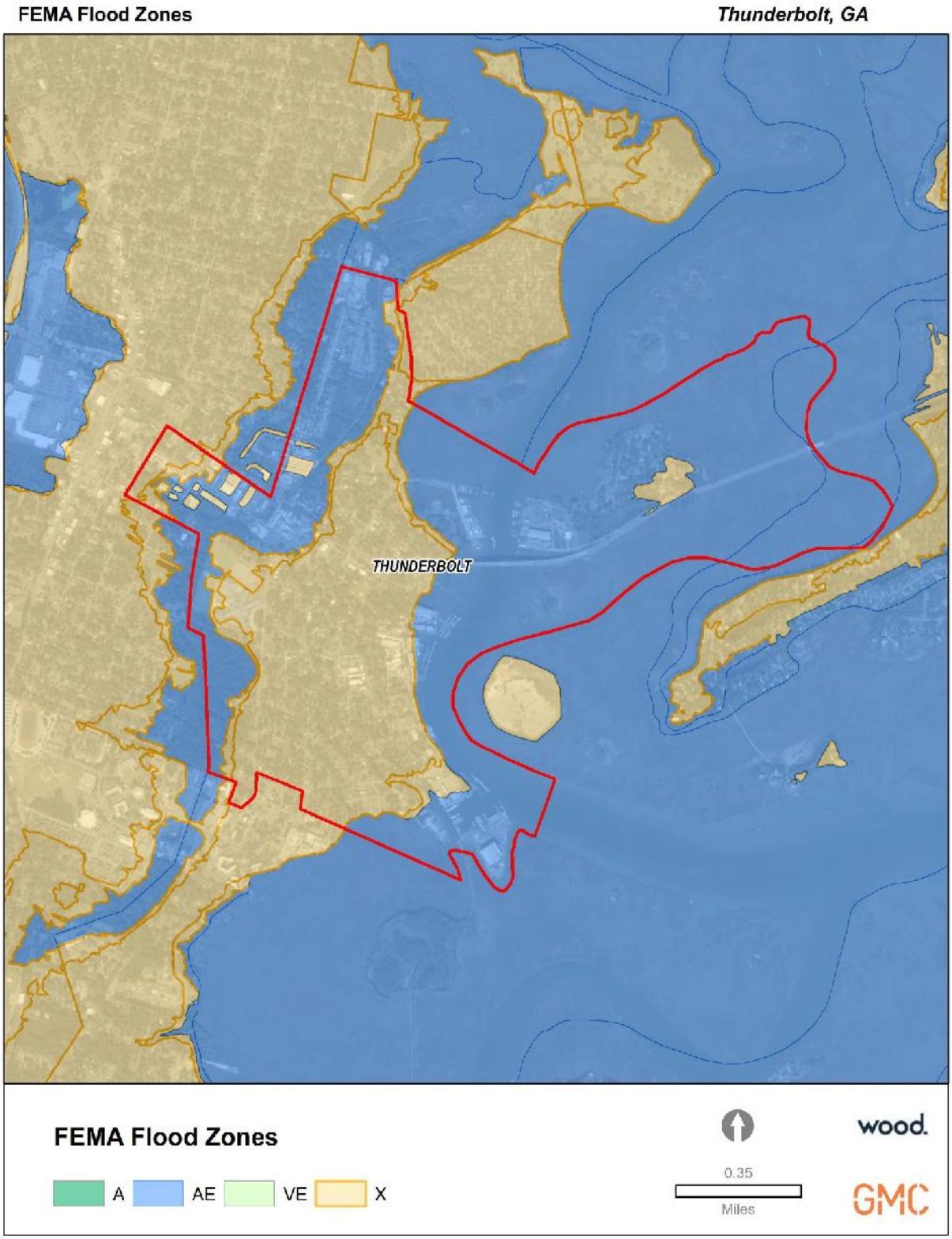
Flood Zone	Area (Acres)	Area (Square Miles)	Percent of City (%)
AE	630	0.98	65.6
X	330	0.52	34.4
TOTAL	**960**	**1.5**	**100.0**

Source: FEMA, 2018

According to the 2018 FEMA data, 630 acres of the land within the Town is located within a 100-year floodplain (Zone AE) which equals 65.6 percent of the City. An additional 330 acres are located within moderate or minimal flood hazard areas (34.4 percent of the City). With nearly 66 percent of the City at high risk to flooding in the Special Flood Hazard Area (SFHA), the City of Town of Thunderbolt should seek ways to balance future development with strategies to preserve sensitive lands and natural drainage features.

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, and the vegetation stabilizes soils during flooding. Natural floodplains in Thunderbolt include wetland areas and low-lying land along the major waterways in and around the Town including the Savannah River. Natural floodplains reduce damage by allowing flood waters to spread out over large areas, aiding infiltration into the ground, reducing flow rates and acting as a flood storage area to reduce downstream peaks. The City should strive to keep floodplain and floodplain waters free of contaminants such as oil, paint, anti-freeze, pesticides, and plastics and other trash. These chemicals and waste materials pollute local waterways, decreasing the water quality that local wildlife and plants depend upon.

Figure G.3 – FEMA Flood Zones, 2018, Thunderbolt



Wetlands

Wetlands benefit the ecosystem by storing, changing, and transmitting surface water and groundwater. Through these processes pollution is removed, nutrients are recycled, groundwater is recharged, and biodiversity is enhanced. Wetland composition varies extensively, with five distinct categories for classification: Estuarine, Lacustrine, Marine, Palustrine, and Riverine systems Based on data from the National Wetland Inventory (NWI) wetlands throughout Thunderbolt are summarized in the Wetland Type table and Wetland Types Map shown below.

Table G.5 – Wetland Types, Thunderbolt

Wetland Type	Area (Acres)	Area (Sq. Miles)	Percent of City
Non-Wetland	530	.8	55.2
Estuarine	400	.6	41.7
Palustrine	29	0.05	3.0
Riverine	1	0.002	0.1
TOTAL	**960**	**1.5**	**100.0**

Source: National Wetland Inventory

The Palustrine System

The Palustrine (freshwater) system includes all non-tidal wetlands dominated by trees, shrubs, persistent emergent plants, emergent mosses or lichens, and all such wetlands that occur in areas where salinity due to ocean-derived salts is below 0.5%. The Palustrine system is bounded by upland.

The Estuarine System

The Estuarine system consists of deep-water tidal habitat and adjacent tidal wetlands that are usually semi-enclosed by land but have open, partly obstructed, or sporadic access to the open ocean, and in which ocean water is at least occasionally diluted by freshwater runoff from the land. The Estuarine system extends (1) upstream and landward to where ocean-derived salts measure less than 0.5% during the period of average annual low flow; (2) to an imaginary line closing the mouth of a river, bay, or sound; and (3) to the seaward limit of emergent wetlands, shrubs, or trees where they are not included in (2). It also includes offshore areas of continuously diluted sea water. It contains two sub-systems: subtidal (where the substrate is continuously submerged) and intertidal (where the substrate is exposed and flooded by tides including the associated splash zone).

The Riverine System

The Riverine system includes all wetlands and deep-water habitats contained within a channel with two exceptions: (1) wetlands dominated by trees, shrubs, emergent vegetation, emergent mosses, or lichens, and (2) habitats with water containing ocean-derived salts in excess of 0.5%. The Riverine system is bounded on the landward side by upland, by the channel bank (including natural and man-made levees), or by wetlands dominated by trees, shrubs, emergent vegetation, emergent mosses, or lichens. In braided streams, the system is bounded by the banks forming the outer limits of the depression within which the braiding occurs.

Figure G.4 – Wetland Types, Thunderbolt

Source: National Wetland Inventory (NWI)

G.2.4 History

The Town of Thunderbolt got its name to a legend of a lightning strike that created a freshwater spring on a bluff overlooking the Wilmington River. Native Americans were found to be among the first inhabitants.

Thunderbolt was a settlement which evolved into a shipping point for local plantation needs which also serviced the river traffic. In 1856, the Town of Thunderbolt was incorporated as Warsaw and then began its history as a processing port for the fishing community. In 1890, Georgia State College was founded for the education of African Americans. This college continues to be a historically black institution and is known today as Savannah State University.

In 1921, Warsaw's name was restored to Thunderbolt and the seafood processing continued to play a large part in this community's development. In 1939, yacht racing became popular and saw the construction of a yacht basin. Annually, the "Blessing of the Fleet" was celebrated until recent years and shrimping evolved into the primary seafood product.

G.2.5 Economy

G.2.5.1 Wages and Employment

Per the 2013-2017 American Community Survey 5-Year Estimates, the median household income for Thunderbolt is $55,227, which is 4.2 percent higher than the state's median household income ($52,977). Approximately 10.5 percent (277) of the population is considered to be living below the poverty level. Moreover, 15.6 (411) percent of people under 18 years of age and 9.5 percent of people 65 years and over are living below the poverty level.

The table below shows employment and unemployment rates along with industry employment by major classification for the Town.

Table G.6 – Employment and Occupation Statistics for Thunderbolt, GA, 2017

Employment Status	Count	Percentage (%)
In labor force	1,474	64.7
Employed	1,387	60.9
Unemployed	76	3.3
Armed Forces	11	0.5
Not in labor force	804	35.3
Occupation		
Management, business, science and arts	562	40.5
Service	189	13.6
Sales and office	287	20.7
Natural resources, construction and maintenance	154	11.1
Production, transportation and material moving	195	14.1

Source: U.S. Census Bureau, 2013-2017 American Community Survey 5-Year Estimates

Major industry sectors in the Town of Thunderbolt include management, business, science, and arts (40.5%) and sales and office (20.7%).

Major employers are discussed in the Chatham County Community Profile.

G.2.6 Housing

According to the 2013-2017 ACS 5-Year Estimates, there are 1,212 housing units in Thunderbolt, of which 88.8 percent (1,076) are occupied. Approximately 55.9% (601) of occupied units are owner-occupied

(44.1% occupied by renters). A high percentage of renters is an indicator of higher pre- and post-disaster vulnerability because, according to Cutter, et al. (2003), renters often do not have the financial resources of homeowners, are more transient, are less likely to have information about or access to recovery aid following a disaster, and are more likely to require temporary shelter following a disaster. Therefore, higher rates of home rentals in Thunderbolt may indicate that residents are not able to implement certain types of mitigation in their homes.

Median home value in Thunderbolt is $179,800. Of the town's owner-occupied housing units, 54.9 percent (330) have a mortgage. Most householders (73.8 percent / 794) moved into their current homes since the year 2000, 24.4 percent (263) moved in between 2000 and 2009, and 33.2 percent (357) moved in between 2010 and 2014. 5.8 percent (62) of occupied housing units have no vehicle available to them, which suggests these residents may have difficulty in the event of an evacuation.

The majority (53.8% / 652) of housing units in Thunderbolt are detached single family homes. However, 9.2 percent (112) of units are mobile homes which can be more vulnerable to certain hazards, such as tornadoes and wind storms, especially if they aren't secured with tie downs.

The town's housing stock is aging, with the majority (88.1% / 1,086) of occupied housing built before 2000. The table below details housing age in the town.

Table G.7 – Housing Age, Thunderbolt

Year Structure Built	Percent of Occupied Housing	Number of Structures
2014 or later	2.0	24
2010 to 2013	0.0	0
2000 to 2009	9.9	120
1980 to 1999	34.1	414
1960 to 1979	26.4	320
1940 to 1959	21.7	262
1939 or earlier	5.9	72

Source: U.S. Census Bureau, American Community Survey 2017

Age can indicate the potential vulnerability of a structure to certain hazards. For example, the Town of Thunderbolt first entered the National Flood Insurance Program in 1987. Therefore, based on housing age estimates at least 68 percent of housing in the town was built before any floodplain development restrictions were required.

G.2.7 Population

According to the U.S. Census Bureau, Thunderbolt had an estimated population of 2,739 residents in 2017 and a population of 2,680 at the time of the 2010 U.S. Census (2.2% increase from 2010-2017). As of 2017, Thunderbolts' population density was 196 persons per square mile. The table below provides demographic profile data from the 2017 American Community Survey 5-Year Estimates.

Table G.8 – Town of Thunderbolt Demographic Profile Data, 2017

Demographic	Thunderbolt
Gender/Age	
Male	1,242
Female	1,395
Under 5 Years	161
65 Years and Over	531
Race/Ethnicity (One Race)	
White	1,600
Black or African American	879
American Indian/Alaska Native	0
Asian	70
Two or More Races	36
Hispanic or Latino[1]	121
Education	
High School Graduate or Higher	446
Bachelor's Degree or Higher	488

Source: U.S. Census Bureau, 2013-2017 American Community Survey 5-Year Estimates
[1]Hispanics may be of any race, so also are included in applicable race categories.

G.2.8 Land Use

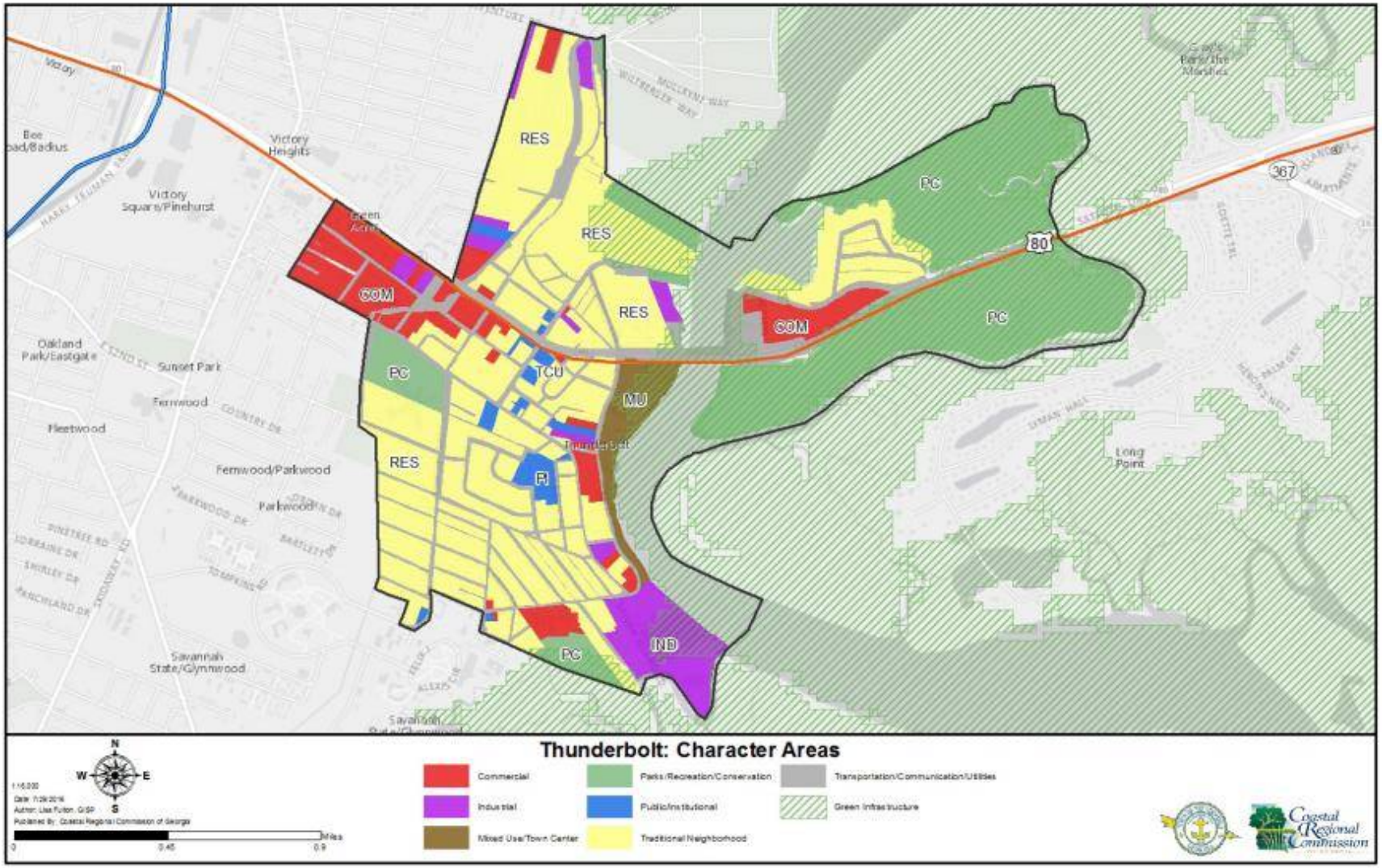
The Town of Thunderbolt's Comprehensive Plan 2016-2036 (Comp Plan) establishes Character Areas to guide future development and includes a Future Land Use Map.

G.2.8.1 Character Areas

The Character Areas established by the City's Comp Plan include those listed below and shown in the Character Area Map.

- Traditional Neighborhood: Eclectic mix ranging from a mobile homme park to luxury waterfront condominiums and including single-family homes, small townhome developments, apartment complexes, and large condominium developments.
- Commercial: Located primarily along Victory Drive but are interspersed throughout the town which is true to the village nature of the town.
- Mixed-Use/Town Center: To create a vibrant mixed-use district along River Ddrive in the area commonly perceived as "Main Street" Thunderbolt.
- Industrial: Intended to retain and expand the maritime industry in Thunderbolt.
- Transportation/Communications/Utilities: Specific use of providing utility easements and the transportation network throughout the town.
- Public/Institutional: Sets aside land for public and institutional uses including churches, schools, town hall, museum, police station, fire station, and library.
- Parks/Recreation/Conservation: Parks with active and passive recreation, green spaces, and conservation areas.

Figure G.5 – Character Area Map, Thunderbolt



G.2.8.2 Future Land Use

The Town of Thunderbolt has the following Future Land Use Categories as shown in the Future Land Use Map below:

Residential: Predominately single-family and multi-family homes and makes up the largest land use category within Thunderbolt.

Commercial: Commercial corridors are found in highly trafficked areas such as Victory Drive and River Drive.

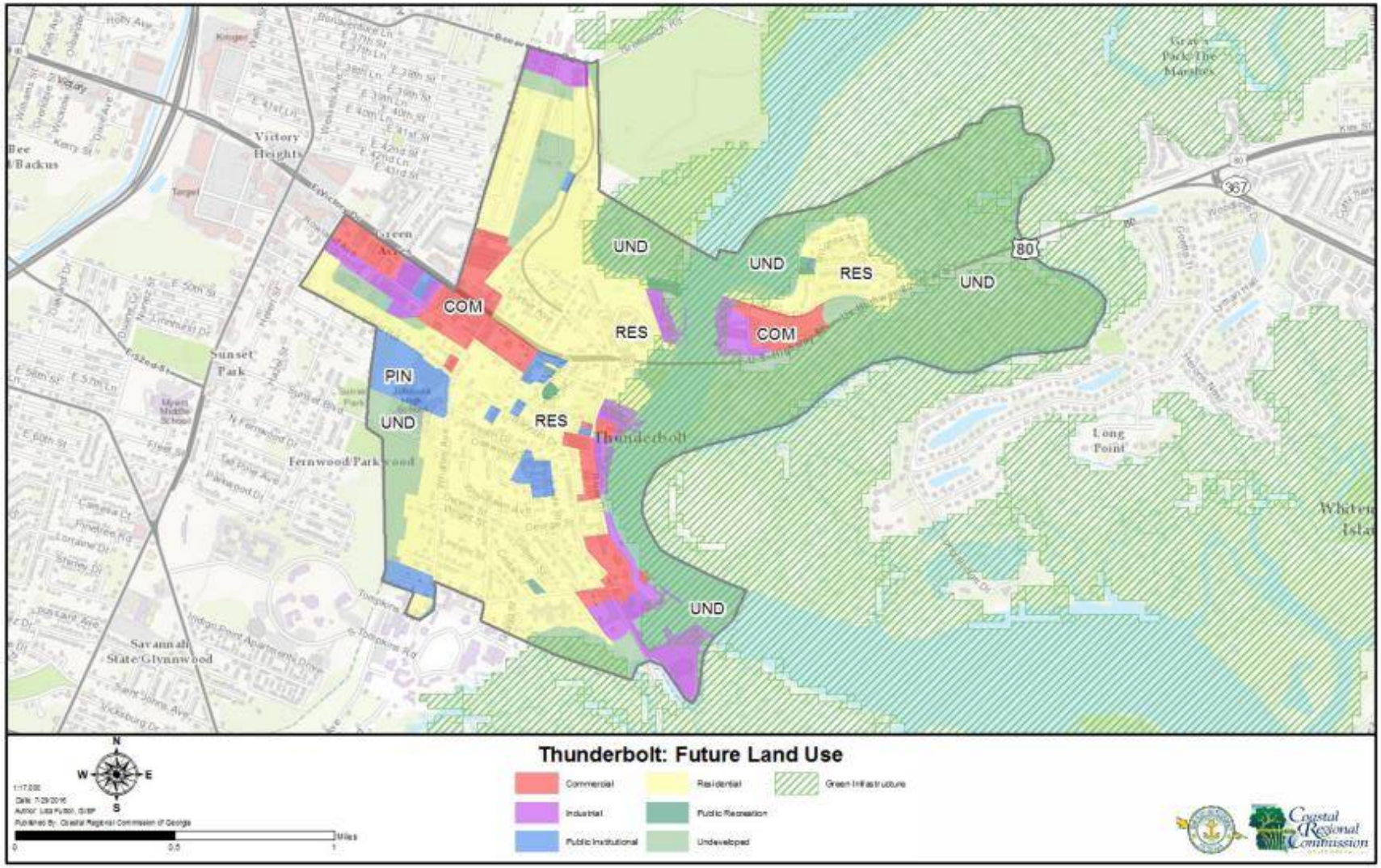
Industrial: Located primarily along Victory Drive and adjacent to the Wilmington River serving the maritime related industries.

Public/Institutional: Located throughout the community and include town hall, police and fire, schools, churches, and the library.

Public Recreation: Passive and active recreation throughout the community.

Undeveloped: Thunderbolt has a few areas of undeveloped land that may be developed in the future or reserved as conservation areas.

Figure G.6 – Future Land Use Map, Thunderbolt

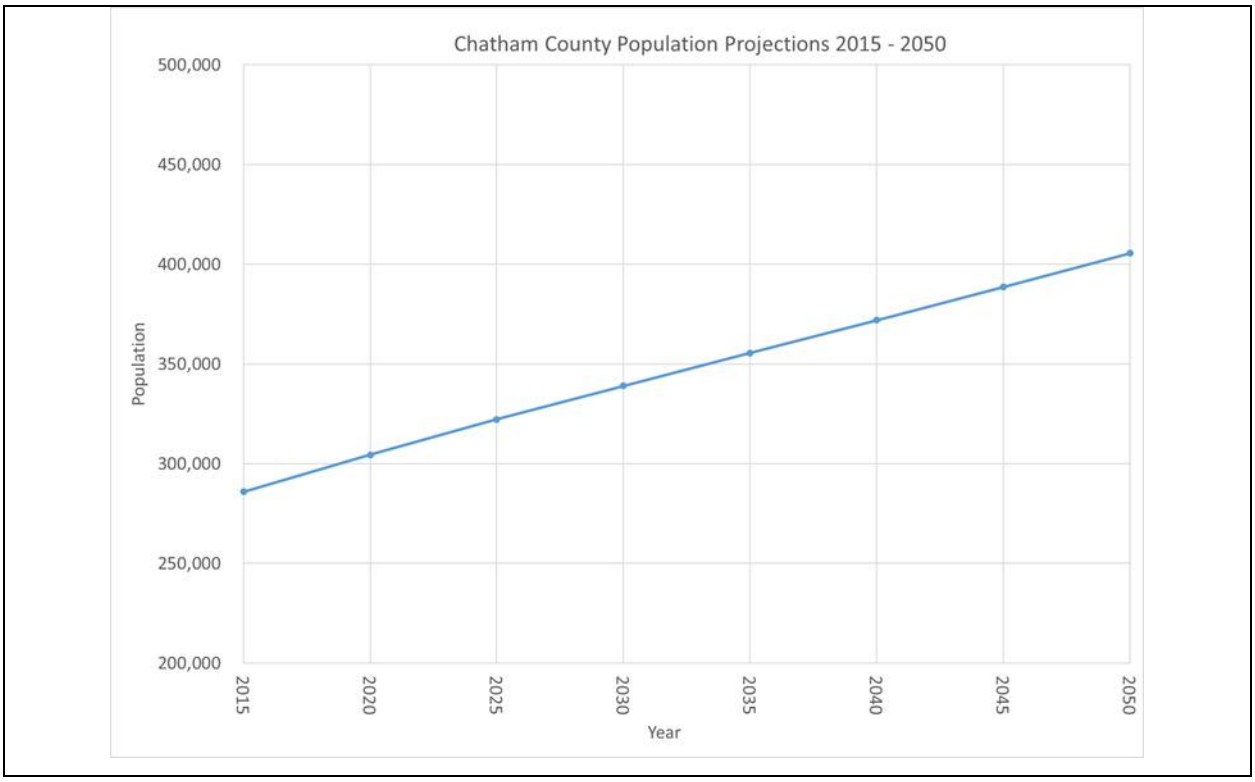


G.2.9 Growth and Development Trends

According to U.S. Census and American Community Survey population estimates, Thunderbolt's population has decreased slightly from 2,668 in 2010 to 2,637 in 2017.

According to the Georgia Governor's Office of Planning and Budget (GOPB), Chatham County is projected to reach a population of 405,573 by 2050, which represents a 38% increase from the 2017 population. The population projections from the GOPB estimate the annual growth for the County to be about 1.1% through 2050.

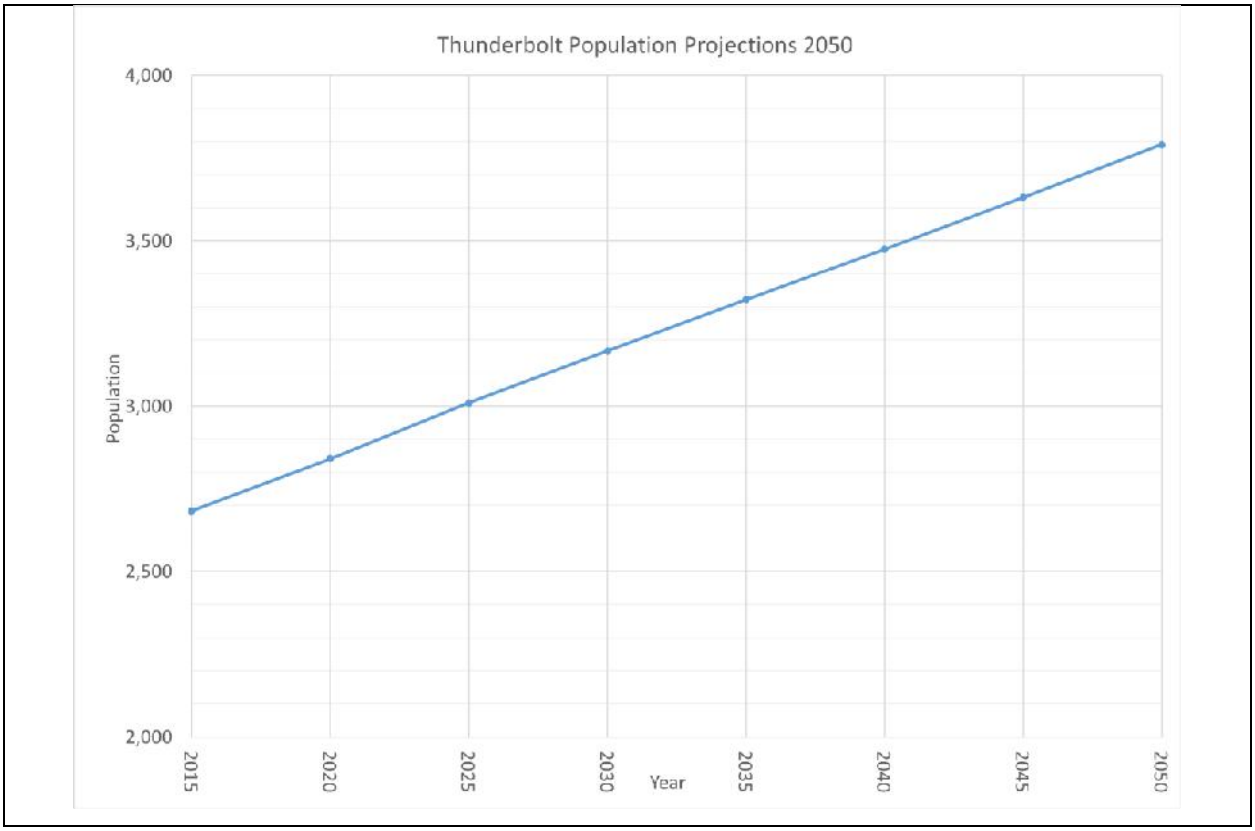
Figure G.7 – Population Projections for Chatham County 2015 – 2050



Source: Georgia Governor's Office of Planning and Budget

Using the projected growth rate for the County, the population of Thunderbolt would increase to 3,791 by 2050 as shown in the graph below.

Figure G.8 – Population Projections for Thunderbolt 2015 – 2050



G.3 ASSET INVENTORY

G.3.1 Property

Table G.9 – Town of Thunderbolt Building Exposure

Occupancy Type	Total Number of Buildings	Total Building Value	Estimated Content Value	Total Value
Commercial	281	$56,094,105.00	$56,094,105.00	$112,188,210.00
Industrial	33	$4,067,300.00	$6,100,950.00	$10,168,250.00
Residential	821	$80,392,456.00	$40,196,228.00	$120,588,684.00
Total	1135	$140,553,861.00	$102,391,283.00	$242,945,144.00

Source: Chatham County

G.3.2 Critical Facilities

Table G.10 – Critical Facilities and Infrastructure at Risk

ID	PRIORITY CRITICAL FACILITY NAME	PHYSICAL ADDRESS	LAT	LONG	REASON				
					COG	Life Safety	Debris	Support	Other
TB-1	Thunderbolt City Hall	2821 River Dr.	32.0313	-81.0509	X				
TB-2	Thunderbolt Police Dept.	2821 River Dr.	32.0313	-81.0509		X			
TB-3	Thunderbolt Fire Dept.	2702 Mechanics Ave.	32.0339	-81.0531		X			
TB-4	Thunderbolt Public Works Dept.	Downing Ave.	32.0456	-81.0533			X		
TB-5	Lift Station	Downing Ave.	32.0387	-81.0561				X	
TB-6	Well #3	Center St.	32.0337	-81.0526				X	
TB-7	Lift Station	Robertson	32.0255	-81.0514				X	
TB-8	Lift Station	Mechanics Ave.	32.037	-81.0485				X	
TB-9	Downing St. Well	Downing Ave.	32.0456	-81.0561					

Source: Chatham County

G.4 RISK ASSESSMENT

This section contains a hazard profile and vulnerability assessment for those hazards that were rated with a higher priority for the Town of Thunderbolt than for Chatham County as a whole. Risk and vulnerability findings are also presented here for those hazards that are spatially defined and have variations in risk that could be evaluated quantitatively on a jurisdictional level. The hazards included in this section are: Flood and Wildfire.

G.4.1 Flood

Approximately 65 percent of the Town falls within the mapped 1%-annual-chance floodplains. Figure G.9 reflects the mapped flood hazard zones for the Town of Thunderbolt, and Figure G.10 displays the depth of flooding estimated to occur in these areas during the 1%-annual-chance flood. The data in this risk assessment is based off FEMA's 2014 DFIRM. Minor changes have since been made and the updated 2018 DFIRM can be seen in Figure G.3 for comparison.

Properties at risk are detailed by flood zone in Table G.11, below. Parcel data was used to assess how many buildings are located in hazard areas based on each parcel's centroid.

Table G.11 – Properties at Risk by Flood Zone

Flood Zone	Number of Buildings	Total Building Value
AE	388	$54,503,105.60
0.2% Annual Chance Flood Hazard	22	$6,216,130.00
X	725	$79,834,625.30
Total	**1,135**	**$140,553,860.90**
SFHA Total	**388**	**$54,503,105.60**

Source: FEMA 2014 DFIRM & Chatham County parcel and building footprint data, 2019

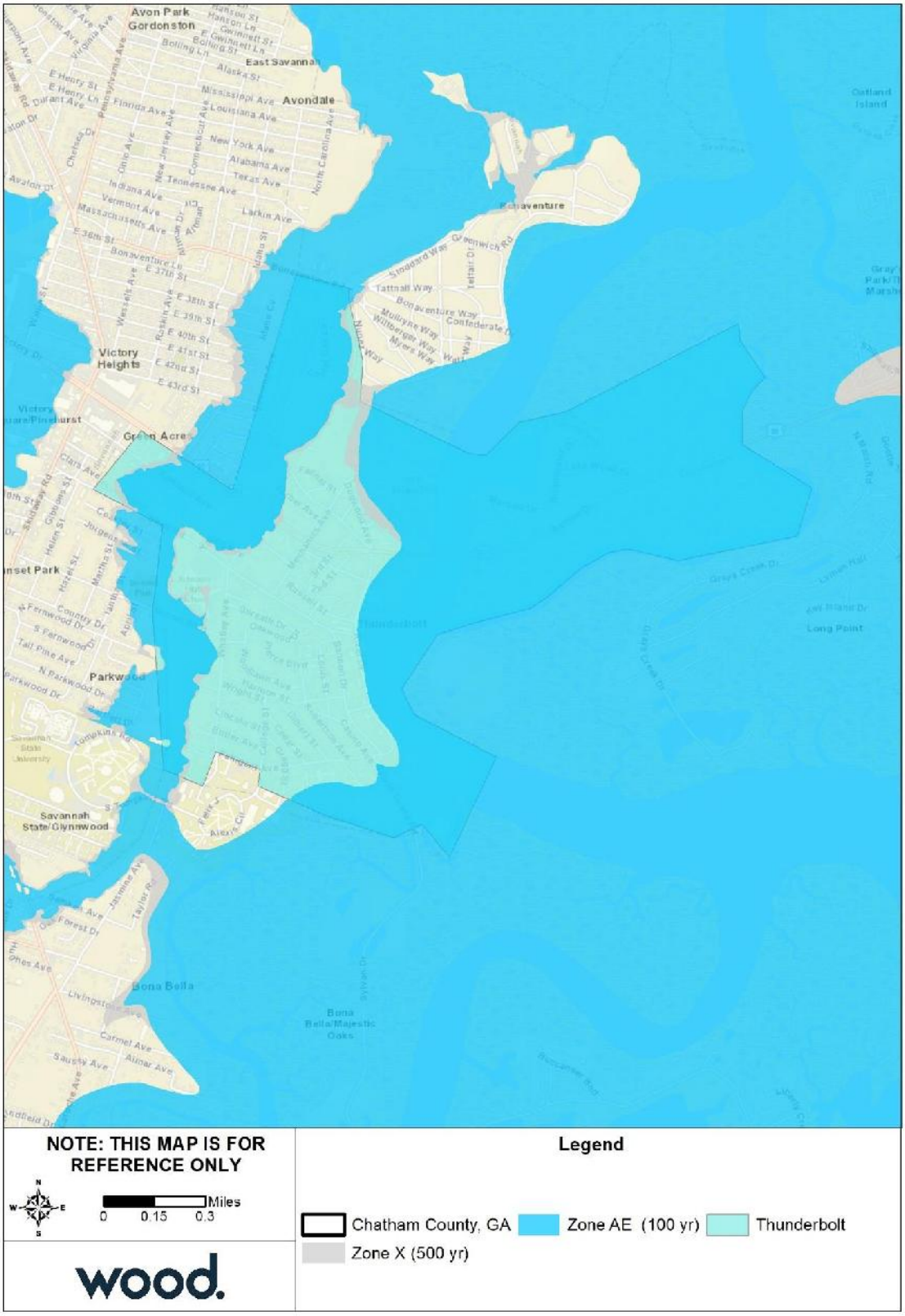
Table G.12 provides building counts and estimated damages by occupancy type for the 1% annual chance flood event.

Table G.12 – Thunderbolt Estimated Building Damage and Content Loss, 1% Annual Chance Flood

Occupancy	Buildings Impacted	Building and Contents Cost	Estimated Building Damages	Estimated Content Damages	Loss Estimate
Commercial	214	$52,321,843.08	$2,799,100.52	$9,091,790.48	22.73%
Industrial	18	$4,125,500.00	$179,425.97	$528,379.87	17.16%
Residential	105	$19,666,837.50	$3,506,816.97	$1,974,688.74	27.87%
Total	**337**	**$76,114,180.58**	**$6,485,343.46**	**$11,594,859.08**	**23.75%**

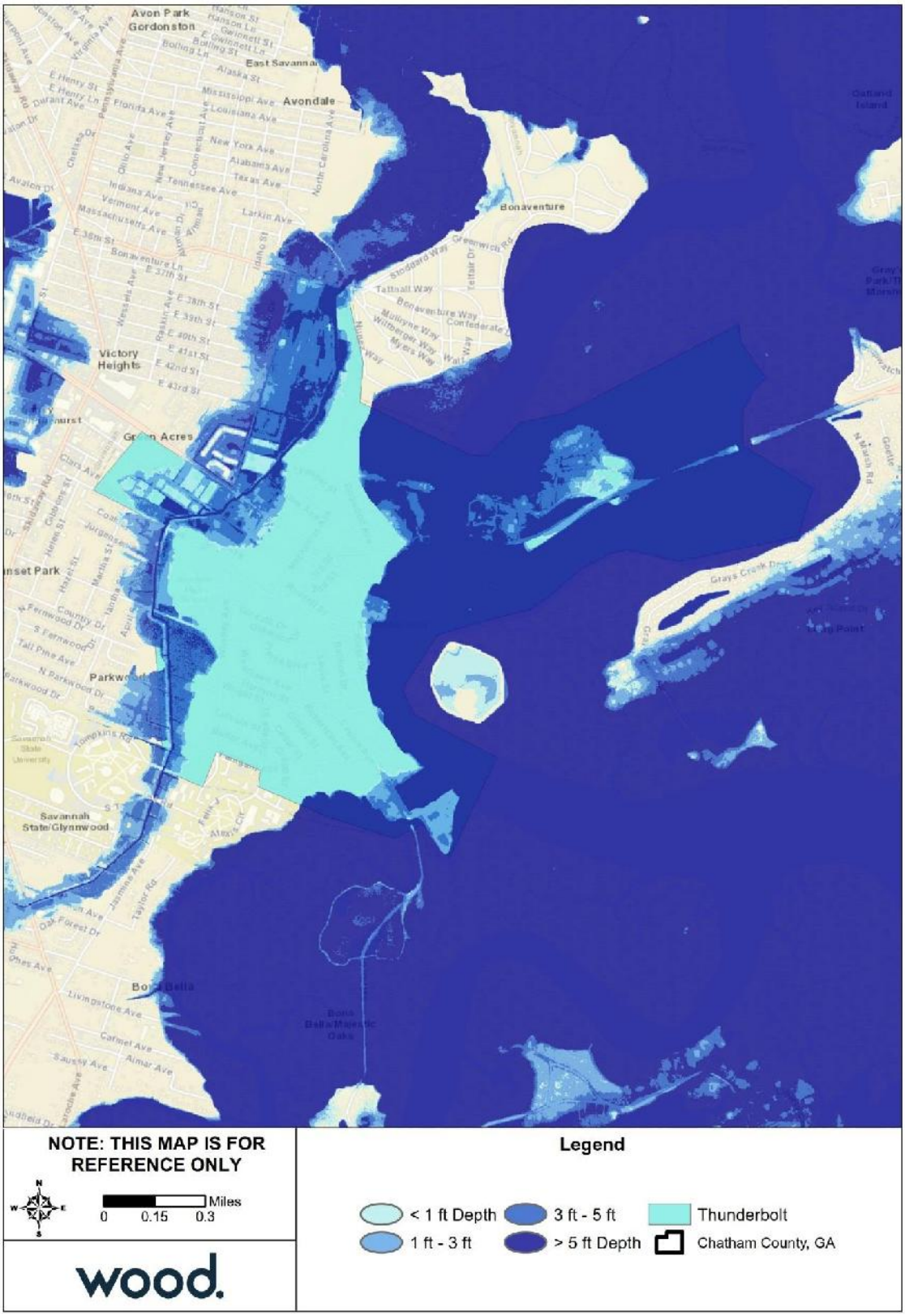
Source: HAZUS

Figure G.9 – FEMA Flood Hazard Areas, Town of Thunderbolt



Source: FEMA 2014 DFIRM

Figure G.10 – Flood Depth, 1%-Annual-Chance Floodplain, Town of Thunderbolt



Source: FEMA 2014 DFIRM

G.4.2 Wildfire

Table G.13 summarizes the acreage in the Town of Thunderbolt that falls within the Wildland Urban Interface (WUI), categorized by housing density. Areas in the WUI are those where development may intermix with flammable vegetation. Over 20 percent of the Town is not included in the WUI.

Table G.13 – Wildland Urban Interface Acreage, Town of Thunderbolt

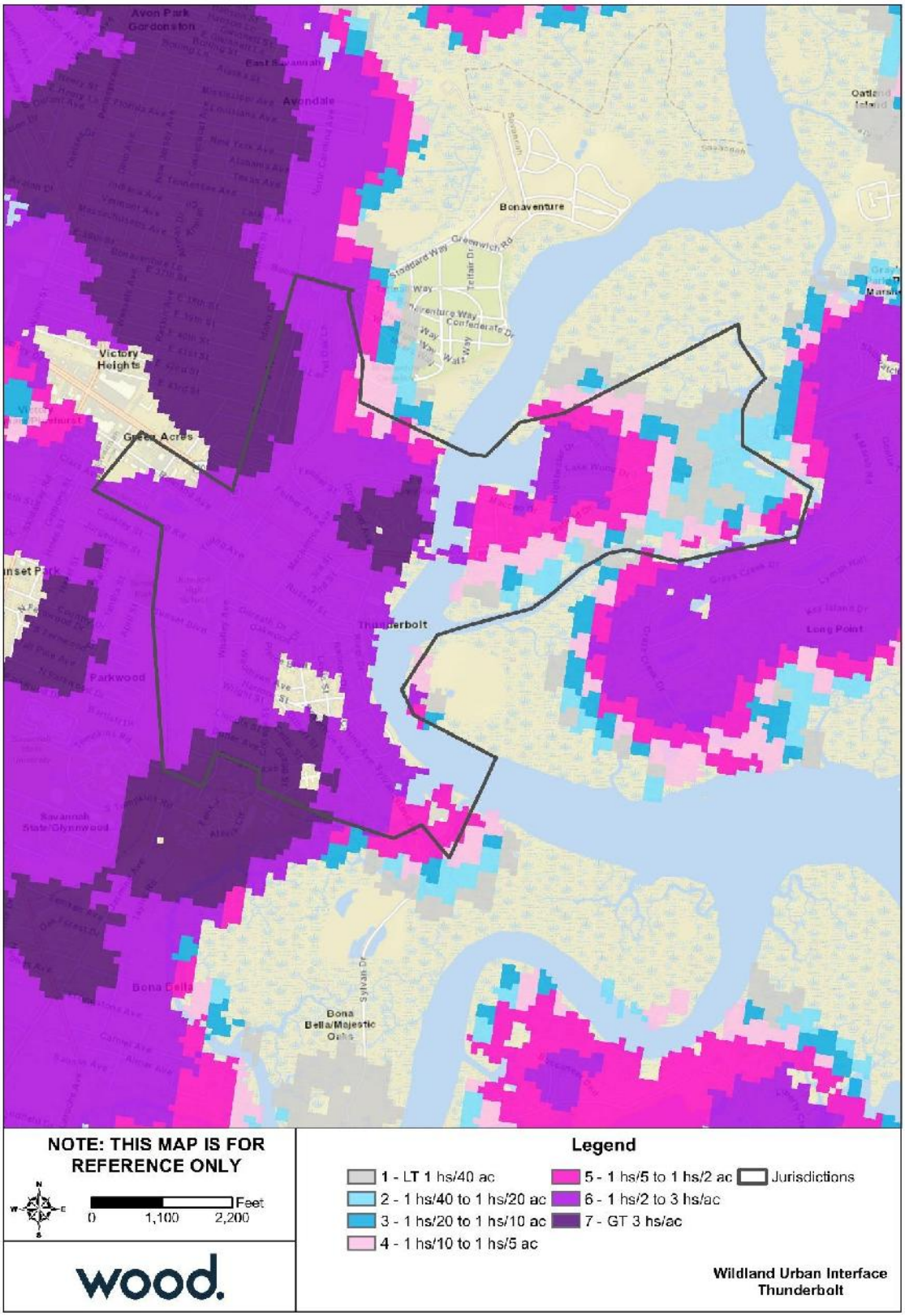
	Housing Density	Total Acreage	Percent of Total Acreage
	Not in WUI	*211.7*	*20.7*
	LT 1hs/40ac	41.1	4.0
	1hs/40ac to 1hs/20ac	38.6	3.8
	1hs/20ac to 1hs/10ac	14.0	1.4
	1hs/10ac to 1hs/5ac	54.3	5.3
	1hs/5ac to 1hs/2ac	89.8	8.8
	1hs/2ac to 3hs/1ac	469.7	46.0
	GT 3hs/1ac	101.0	9.9
	Total	**1,020.1**	

Source: Southern Wildfire Risk Assessment

Figure G.11 depicts the WUI for the Town of Thunderbolt. The WUI is the area where housing development is built near or among areas of vegetation that may be prone to wildfire. Figure G.12 depicts the Fire Intensity Scale, which indicates the potential severity of fire based on fuel loads, topography, and other factors. Figure G.13 depicts Burn Probability based on landscape conditions, percentile weather, historical ignition patterns, and historical prevention and suppression efforts.

Exposure to wildfire is greatest in eastern Thunderbolt, where high potential fire intensity and relatively high burn probabilities coincide with lower density areas of the WUI.

Figure G.11 – Wildland Urban Interface, Town of Thunderbolt

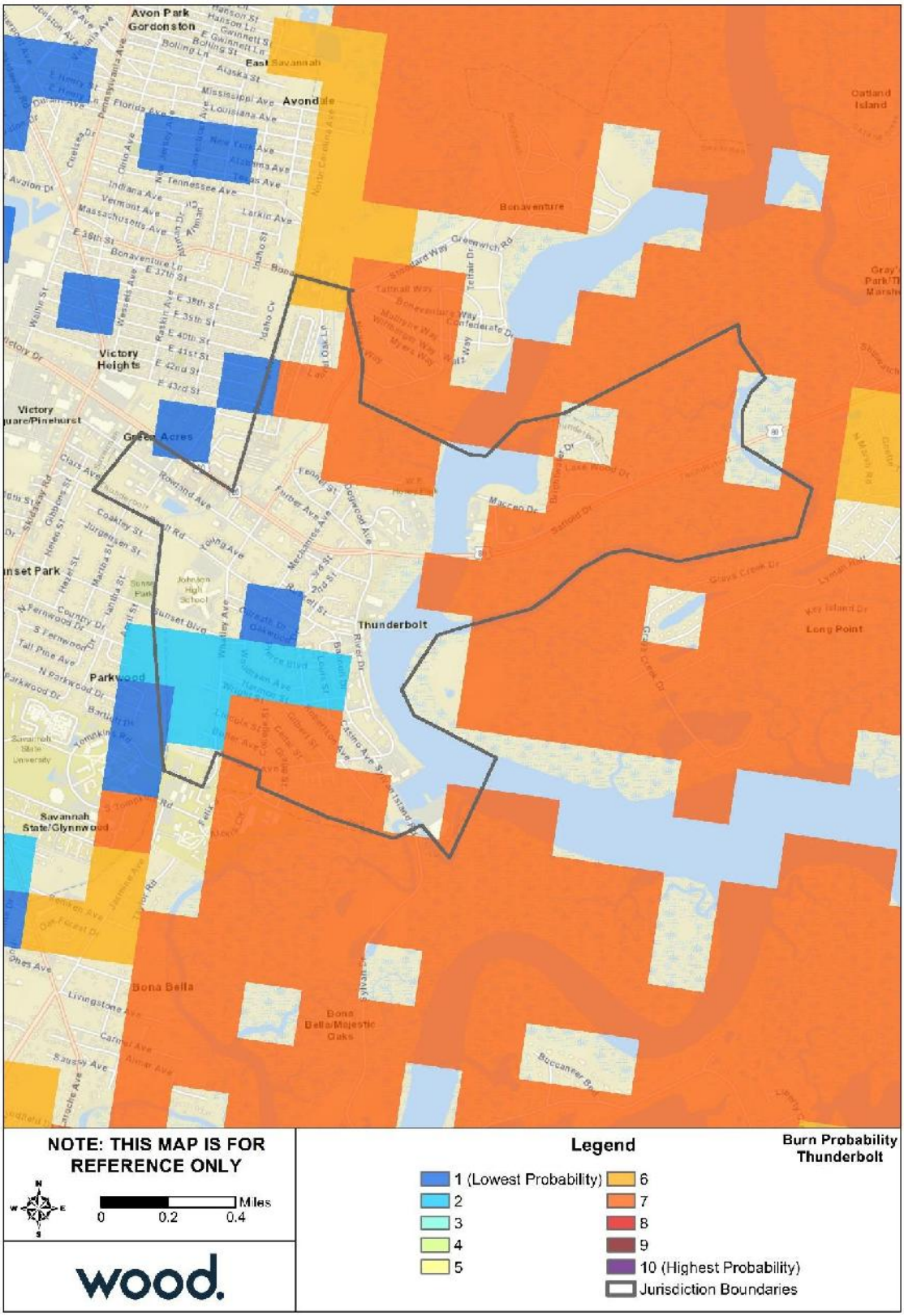


Source: Southern Wildfire Risk Assessment

Figure G.12 – Fire Intensity Scale, Town of Thunderbolt

Source: Southern Wildfire Risk Assessment

Figure G.13 – Burn Probability, Town of Thunderbolt



Source: Southern Wildfire Risk Assessment

G.5 FLOODPLAIN MANAGEMENT CAPABILITY ASSESSMENT

The Town of Thunderbolt joined the NFIP emergency program in 1980 and has been a regular participant in the NFIP since July 1987. The following tables reflect NFIP policy and claims data for the Town categorized by structure type, flood zone, Pre-FIRM and Post-FIRM. Zones with no policies or closed paid losses were left out of the tables below.

Table G.14 – NFIP Policy and Claims Data by Structure Type

Structure Type	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
Single Family	197	$118,543	$46,176,900	17	$424,672.49
2-4 Family	1	$378	$270,000	1	$4,377.85
All Other Residential	81	$24,944	$22,243,200	2	$15,608.71
Non Residential	54	$132,837	$18,510,200	8	$443,413.22
Total	**333**	**$276,702**	**$87,200,300**	**28**	**$888,072.27**

Source: FEMA Community Information System, accessed September 2019

Table G.15 – NFIP Policy and Claims Data by Flood Zone

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	231	$227,586	$54,045,000	23	$862,143.50
B, C & X Zone					
Standard	4	$6,128	$1,360,400	1	$4,377.85
Preferred	97	$42,388	$31,760,000	4	$21,550.92
Total	**332**	**$276,102**	**$87,165,400**	**28**	**$888,072.27**

Source: FEMA Community Information System, accessed September 2019

Table G.16 – NFIP Policy and Claims Data Pre-FIRM

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	64	$121,583	$13,123,600	20	$830,623.61
B, C & X Zone	77	$30,623	$23,610,400	5	$25,928.77
Standard	2	$3,321	$570,400	1	$4,377.85
Preferred	75	$27,302	$23,040,000	4	$21,550.92
Total	**141**	**$152,206**	**$36,734,000**	**25**	**$856,552.38**

Source: FEMA Community Information System, accessed September 2019

Table G.17 – NFIP Policy and Claims Data Post-FIRM

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	167	$106,003	$40,921,400	3	$31,519.89
B, C & X Zone	24	$17,893	$9,510,000	0	$0.00
Standard	2	$2,807	$790,000	0	$0.00
Preferred	22	$15,086	$8,720,000	0	$0.00
Total	**191**	**$123,896**	**$50,431,400**	**3**	**$31,519.89**

Source: FEMA Community Information System, accessed September 2019

G.6 MITIGATION STRATEGY

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Lead Agency / Department	Potential Funding Source	Implementation Timeline	2020 Status	2020 Implementation Status Comments
Prevention									
P-1	Increase the area for debris following a storm with an MOU with the Board of Education to use the fields at Johnson High School as an additional area.	All	3.1	Moderate	Town of Thunderbolt Public Safety and Public Works	N/A	2022	Carry Forward	New-Currently, the Town only has one location for debris at Cesaroni ball field and this would great expand their capacity.
P-2	Conduct a full inspection of the Thunderbolt bridge to ensure that it will be open during any event or extreme threat.	All	1.1 & 3.1	High	Town of Thunderbolt Public Safety/GA DOT	PDM; HMGP	2022	Carry Forward	New-If the drawbridge on President Street is unavailable, the Thunderbolt Bridge is the only means of access from the islands to the mainland including access to hospitals and critical care facilities.
P-3	Assist and coordinate with Tara Nursing Home for evacuation of patients in the event of a threat.	All	4.1	Moderate	Town Administration / CEMA	Local Staff Time	2022	Carry Forward	New-The Nursing Home has a plan in place; however, the Town's involvement would be to ensure that the removal and transition of patients would be a smooth as possible.
Property Protection									
PP-1	Upgrade and Elevate Lift Station	Flood	1.1	High	Town of Thunderbolt Public Works	HMGP; CIP	2023	Carried Forward	Revised. *New After Irma - Lift station was inundated with water during hurricane Irma.
PP-2	Purchase and install bypass pumps	Flood, Hurricane	1.1	Moderate	Public Works	Local Funds	2020	New	
PP-3	Purchase Vac Truck for Stormwater	Flooding, Hurricane, Coastal Storm	1.1	Moderate	Town of Thunderbolt Public Works	HMGP 5%	2022	Carried Forward	Revised. *NEW POST MATTHEW: The public works department will utilize the vac truck to mitigate flooding issues.
PP-4	Retrofit Community Park Piers, Decks and Pavilions	Flood	1.1	Low	Town of Thunderbolt Public Works	HMGP; CIP	2018	Carried Forward	Revised. *New After Irma Thomson Park was inundated with water during Hurricane Irma; would like to retrofit the pier, deck and pavilion with higher impact/flood resistant materials.
PP-5	Anchor HVAC units and Storage Tanks	All	1.1	Moderate	Town of Thunderbolt Public Works	TBD	2020	New	
PP-6	Acquire or elevate properties prone to flooding	Flood	1.2 & 3.1	Moderate	Town of Thunderbolt Public Works	HMGP	2025	New	
PP-7	Elevate or dry floodproof components or systems vulnerable to flood damage	Flood	1.1	High	Town of Thunderbolt Public Works	TBD	2020	New	
Structural Projects									
SP-1	Construct and/or improve drainage systems to alleviate drainage issues.	Flood	3.1	Moderate	Public Works	HMGP	2021	New	
Emergency Services									
ES-1	Generators for critical facilities	All	1.1	Moderate	Town of Thunderbolt Public Works	HMGP, General Fund	2021	New	
ES-2	Portable generators for critical facilities	All	1.1	Moderate	Town of Thunderbolt Public Works	HMGP, General Fund	2021	New	
ES-3	Purchase and install generator quick connects and transfer switches for critical facilities	All	1.1	Moderate	Town of Thunderbolt Public Works	HMGP, General Fund	2021	New	

Annex H City of Tybee Island

H.1 PLANNING PROCESS

The table below lists the HMPC members who represented the City of Tybee Island.

Table H.1 – HMPC Members

Member Name	Title	Agency/Department
George Shaw	Manager	Planning & Zoning

H.2 COMMUNITY PROFILE

H.2.1 Overview of the Community

The City of Tybee Island is located on a barrier island along the coast of Georgia approximately 18 miles east of Savannah and is the eastern most point in the State of Georgia.

According to the U.S. Census Bureau, Tybee Island has a total area of 3.2 square miles of which 2.3 square miles (72%) is land and 0.9 square miles (28%) is water.

According to the U.S. Census Bureau's American Community Survey (ACS) 5-Year Estimates, the town had a total population of 3,079 in 2017. Therefore, the City's average population density is approximately 962 people per square mile.

The Location Map below reflects the City of Tybee's boundaries and shows the City's location within the county and in relation to surrounding municipalities.

Figure H.1 – Location Map, Tybee Island

H.2.2 Geography and Climate

Please refer to Chatham County Community Profile for a summary of climate for Chatham County.

Tybee Island lies within the Sea Island Flatwoods Level IV Ecoregion which consists of flat plains on marine terraces. Waterways consists of swamps, bays, and low gradient streams with sandy and silty substrates. Elevations average approximately 20 feet. Typical land cover consists of evergreen forests, pine plantations, and forested wetlands.

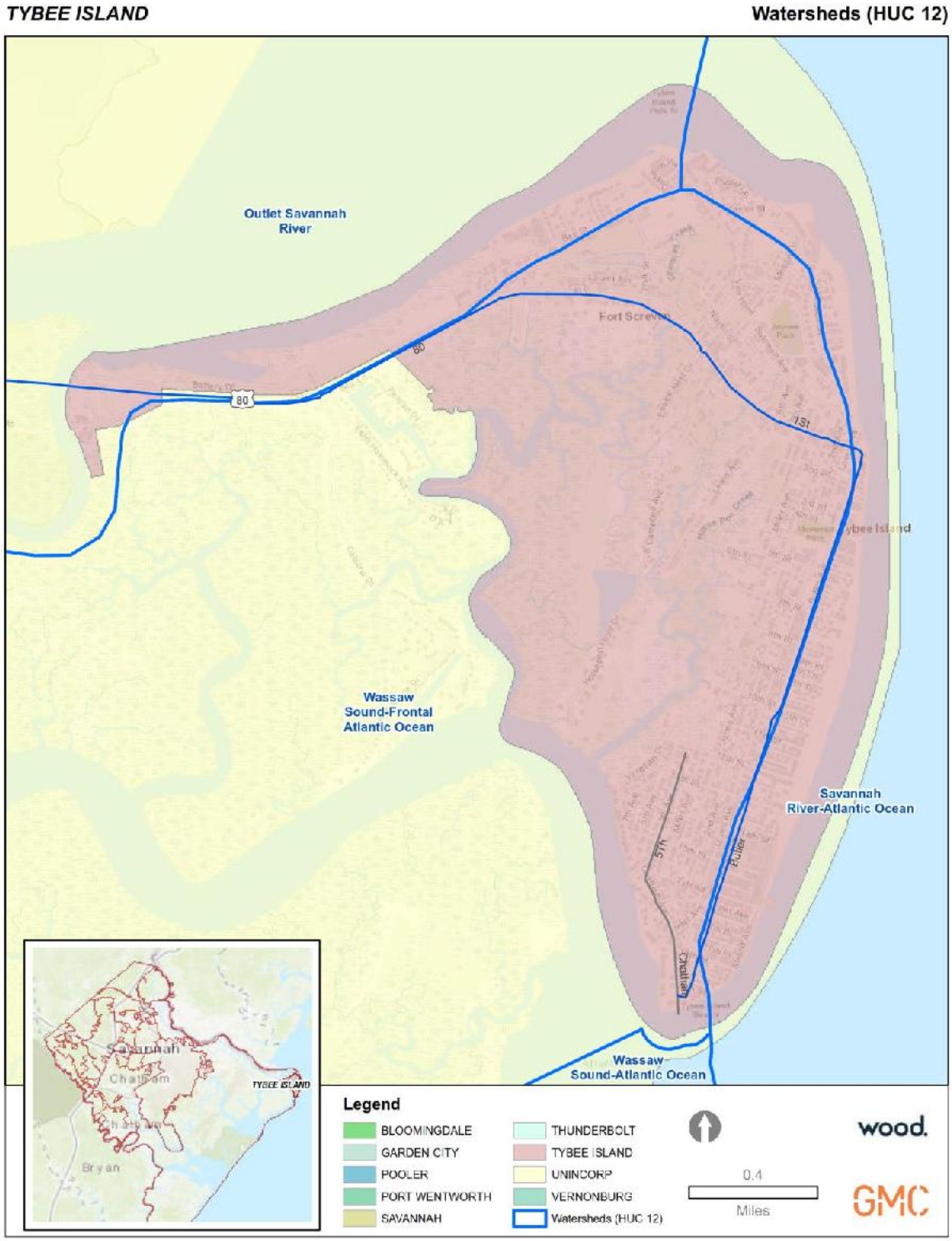
Tybee Island is located partially within the HUC 12 Watersheds summarized in the table below.

Table H.2 – HUC 12 Watersheds

HUC 12 Watershed Name	HUC 12 #
Outlet Savannah River	030601090307
Wassaw Sound-Frontal Atlantic Ocean	030602040102
Savannah River – Atlantic Ocean	030601090309

The figure below illustrates the HUC 12 drainage basins and drainage features in and around Tybee Island.

Figure H.2 – HUC 12 Watershed Map, Tybee Island



H.2.3 Cultural, Historic and Natural Resources

H.2.3.1 Cultural and Historic Resources

Cultural and historic facilities on Tybee Island include:

- A complex of buildings located at 204 Fifth Street near Butler and include:
  - Tybee Gymnasium
  - The YMCA
  - Cafeteria
  - Old School Complex
- Community Building (Guard House: 31 Van Horne Ave.)
- Tybee American Legion
- Tybee Lite Shrine Club
- Tybee Arts Association: Provides classes, plays, Annual Art Auction and Annual October Festival of the Arts

H.2.3.2 Parks, Preserve, and Conservation

The City of Tybee Island has two main public parks as summarized in the table below.

Table H.3 – Public Parks, Tybee Island

Name	Amenities	Photo
Jaycee park (30 Van Horn St.)	• Baseball / Softball Diamond • Basketball Court • Soccer Field • Bike Trail • Walking Trail • Gazebo • Playground • Scenic Waterway • Picnic Areas	
Memorial Park (402 Jones Ave.)	• Basketball Court • Beach Volleyball Court • Cemetery • Picnic Areas • Open pavilion • Soccer • Tennis Court	

Other outdoor facilities include:

- Park of 7 Flags: Small passive park with fountain and bench seats located on Butler Ave. at the west end of Tybrisa
- Sally Pearce Nature Trail: A short hiking trail located on the south side of US Hwy. 80 at Fifth Ave.
- Blue Heron Nature Trail: Located on the north side of US Hwy. 80 opposite Lewis Ave.

- North Beach Birding Trail: Bird Sanctuary located west of the Tybee Island Lighthouse in the North Beach area.
- Tybee Pier and Pavilion

H.2.3.3 Natural Resources

Floodplains and Flood Zones

FEMA flood zone designations within the City of Tybee Island are identified in the figure below. The flood hazard areas shown are designated by the Federal Emergency Management Agency (FEMA) and include: Zone A (subject to inundation by the 1% annual-chance flood event with no base flood elevation (BFE) determined), Zone AE (subject to inundation by the 1% annual-chance flood event with BFE determined), Zone VE (subject to inundation by the 1% annual-chance flood event with additional hazards due to storm waves with BFE determined), and Zone X (Moderate Risk areas outside the 1% and inside the 0.2% annual-chance floodplains with no BFE or base flood depths determined and Minimal Risk areas outside the 0.2% annual chance floodplain).

Table H.4 – Flood Zones, Tybee Island

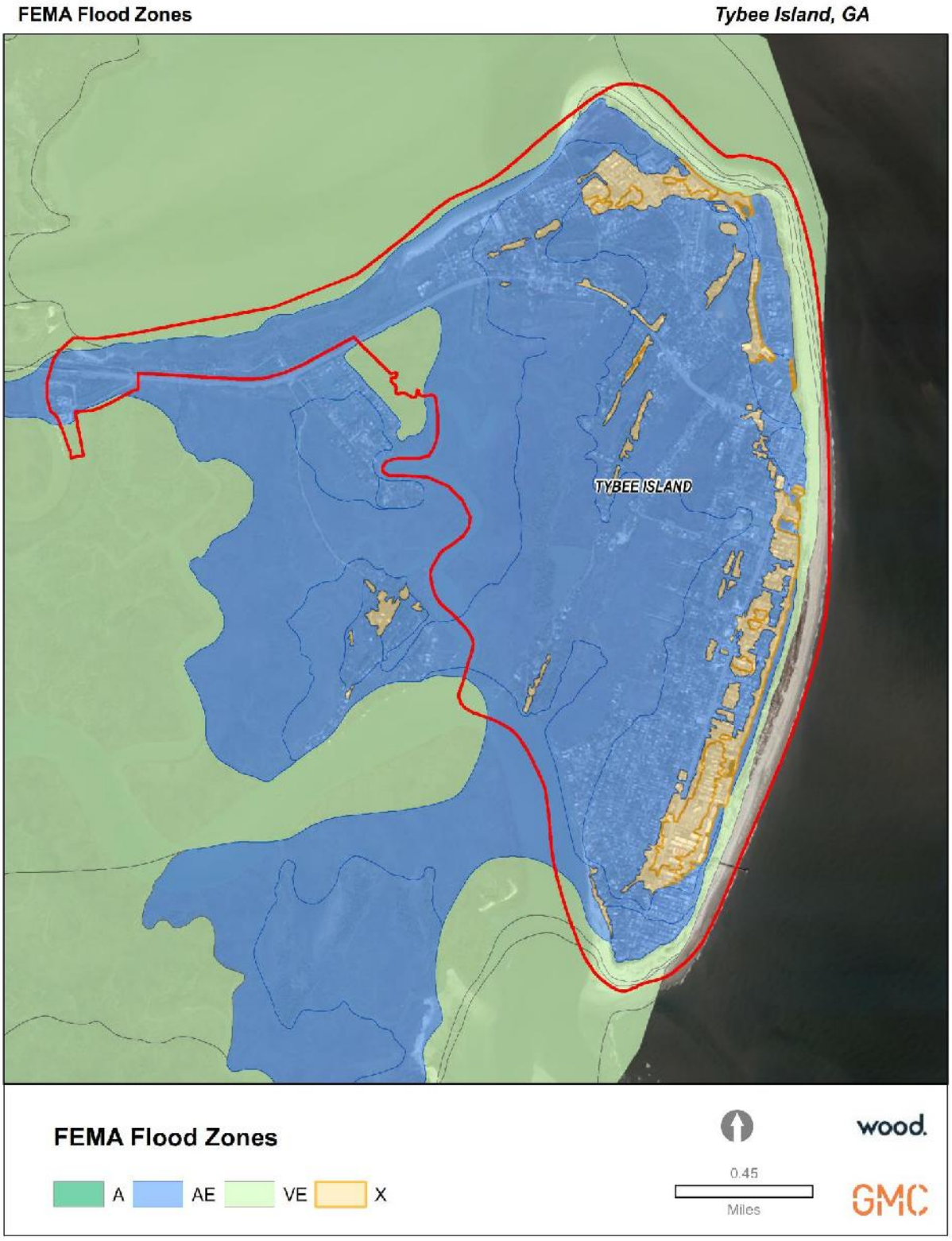
Flood Zone	Area (Acres)	Area (Square Miles)	Percent of City (%)
Outside of Flood Zones / Ocean	80	0.12	3.8
AE	1,553	2.4	75.9
VE	246	0.38	12.0
X	169	0.26	8.3
TOTAL	**2,048**	**3.2**	**100.0**

Source: FEMA, 2018

According to the 2018 FEMA data, 630 acres of the land within Tybee Island is located within a 100-year floodplain (Zone AE and VE) which equals about 88 percent of the City. An additional 169 acres are located within moderate or minimal flood hazard areas (8.3percent of the City). With nearly 88 percent of the City at high risk to flooding in the Special Flood Hazard Area (SFHA), the City of City should seek ways to balance future development with strategies to preserve sensitive lands and natural drainage features.

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, and the vegetation stabilizes soils during flooding. Natural floodplains in Tybee include wetland areas and low-lying land along the major waterways in and around the City including the Atlantic Ocean, Lazaretto Creek, Tybee Creek, the Back River, and other tidal creeks on the west side of the island. Natural floodplains reduce damage by allowing flood waters to spread out over large areas, aiding infiltration into the ground, reducing flow rates and acting as a flood storage area to reduce downstream peaks. The City should strive to keep floodplain and floodplain waters free of contaminants such as oil, paint, anti-freeze, pesticides, and plastics and other trash. These chemicals and waste materials pollute local waterways, decreasing the water quality that local wildlife and plants depend upon.

Figure H.3 – FEMA Flood Zones, 2018, Tybee Island



Wetlands

Wetlands benefit the ecosystem by storing, changing, and transmitting surface water and groundwater. Through these processes pollution is removed, nutrients are recycled, groundwater is recharged, and biodiversity is enhanced. Wetland composition varies extensively, with five distinct categories for classification: Estuarine, Lacustrine, Marine, Palustrine, and Riverine systems Based on data from the National Wetland Inventory (NWI) wetlands throughout the City of Tybee Island are summarized in the Wetland Type table and Wetland Types Map shown below.

Table H.5 – Wetland Types, Tybee Island

Wetland Type	Area (Acres)	Area (Sq. Miles)	Percent of City
Non-Wetland	1,347	2.1	65.8
Estuarine	663	1.0	32.4
Palustrine	5.0	0.01	0.2
Marine	32	0.1	1.6
TOTAL	**2,048**	**3.2**	**100.0**

Source: National Wetland Inventory

The Palustrine System

The Palustrine (freshwater) system includes all non-tidal wetlands dominated by trees, shrubs, persistent emergent plants, emergent mosses or lichens, and all such wetlands that occur in areas where salinity due to ocean-derived salts is below 0.5%. The Palustrine system is bounded by upland.

The Estuarine System

The Estuarine system consists of deep-water tidal habitat and adjacent tidal wetlands that are usually semi-enclosed by land but have open, partly obstructed, or sporadic access to the open ocean, and in which ocean water is at least occasionally diluted by freshwater runoff from the land. The Estuarine system extends (1) upstream and landward to where ocean-derived salts measure less than 0.5% during the period of average annual low flow; (2) to an imaginary line closing the mouth of a river, bay, or sound; and (3) to the seaward limit of emergent wetlands, shrubs, or trees where they are not included in (2). It also includes offshore areas of continuously diluted sea water. It contains two sub-systems: subtidal (where the substrate is continuously submerged) and intertidal (where the substrate is exposed and flooded by tides including the associated splash zone).

Marine Wetlands

Marine Wetlands are areas exposed to the open ocean. The Marine System consists of the open ocean overlying the continental shelf and the coastline.

Figure H.4 – Wetlands by Type, Tybee Island

Source: U.S. Fish & Wildlife Service, National Wetlands Inventory - Version 2

H.2.4 History

At the time of the first European exploration of Tybee by the Spanish in the 16th century, the island was home to the Euchee Indians. The name "Tybee" is derived from the Euchee word for "salt." In 1733, James Oglethorpe settled the City of Savannah and the Colony of Georgia 17 miles upriver. The island was important to defense and commerce due to its strategic location at the mouth of the Savannah River.

In 1873, the Tybee Improvement Company established what would become the City of Tybee with the first partial survey of lots. The federal government acquired land to establish a military reservation on the north end of the island in 1875 which became Fort Screven. The following year brought the first resort hotel, Ocean House, on the south end of the island and other commercial and residential development soon followed especially after the construction of the Savannah-Tybee Railroad in 1887. By 1890, when the Savannah-Tybee Railroad became a unit of the Central of Georgia Railroad, Tybee became a regional resort. In the early 1920's, Tybee began its golden era as a resort with the completion of the Tybee Road connecting with the mainland via Victory Drive. As a result, Tybee experienced an unparalleled building boom with boarding houses and hotels.

By the mid-1930s, Tybee had a permanent population of 350 with a swell to 6,000 during the summer resort season. The establishment of a permanent population served to stabilize the community and the economy. During this time the intersection of Tybrisa Street (formerly 16th Street) at Butler Avenue began to develop as the main commercial area for the town. By the end of the 1940's Tybee year-round population was over 1,000.

By 1990, the population of Tybee Island was 2,800 and Tybee was selected as a host site for the 1996 Olympics, Today, Tybee Island is just as popular as it was before the 1950's with a year-round population of 2,900 and a swell to 30,000 in the summer season. In addition to the miles of beaches, acts of preservation, and sense of community, Tybee offers a variety of accommodations, restaurants, shops, and entertainment for all ages.

H.2.5 Economy

H.2.5.1 Wages and Employment

Per the 2013-2017 American Community Survey 5-Year Estimates, the median household income for Tybee is $74,919, which is over 41 percent higher than the state's median household income ($52,977). Approximately 15.8% of the population is considered to be living below the poverty level. Moreover, 34.7 percent of people under 18 years of age and 0.0 percent of people 65 years and over are living below the poverty level.

The table below shows employment and unemployment rates along with industry employment by major classification for the City.

Table H.6 – Employment and Occupation Statistics for Tybee Island, GA

Employment Status	Count	Percentage (%)
In labor force	1,643	62.0
Employed	1,585	59.8
Unemployed	58	2.2
Armed Forces	0	0.0
Not in labor force	1,008	38.0
Occupation	**Count**	**Percentage (%)**
Management, business, science and arts	706	44.5
Service	393	24.8

Employment Status	Count	Percentage (%)
Sales and office	247	15.6
Natural resources, construction and maintenance	133	8.4
Production, transportation and material moving	106	6.7

Source: U.S. Census Bureau, 2013-2017 American Community Survey 5-Year Estimates

Major industry sectors in Tybee Island include management, business, science, and arts (44.5%); service (24.8%); and sales and office (15.6%); natural resources, construction, and maintenance (8.4%); and production, transportation, and material moving (6.7%).

Major employers are discussed in the Chatham County Community Profile.

H.2.6 Housing

According to the 2013-2017 ACS 5-Year Estimates, there are 3,361 housing units in the City of Tybee Island, of which 37.7 (1,268) percent are occupied. Approximately 61.8% (784) of occupied units are owner-occupied (38.2% occupied by renters). A high percentage of renters is an indicator of higher pre- and post-disaster vulnerability because, according to Cutter, et al. (2003), renters often do not have the financial resources of homeowners, are more transient, are less likely to have information about or access to recovery aid following a disaster, and are more likely to require temporary shelter following a disaster. Therefore, higher rates of home rentals in Tybee Island may indicate that residents are not able to implement certain types of mitigation in their homes.

Median home value in Tybee is $493,800. Of the town's owner-occupied housing units, 68.1 percent (534) have a mortgage. Most householders (75.7 percent/960 households) moved into their current homes since the year 2000, 32.8 percent (416) moved in between 2000 and 2009, and 28.2 percent (357) moved in between 2010 and 2014. 3.0 percent (38) of occupied housing units have no vehicle available to them, which suggests these residents may have difficulty in the event of an evacuation.

The majority (54.6%/1,834) of housing units in Tybee are detached single family homes. There are no mobile homes which can be more vulnerable to certain hazards, such as tornadoes and wind storms, especially if they aren't secured with tie downs.

The City's housing stock is relatively old, with the majority (73% / 2,457) of occupied housing built before 2000. Table H.7 details housing age in the town.

Table H.7 – Housing Age

Year Structure Built	Percent of Occupied Housing	Number of Homes
2014 or later	0.7	22
2010 to 2013	0.7	23
2000 to 2009	25.6	859
1980 to 1999	34.1	1,147
1960 to 1979	17.8	599
1940 to 1959	14.3	478
1939 or earlier	6.9	233

Source: U.S. Census Bureau, American Community Survey 2013-2017 5-Year Estimates

Age can indicate the potential vulnerability of a structure to certain hazards. For example, the City of Tybee first entered the National Flood Insurance Program in 1971. Therefore, based on housing age estimates approximately 39 percent (1,311) of housing in the town was built before any floodplain development restrictions were required.

H.2.7 Population

According to the U.S. Census Bureau, Tybee had an estimated population of 3,079 residents in 2017 and a population of 3,024 at the time of the 2010 U.S. Census (1.8% increase from 2010-2017). As of 2017, Tybee's population density was 962 persons per square mile. The table below provides demographic profile data from the 2017 American Community Survey 5-Year Estimates.

Table H.8 – Tybee Island Demographic Profile Data, 2017

Demographic	Tybee Island
Gender/Age	
Male	1,462
Female	1,562
Under 5 Years	66
65 Years and Over	668
Race/Ethnicity (One Race)	
White	2,804
Black or African American	148
American Indian/Alaska Native	0
Asian	0
Two or More Races	7
Hispanic or Latino[1]	289
Education	
High School Graduate or Higher	331
Bachelor's Degree or Higher	656

Source: U.S. Census Bureau, 2013-2017 American Community Survey 5-Year Estimates
[1]Hispanics may be of any race, so also are included in applicable race categories.

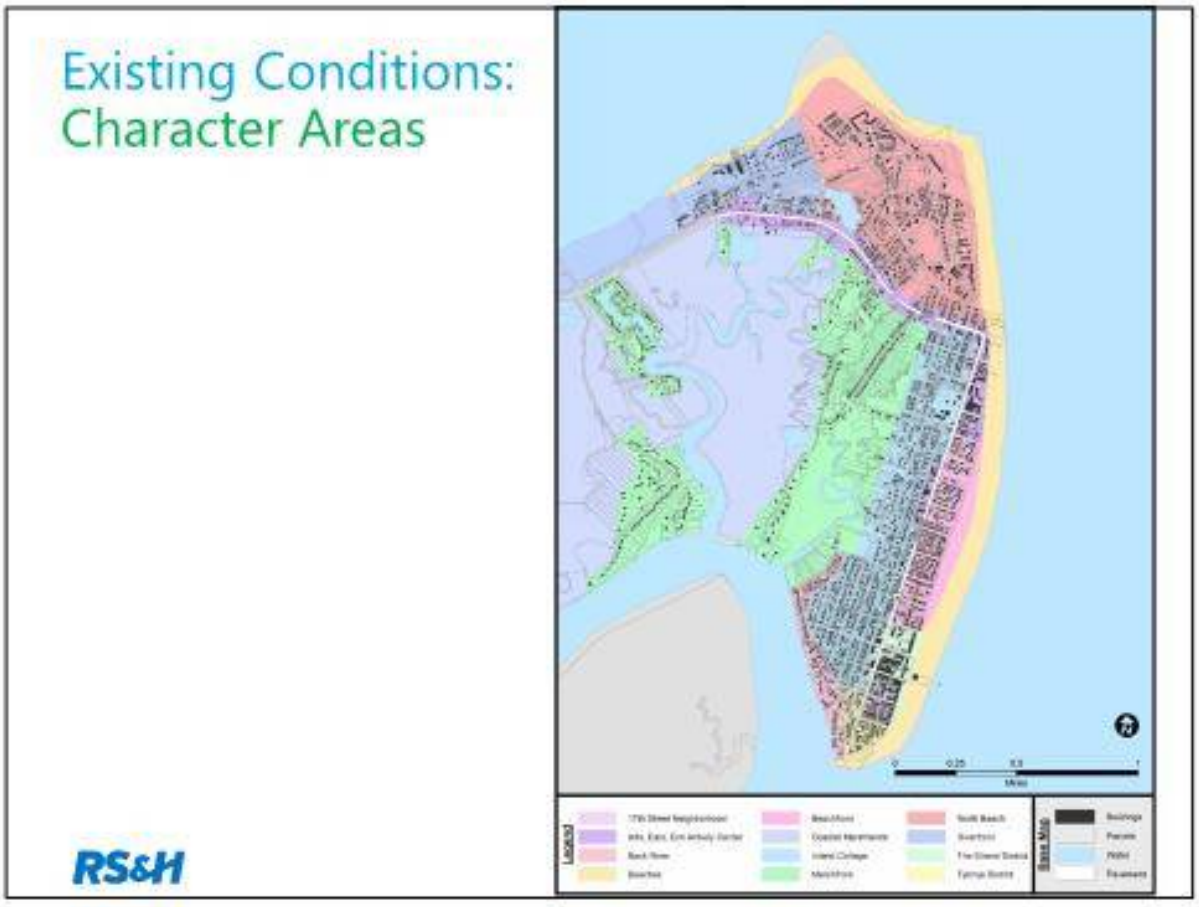
H.2.8 Land Use

The City of Tybee Island Master Plan (July 2016) established updated Character Areas to guide future development including:

- Back River Neighborhood: A unique residential area with waterfront lots and beach access along the Back River.
- Beaches: Consists of the undeveloped, environmentally sensitive beachfront and dune system.
- Beachfront Neighborhood: The area is characterized by wide streets with on street parking and old growth trees supplemented by side alleys with public and private beach access.
- Coastal Marshlands: Includes environmentally sensitive undeveloped natural land not suitable for development. The marshlands bugger against flooding and erosion and provide marine/wildlife habitat and recreational opportunities.
- Commercial Gateway: Function as an activity center and serves as the commercial gateway for the City.
- Ft. Screven Historic District: Includes Officers Row and all of Ft. Screven which represents significant historic, cultural, and natural resources.
- Inland Cottage Neighborhood: Traditional neighborhood west of Butler characterized by narrow, tree lines streets.
- Marshfront Neighborhood: Located along the marshfront are residential uses of various ages, sprinkled with intermittent commercial uses.

- North Beach/Maritime District: This district include commercial, recreational, campground, public/government uses and buildings and a mix of residential styles and home on narrow streets.
- The Strand/Historic Downtown: This district is the traditional "Main Street" of Tybee Island.
- South End Neighborhood: This area has public beach access and parking and includes a mix of residential uses.

Figure H.5 – Character Area Map, Tybee Island

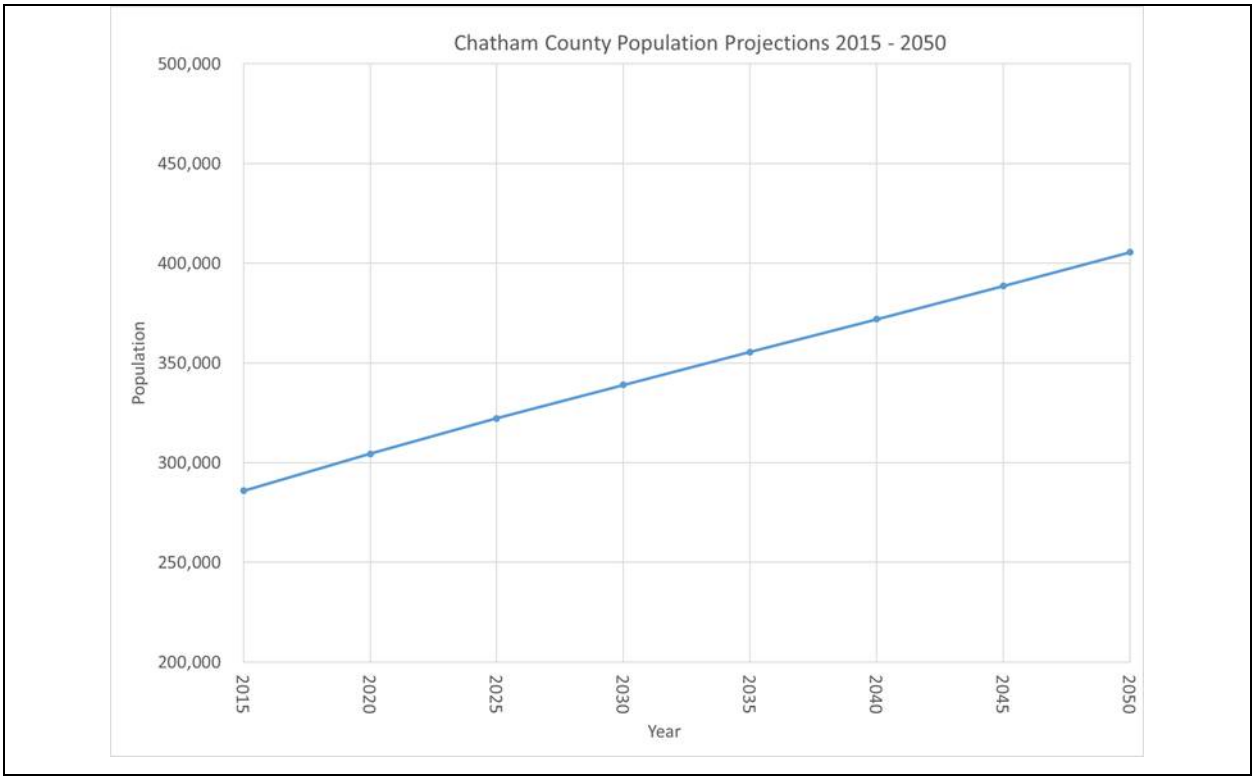


H.2.9 Growth and Development Trends

According to the U.S. Census Bureau, Tybee Island had an estimated population of 3,079 residents in 2017.

According to the Georgia Governor's Office of Planning and Budget (GOPB), Chatham County is projected to reach a population of 405,573 by 2050, which represents a 38% increase from the 2017 population. The population projections from the GOPB estimate the annual growth for the County to be about 1.1% through 2050.

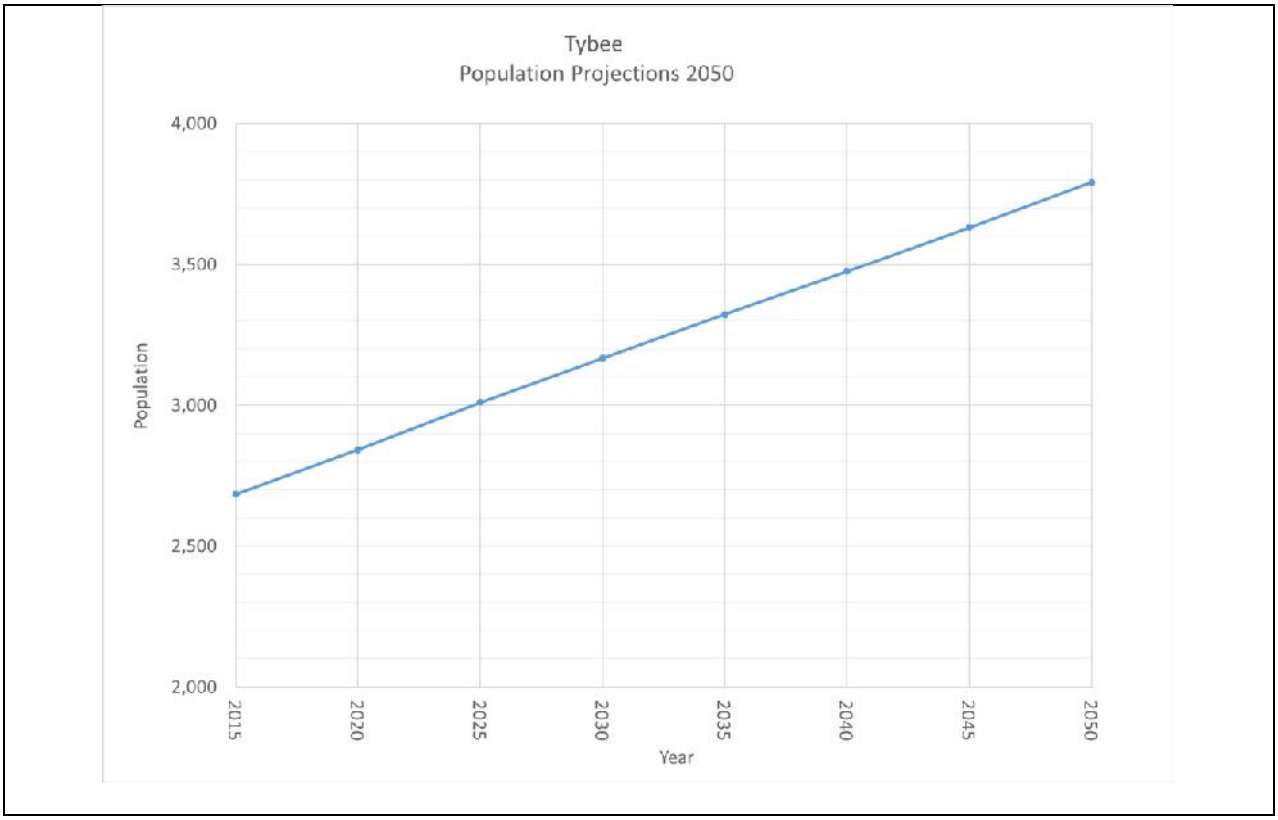
Figure H.6 – Population Projections for Chatham County 2013 – 2050



Source: Georgia Governor's Office of Planning and Budget

Using the projected growth rate for the County, the population of Tybee Island would increase to 4,262 by 2050 as shown in the graph below.

Figure H.7 – Population Projections for Tybee Island 2013 – 2050



H.3 ASSET INVENTORY

H.3.1 Property

Table H.9 – City of Tybee Island Building Exposure

Occupancy Type	Total Number of Buildings	Total Building Value	Estimated Content Value	Total Value
Commercial	226	$52,369,025.30	$52,369,025.30	$104,738,050.60
Industrial	4	$307,391.00	$461,086.50	$768,477.50
Residential	2,268	$520,134,785.00	$260,067,392.50	$780,202,177.50
Total	2,498	$572,811,201.30	$312,897,504.30	$885,708,705.60

Source: Chatham County

H.3.2 Critical Facilities

Table H.10 – Critical Facilities and Infrastructure at Risk

ID	PRIORITY CRITICAL FACILITY NAME	PHYSICAL ADDRESS	LAT	LONG	REASON				
					COG	Life Safety	Debris	Support	Other
TY-1	City of Tybee Island City Hall	403 Butler Ave.	32.0087	-80.843	X				
TY-2	City of Tybee Island Police Dept.	78 Van Horne Dr.	32.0238	-80.8497		X			
TY-3	City of Tybee Island Fire Dept.	512 Jones Ave	32.0079	-80.845		X			
TY-4	City of Tybee Island Public Works	76 Polk St.	32.0234	-80.8525			X		
TY-5	Water / Sewer Plant	923 Bay Street	32.0234	-80.8525				X	
TY-6	Well #2 and Water Tower #2	78 Van Horn	32.0238	-80.8497				X	
TY-7	Well #1 and Water Tower #1	111 Butler Ave @ 2nd St	32.0234	-80.842				X	
TY-8	Lift Station #5	305 4th street	32.00937	-80.8439				X	
TY-9	Lift Station #6	101 Jones Ave	32.0129	-80.8434				X	
TY-10	Lift Station #9	2 Fort Ave and Polk St.	32.0112	-80.842				X	
TY-11	Well #3	105 E. 14th Street	31.5926	-80.5167				X	

Source: Chatham County

H.4 RISK ASSESSMENT

This section contains a hazard profile and vulnerability assessment for those hazards that were rated with a higher priority for the City of Tybee Island than for Chatham County as a whole. Risk and vulnerability findings are also presented here for those hazards that are spatially defined and have variations in risk that could be evaluated quantitatively on a jurisdictional level. The hazards included in this section are: Flood and Wildfire.

H.4.1 Flood

Over 85 percent of the City falls within the mapped 1%-annual-chance floodplains. Figure H.8 reflects the mapped flood hazard zones for the City of Tybee Island, and Figure H.9 displays the depth of flooding estimated to occur in these areas during the 1%-annual-chance flood. The data in this risk assessment is based off FEMA's 2014 DFIRM. Minor changes have since been made and the updated 2018 DFIRM can be seen in Figure H.3 for comparison.

Properties at risk are detailed by flood zone in Table H.11, below. Parcel data was used to assess how many buildings are located in hazard areas based on each parcel's centroid.

Table H.11 – Properties at Risk by Flood Zone

Flood Zone	Number of Buildings	Total Building Value
AE	2,266	$497,183,131.60
VE	232	$75,628,069.60
Total	**2,498**	**$572,811,201.20**
SFHA Total	**2,498**	**$572,811,201.20**

Source: FEMA 2014 DFIRM & Chatham County parcel and building footprint data, 2019

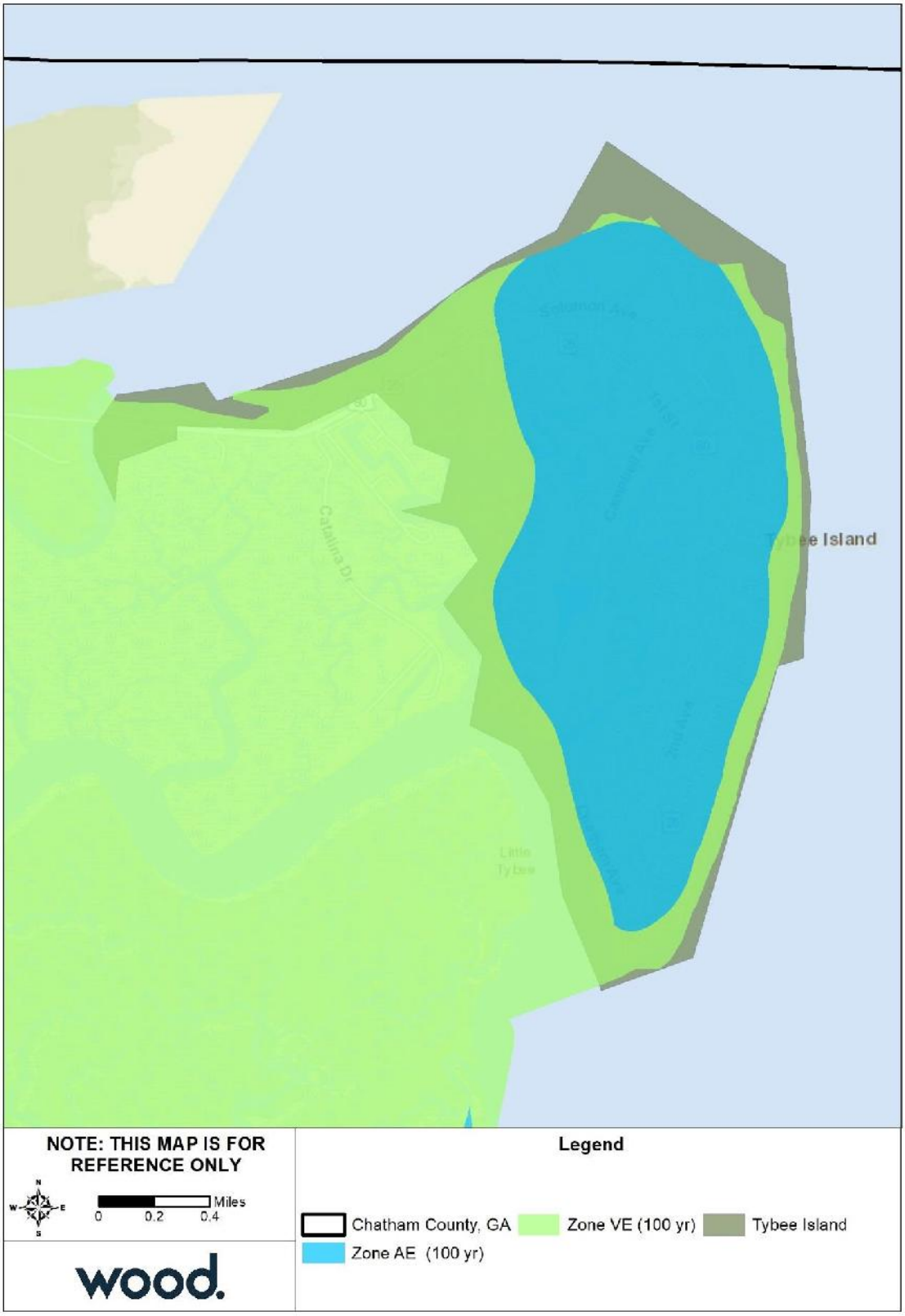
Table H.12 provides building counts and estimated damages by occupancy type for the 1% annual chance flood event.

Table H.12 – Tybee Island Estimated Building Damage and Content Loss, 1% Annual Chance Flood

Occupancy	Buildings Impacted	Building and Contents Cost	Estimated Building Damages	Estimated Content Damages	Loss Estimate
Commercial	191	$69,058,700.66	$5,131,263.03	$17,215,955.11	32.36%
Industrial	4	$768,477.50	$55,852.14	$179,751.38	30.66%
Residential	2,182	$741,249,077.99	$140,335,460.89	$86,132,540.04	30.55%
Total	2,377	$811,076,256.15	$145,522,576.06	$103,528,246.53	30.71%

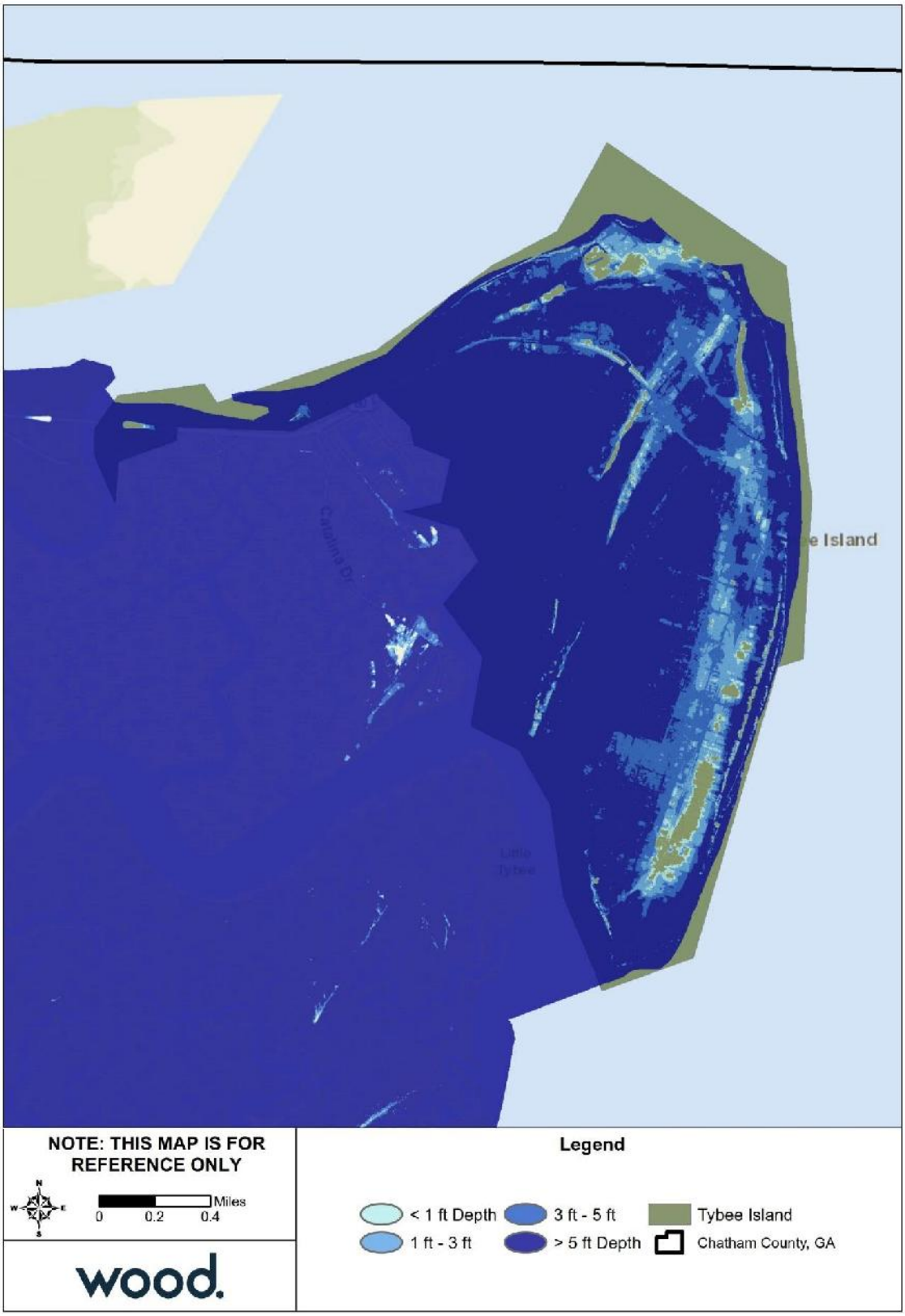
Source: HAZUS

Figure H.8 – FEMA Flood Hazard Areas, City of Tybee Island



Source: FEMA 2014 DFIRM

Figure H.9 – Flood Depth, 1%-Annual-Chance Floodplain, City of Tybee Island



Source: FEMA 2014 DFIRM

H.4.2 Wildfire

Table H.13 summarizes the acreage in the City of Tybee Island that falls within the Wildland Urban Interface (WUI), categorized by housing density. Areas in the WUI are those where development may intermix with flammable vegetation. Over 40 percent of Tybee Island is not included in the WUI.

Table H.13 – Wildland Urban Interface Acreage, City of Tybee Island

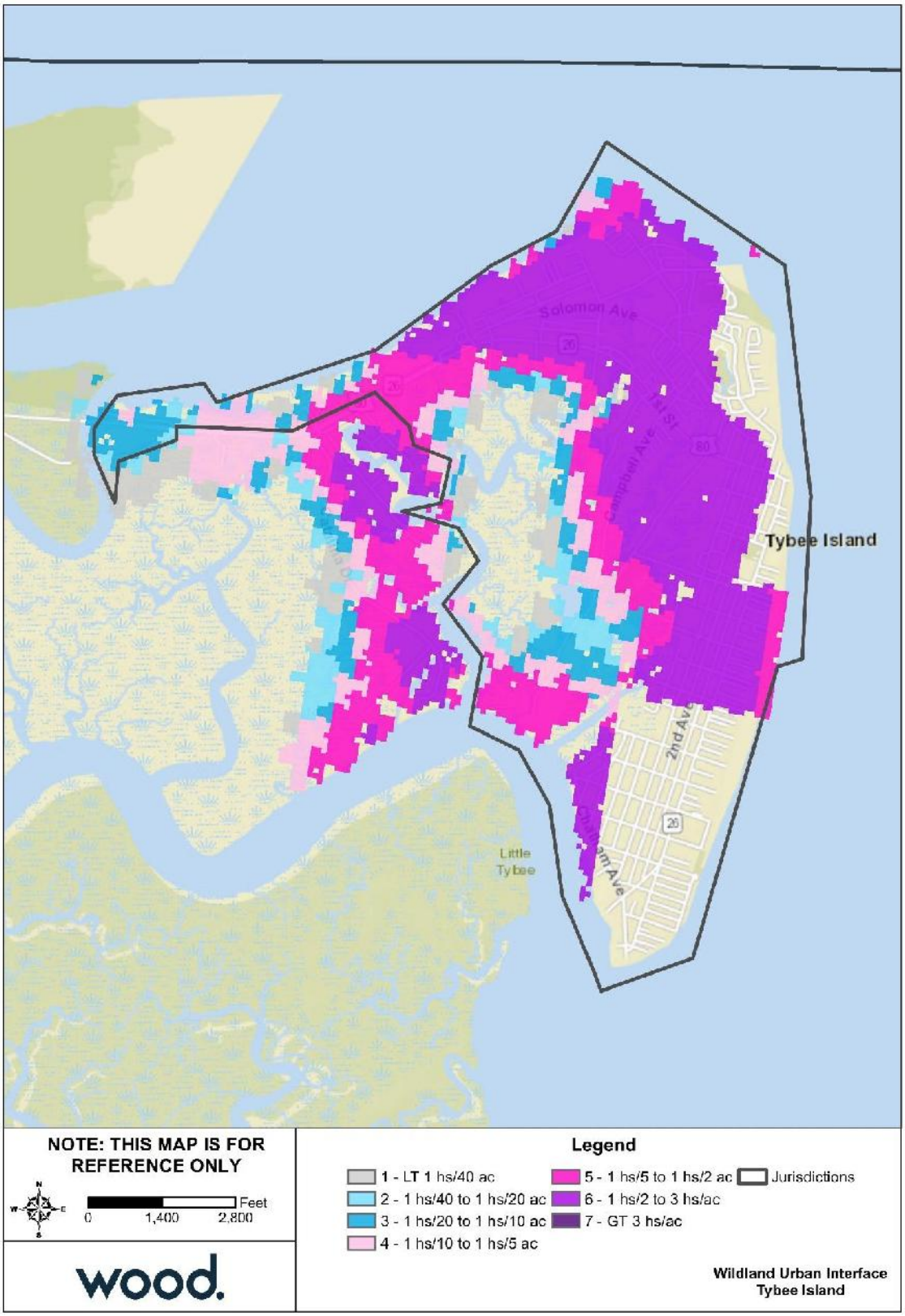
	Housing Density	Total Acreage	Percent of Total Acreage
	Not in WUI	*799.4*	*41.0*
	LT 1hs/40ac	52.5	2.7
	1hs/40ac to 1hs/20ac	41.7	2.1
	1hs/20ac to 1hs/10ac	104.5	5.4
	1hs/10ac to 1hs/5ac	100.5	5.2
	1hs/5ac to 1hs/2ac	202.3	10.4
	1hs/2ac to 3hs/1ac	650.6	33.3
	GT 3hs/1ac	0	
	Total	**1,951.4**	

Source: Southern Wildfire Risk Assessment

Figure H.10 depicts the WUI for the City of Tybee Island. The WUI is the area where housing development is built near or among areas of vegetation that may be prone to wildfire. Figure H.11 depicts the Fire Intensity Scale, which indicates the potential severity of fire based on fuel loads, topography, and other factors. Figure H.12 depicts Burn Probability based on landscape conditions, percentile weather, historical ignition patterns, and historical prevention and suppression efforts.

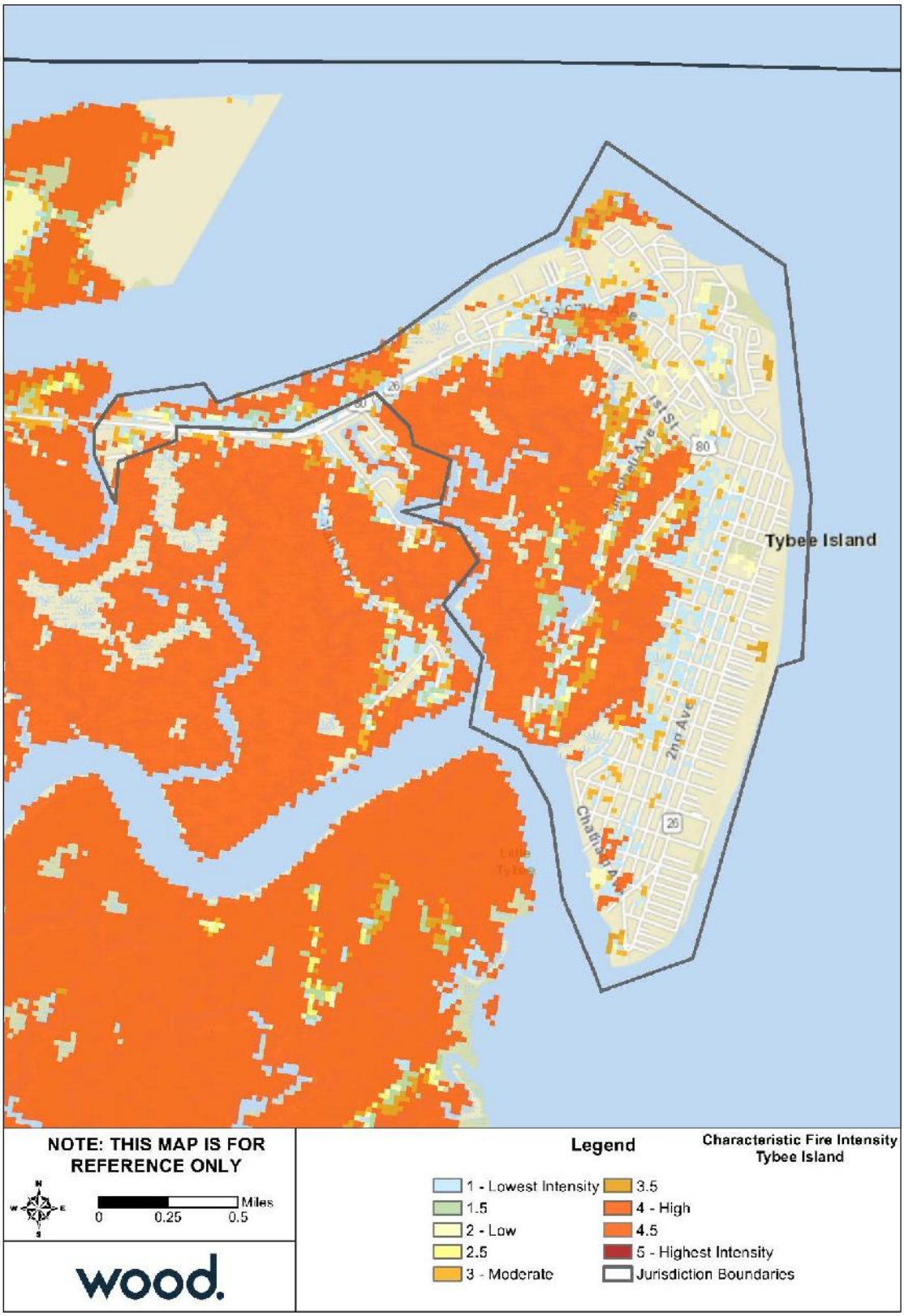
Potential fire intensity is high across much of western Tybee Island. This area also has a moderate burn probability. Developed areas within the WUI along U.S. 80 and the northern and eastern fringe of this cluster of higher potential fire intensity and burn probability are potentially exposed to wildfire.

Figure H.10 – Wildland Urban Interface, City of Tybee Island



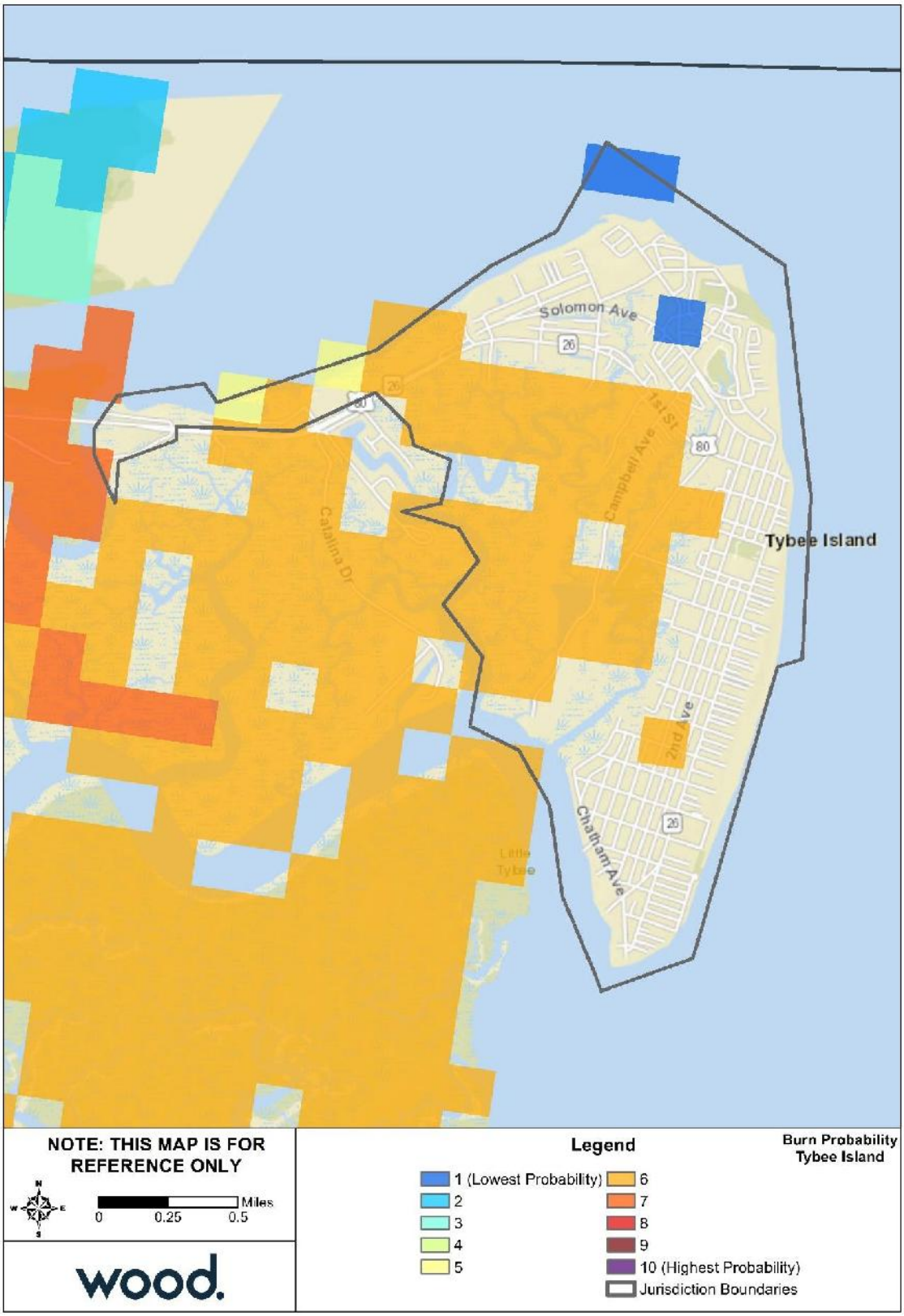
Source: Southern Wildfire Risk Assessment

Figure H.11 – Fire Intensity Scale, City of Tybee Island



Source: Southern Wildfire Risk Assessment

Figure H.12 – Burn Probability, City of Tybee Island



Source: Southern Wildfire Risk Assessment

H.5 FLOODPLAIN MANAGEMENT CAPABILITY ASSESSMENT

The City of Tybee Island joined the NFIP emergency program in 1970 and has been a regular participant in the NFIP since January 1972. The following tables reflect NFIP policy and claims data for the City categorized by structure type, flood zone, Pre-FIRM and Post-FIRM. Zones with no policies or closed paid losses were left out of the tables below.

Table H.14 – NFIP Policy and Claims Data by Structure Type

Structure Type	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
Single Family	1,622	$1,599,240	$454,050,600	450	$12,152,787.86
2-4 Family	165	$131,969	$43,728,900	48	$826,630.14
All Other Residential	825	$273,769	$136,654,200	14	$327,811.45
Non Residential	97	$252,066	$36,922,600	19	$743,896.62
Total	**2,709**	**$2,257,044**	**$671,356,300**	**531**	**$14,051,126.07**

Source: FEMA Community Information System, accessed September 2019

Table H.15 – NFIP Policy and Claims Data by Flood Zone

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	2,389	$1,915,860	$584,025,000	482	$13,311,218.48
A Zones	1	$492	$277,100	0	$0.00
V01-30 & VE Zones	81	$232,084	$13,303,800	45	$631,484.51
B, C & X Zone					
Standard	17	$8,883	$2,623,800	0	$0.00
Preferred	207	$91,325	$70,638,000	0	$0.00
Total	**2,695**	**$2,248,644**	**$670,867,700**	**527**	**$13,942,702.99**

Source: FEMA Community Information System, accessed September 2019

Table H.16 – NFIP Policy and Claims Data Pre-FIRM

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	640	$1,319,771	$157,286,700	369	$12,493,937.24
V01-30 & VE Zones	7	$27,567	$1,162,100	43	$628,890.49
B, C & X Zone	82	$40,238	$25,844,300	0	$0.00
Standard	5	$2,714	$458,300	0	$0.00
Preferred	77	$37,524	$25,386,000	0	$0.00
Total	**729**	**$1,387,576**	**$184,293,100**	**412**	**$13,122,827.73**

Source: FEMA Community Information System, accessed September 2019

Table H.17 – NFIP Policy and Claims Data Post-FIRM

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	1,749	$596,089	$426,738,300	113	$817,281.24
A Zones	1	$492	$277,100	0	$0.00
V01-30 & VE Zones	74	$204,517	$12,141,700	2	$2,594.02

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
B, C & X Zone	142	$59,970	$47,417,500	0	$0.00
Standard	12	$6,169	$2,165,500	0	$0.00
Preferred	130	$53,801	$45,252,000	0	$0.00
Total	**1,966**	**$861,068**	**$486,574,600**	**115**	**$819,875.26**

Source: FEMA Community Information System, accessed September 2019

H.6 MITIGATION STRATEGY

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Lead Agency / Department	Potential Funding Source	Implementation Timeline	2020 Status	2020 Implementation Status Comments
Property Protection									
PP-1	Acquire or elevate or mitigate repetitive loss and other flood properties.	Flood	1.2 & 3.1	Moderate	City Administration	HMGP; PDM; SRL; FMA	2020	Carried Forward	Revised
PP-2	Purchase and install generators at 12 sewer lift stations (1609 Strand Ave., 1664 2nd Avenue, 407 14th Street, 1002 2nd Avenue, 300 4th Avenue, 101 Jones Avenue, 102 S. Campbell, 1275 Soloman Avenue, 101 Fort Street, 25 Gulick Street, 8 Rosewood Avenue and 111 Lewis Avenue. .)	All	1.1	High	City Water and Sewer Department	Existing Budget; HMGP	2020	Carried Forward	
PP-3	Purchase and Install Stabilizers for the water and sewer department.	All	1.1	High	City Water and Sewer Department	Existing Budget; HMGP	2020	Carried Forward	
PP-4	Purchase and Install storm shutters for the Old Marine Science Center	Tornado, Storm Surge, Hurricane, Severe Weather	1.1	High	City Water and Sewer Department	Existing Budget; HMGP	2020	Carried Forward	Revised
PP-5	Purchase and Install Shutters for the Guard House.	Tornado, Storm Surge, Hurricane, Severe Weather	1.1	High	City Water and Sewer Department	Existing Budget; HMGP	2020	Carried Forward	
PP-6	Construct community safe room	Tornado, Severe Weather	1.1	Low	City Administration	HMGP	2025	New	
PP-7	Anchor HVAC units and Storage Tanks	All	1.1	Moderate	City Water and Sewer Department	TBD	2020	New	
PP-8	Elevate or dry floodproof components or systems vulnerable to flood damage	All	1.1	High	City Water and Sewer Department	TBD	2020	New	
Natural Resource Protection									
NRP-1	Protect existing sand dunes.	Tornado, Storm Surge, Hurricane, Severe Weather, Erosion, Sea Level Rise	1.3 & 3.1	Moderate	City Administration	PDM; FMA; HMGP	2022	Carried Forward	
NRP-2	Build additional sand dunes.	Tornado, Storm Surge, Hurricane, Severe Weather, Erosion, Sea Level Rise	1.3 & 3.1	Moderate	City Administration	Local Funds	2023	Carried Forward	
Structural Projects									
SP-1	Remove submerged hazards from North Beach (pieces of old jetties protrude at low tide but are covered at high tide creating a safety hazard for swimmers).	Storm Surge, Hurricane	3.1	Moderate	City Administration	Local Funds	2022	Carried Forward	
SP-2	Construct flood prevention barriers	Flood	3.1	Moderate	City Administration	Local Funds	2025	New	
SP-3	Construct and/or improve drainage systems to alleviate drainage issues	Flood, Severe Weather, Hurricane	3.1	Moderate	City Administration	Local Funds	2025	New	
Emergency Services									
ES-1	Fixed site generators for critical facilities	All	1.1	High	City Administration	Local Funds	2021	New	
ES-2	Portable generators for critical facilities	All	1.1	High	City Administration	Local Funds	2021	New	
ES-3	Purchase and install generator quick connects and transfer switches for critical facilities	All	1.1	High	City Administration	Local Funds	2021	New	
Public Education & Awareness									
PEA-1	Increase public education and awareness utilizing an all-hazards approach in the City via various outreach methods (print, tv, radio, social media, etc.)	All	2.2	High	City Administration	Local Funds	2020	New	

Appendix A Local Mitigation Plan Review Tool

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APPENDIX A:
LOCAL MITIGATION PLAN REVIEW TOOL

The *Local Mitigation Plan Review Tool* demonstrates how the Local Mitigation Plan meets the regulation in 44 CFR §201.6 and offers States and FEMA Mitigation Planners an opportunity to provide feedback to the community.

- The Regulation Checklist provides a summary of FEMA's evaluation of whether the Plan has addressed all requirements.
- The Plan Assessment identifies the plan's strengths as well as documents areas for future improvement.
- The Multi-jurisdiction Summary Sheet is an optional worksheet that can be used to document how each jurisdiction met the requirements of the each Element of the Plan (Planning Process; Hazard Identification and Risk Assessment; Mitigation Strategy; Plan Review, Evaluation, and Implementation; and Plan Adoption).

The FEMA Mitigation Planner must reference this *Local Mitigation Plan Review Guide* when completing the *Local Mitigation Plan Review Tool*.

Jurisdiction: **Chatham County, GA**	**Title of Plan:** **Chatham County Multi-Jurisdictional Pre-Disaster Hazard Mitigation Plan**	**Date of Plan:** **January 2020**
Local Point of Contact: **Randall Mathews**	**Address:** **124 Bull Street, Room 140** **Savannah, GA 31401**	
Title: **Emergency Preparedness Manager**		
Agency: **Chatham Emergency Management Agency**		
Phone Number: **912-201-4500**	**E-Mail:** **rjmathews@chathamcounty.org**	

State Reviewer:	**Title:**	**Date:**

FEMA Reviewer:	**Title:**	**Date:**
Date Received in FEMA Region ***(insert #)***		
Plan Not Approved		
Plan Approvable Pending Adoption		
Plan Approved		

SECTION 1:
REGULATION CHECKLIST

INSTRUCTIONS: The Regulation Checklist must be completed by FEMA. The purpose of the Checklist is to identify the location of relevant or applicable content in the Plan by Element/sub-element and to determine if each requirement has been 'Met' or 'Not Met.' The 'Required Revisions' summary at the bottom of each Element must be completed by FEMA to provide a clear explanation of the revisions that are required for plan approval. Required revisions must be explained for each plan sub-element that is 'Not Met.' Sub-elements should be referenced in each summary by using the appropriate numbers (A1, B3, etc.), where applicable. Requirements for each Element and sub-element are described in detail in this *Plan Review Guide* in Section 4, Regulation Checklist.

1. REGULATION CHECKLIST **Regulation** (44 CFR 201.6 Local Mitigation Plans)	**Location in Plan (section and/or page number)**	**Met**	**Not Met**
ELEMENT A. PLANNING PROCESS			
A1. Does the Plan document the planning process, including how it was prepared and who was involved in the process for each jurisdiction? (Requirement §201.6(c)(1))	Section 1 (p. 1-27)	X	
A2. Does the Plan document an opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, agencies that have the authority to regulate development as well as other interests to be involved in the planning process? (Requirement §201.6(b)(2))	Section 1.2.2 (p. 8-10), Section 1.2.5 (p.12), Appendix B	X	
A3. Does the Plan document how the public was involved in the planning process during the drafting stage? (Requirement §201.6(b)(1))	Section 1.2.3 – 1.2.4 (p. 10-12); Appendix B	X	
A4. Does the Plan describe the review and incorporation of existing plans, studies, reports, and technical information? (Requirement §201.6(b)(3))	Section 1.2 (p.5-6)	X	
A5. Is there discussion of how the community(ies) will continue public participation in the plan maintenance process? (Requirement §201.6(c)(4)(iii))	Section 5 (p. 265)	X	
A6. Is there a description of the method and schedule for keeping the plan current (monitoring, evaluating and updating the mitigation plan within a 5-year cycle)? (Requirement §201.6(c)(4)(i))	Section 5 (p. 261-265)	X	
ELEMENT A: REQUIRED REVISIONS			
ELEMENT B. HAZARD IDENTIFICATION AND RISK ASSESSMENT			
B1. Does the Plan include a description of the type, location, and extent of all natural hazards that can affect each jurisdiction(s)? (Requirement §201.6(c)(2)(i))	Section 2.5 (p. 57-221)	X	

1. REGULATION CHECKLIST **Regulation** (44 CFR 201.6 Local Mitigation Plans)	Location in Plan (section and/or page number)	Met	Not Met
B2. Does the Plan include information on previous occurrences of hazard events and on the probability of future hazard events for each jurisdiction? (Requirement §201.6(c)(2)(i))	Section 2.5 (p. 57-221)	X	
B3. Is there a description of each identified hazard's impact on the community as well as an overall summary of the community's vulnerability for each jurisdiction? (Requirement §201.6(c)(2)(ii))	Section 2.5 (p. 57-221)	X	
B4. Does the Plan address NFIP insured structures within the jurisdiction that have been repetitively damaged by floods? (Requirement §201.6(c)(2)(ii))	Section 2.5.6 (p. 112)	X	
ELEMENT B: REQUIRED REVISIONS			
ELEMENT C. MITIGATION STRATEGY			
C1. Does the plan document each jurisdiction's existing authorities, policies, programs and resources and its ability to expand on and improve these existing policies and programs? (Requirement §201.6(c)(3))	Section 4 (p. 239-250)	X	
C2. Does the Plan address each jurisdiction's participation in the NFIP and continued compliance with NFIP requirements, as appropriate? (Requirement §201.6(c)(3)(ii))	Section 4 (p. 244 – 246)	X	
C3. Does the Plan include goals to reduce/avoid long-term vulnerabilities to the identified hazards? (Requirement §201.6(c)(3)(i))	Section 3 (p. 222-223)	X	
C4. Does the Plan identify and analyze a comprehensive range of specific mitigation actions and projects for each jurisdiction being considered to reduce the effects of hazards, with emphasis on new and existing buildings and infrastructure? (Requirement §201.6(c)(3)(ii))	Section 3 (p. 223-238), Appendix C	X	
C5. Does the Plan contain an action plan that describes how the actions identified will be prioritized (including cost benefit review), implemented, and administered by each jurisdiction? (Requirement §201.6(c)(3)(iv)); (Requirement §201.6(c)(3)(iii))	Section 3 (p. 223-238)	X	
C6. Does the Plan describe a process by which local governments will integrate the requirements of the mitigation plan into other planning mechanisms, such as comprehensive or capital improvement plans, when appropriate? (Requirement §201.6(c)(4)(ii))	Section 5 (p. 264-265)	X	
ELEMENT C: REQUIRED REVISIONS			
ELEMENT D. PLAN REVIEW, EVALUATION, AND IMPLEMENTATION (applicable to plan updates only)			
D1. Was the plan revised to reflect changes in development? (Requirement §201.6(d)(3))	Section 1.8 (p. 29-44), Section 2.4 (p. 55-56), Annexes	X	

1. REGULATION CHECKLIST **Regulation** (44 CFR 201.6 Local Mitigation Plans)	Location in Plan (section and/or page number)	Met	Not Met
D2. Was the plan revised to reflect progress in local mitigation efforts? (Requirement §201.6(d)(3))	Section 1.3 (p.14-27), Section 3.3 (p.197-209)	X	
D3. Was the plan revised to reflect changes in priorities? (Requirement §201.6(d)(3))	Section 1.3 (p.14-27), Section 3 (p. 223-224)	X	
ELEMENT D: REQUIRED REVISIONS			
ELEMENT E. PLAN ADOPTION			
E1. Does the Plan include documentation that the plan has been formally adopted by the governing body of the jurisdiction requesting approval? (Requirement §201.6(c)(5))	Section 5.1 Plan will be adopted upon receipt of APA letter from FEMA		X
E2. For multi-jurisdictional plans, has each jurisdiction requesting approval of the plan documented formal plan adoption? (Requirement §201.6(c)(5))	Section 5.1 Plan will be adopted upon receipt of APA letter from FEMA		X
ELEMENT E: REQUIRED REVISIONS *E1/E2: plan to be adopted after FEMA approval.*			
ELEMENT F. ADDITIONAL STATE REQUIREMENTS (OPTIONAL FOR STATE REVIEWERS ONLY; NOT TO BE COMPLETED BY FEMA)			
F1. Does the plan document opportunities for participation by neighboring communities, businesses and other interested parties? (Invitation letters, sign in sheets, etc.)	Appendix B	X	
F2. Does the plan document opportunities for public input and participation? (copies of meeting notices, sign in sheets, or other applicable documentation)	Appendix B	X	
F3. Does the plan discuss the review of the following planning mechanisms, at a minimum, for incorporation as applicable? • Comprehensive Plan • Flood Mitigation Assistance Plan (if one exists) • Flood Insurance Study (If one exists) • Community Wildfire Protection Plan • Local Emergency Operations Plan • State Hazard Mitigation Strategy	Section 1.2 (p.5-6), Section 4 (p.239-250)	X	
F4. Has the Critical Facilities Inventory been completed online?	Yes	X	

1. REGULATION CHECKLIST **Regulation** (44 CFR 201.6 Local Mitigation Plans)	Location in Plan (section and/or page number)	Met	Not Met
F5. Have the GMIS Critical Facilities reports and maps, or maps from a superior system, been provided?	Sample GMIS report included in Appendix E; other mapping in Section 2	X	
F6: Has the county included/incorporated their state-provided Hazus-MH report (if available).	Hazus was run with updated local data; State-provided Hazus report in Appendix E	X	
ELEMENT F: REQUIRED REVISIONS			

SECTION 2:
PLAN ASSESSMENT

INSTRUCTIONS: The purpose of the Plan Assessment is to offer the local community more comprehensive feedback to the community on the quality and utility of the plan in a narrative format. The audience for the Plan Assessment is not only the plan developer/local community planner, but also elected officials, local departments and agencies, and others involved in implementing the Local Mitigation Plan. The Plan Assessment must be completed by FEMA. The Assessment is an opportunity for FEMA to provide feedback and information to the community on: 1) suggested improvements to the Plan; 2) specific sections in the Plan where the community has gone above and beyond minimum requirements; 3) recommendations for plan implementation; and 4) ongoing partnership(s) and information on other FEMA programs, specifically RiskMAP and Hazard Mitigation Assistance programs. The Plan Assessment is divided into two sections:

1. Plan Strengths and Opportunities for Improvement
2. Resources for Implementing Your Approved Plan

Plan Strengths and Opportunities for Improvement is organized according to the plan Elements listed in the Regulation Checklist. Each Element includes a series of italicized bulleted items that are suggested topics for consideration while evaluating plans, but it is not intended to be a comprehensive list. FEMA Mitigation Planners are not required to answer each bullet item, and should use them as a guide to paraphrase their own written assessment (2-3 sentences) of each Element.

The Plan Assessment must not reiterate the required revisions from the Regulation Checklist or be regulatory in nature, and should be open-ended and to provide the community with suggestions for improvements or recommended revisions. The recommended revisions are suggestions for improvement and are not required to be made for the Plan to meet Federal regulatory requirements. The italicized text should be deleted once FEMA has added comments regarding strengths of the plan and potential improvements for future plan revisions. It is recommended that the Plan Assessment be a short synopsis of the overall strengths and weaknesses of the Plan (no longer than two pages), rather than a complete recap section by section.

Resources for Implementing Your Approved Plan provides a place for FEMA to offer information, data sources and general suggestions on the overall plan implementation and maintenance process. Information on other possible sources of assistance including, but not limited to, existing publications, grant funding or training opportunities, can be provided. States may add state and local resources, if available.

A. Plan Strengths and Opportunities for Improvement

This section provides a discussion of the strengths of the plan document and identifies areas where these could be improved beyond minimum requirements.

Element A: Planning Process

How does the Plan go above and beyond minimum requirements to document the planning process with respect to:

- *Involvement of stakeholders (elected officials/decision makers, plan implementers, business owners, academic institutions, utility companies, water/sanitation districts, etc.);*
- *Involvement of Planning, Emergency Management, Public Works Departments or other planning agencies (i.e., regional planning councils);*
- *Diverse methods of participation (meetings, surveys, online, etc.); and*
- *Reflective of an open and inclusive public involvement process.*

Element B: Hazard Identification and Risk Assessment

In addition to the requirements listed in the Regulation Checklist, 44 CFR 201.6 Local Mitigation Plans identifies additional elements that should be included as part of a plan's risk assessment. The plan should describe vulnerability in terms of:

1) *A general description of land uses and future development trends within the community so that mitigation options can be considered in future land use decisions;*
2) *The types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard areas; and*
3) *A description of potential dollar losses to vulnerable structures, and a description of the methodology used to prepare the estimate.*

How does the Plan go above and beyond minimum requirements to document the Hazard Identification and Risk Assessment with respect to:

- *Use of best available data (flood maps, HAZUS, flood studies) to describe significant hazards;*
- *Communication of risk on people, property, and infrastructure to the public (through tables, charts, maps, photos, etc.);*
- *Incorporation of techniques and methodologies to estimate dollar losses to vulnerable structures;*
- *Incorporation of Risk MAP products (i.e., depth grids, Flood Risk Report, Changes Since Last FIRM, Areas of Mitigation Interest, etc.); and*
- *Identification of any data gaps that can be filled as new data became available.*

Element C: Mitigation Strategy

How does the Plan go above and beyond minimum requirements to document the Mitigation Strategy with respect to:

- *Key problems identified in, and linkages to, the vulnerability assessment;*
- *Serving as a blueprint for reducing potential losses identified in the Hazard Identification and Risk Assessment;*
- *Plan content flow from the risk assessment (problem identification) to goal setting to mitigation action development;*
- *An understanding of mitigation principles (diversity of actions that include structural projects, preventative measures, outreach activities, property protection measures, post-disaster actions, etc);*
- *Specific mitigation actions for each participating jurisdictions that reflects their unique risks and capabilities;*
- *Integration of mitigation actions with existing local authorities, policies, programs, and resources; and*
- *Discussion of existing programs (including the NFIP), plans, and policies that could be used to implement mitigation, as well as document past projects.*

Element D: Plan Update, Evaluation, and Implementation (***Plan Updates Only***)

How does the Plan go above and beyond minimum requirements to document the 5-year Evaluation and Implementation measures with respect to:

- *Status of previously recommended mitigation actions;*
- *Identification of barriers or obstacles to successful implementation or completion of mitigation actions, along with possible solutions for overcoming risk;*
- *Documentation of annual reviews and committee involvement;*
- *Identification of a lead person to take ownership of, and champion the Plan;*
- *Reducing risks from natural hazards and serving as a guide for decisions makers as they commit resources to reducing the effects of natural hazards;*
- *An approach to evaluating future conditions (i.e. socio-economic, environmental, demographic, change in built environment etc.);*
- *Discussion of how changing conditions and opportunities could impact community resilience in the long term; and*
- *Discussion of how the mitigation goals and actions support the long-term community vision for increased resilience.*

B. Resources for Implementing Your Approved Plan

Ideas may be offered on moving the mitigation plan forward and continuing the relationship with key mitigation stakeholders such as the following:

- *What FEMA assistance (funding) programs are available (for example, Hazard Mitigation Assistance (HMA)) to the jurisdiction(s) to assist with implementing the mitigation actions?*
- *What other Federal programs (National Flood Insurance Program (NFIP), Community Rating System (CRS), Risk MAP, etc.) may provide assistance for mitigation activities?*
- *What publications, technical guidance or other resources are available to the jurisdiction(s) relevant to the identified mitigation actions?*
- *Are there upcoming trainings/workshops (Benefit-Cost Analysis (BCA), HMA, etc.) to assist the jurisdictions(s)?*
- *What mitigation actions can be funded by other Federal agencies (for example, U.S. Forest Service, National Oceanic and Atmospheric Administration (NOAA), Environmental Protection Agency (EPA) Smart Growth, Housing and Urban Development (HUD) Sustainable Communities, etc.) and/or state and local agencies?*

SECTION 3:
MULTI-JURISDICTION SUMMARY SHEET (OPTIONAL)

INSTRUCTIONS: For multi-jurisdictional plans, a Multi-jurisdiction Summary Spreadsheet may be completed by listing each participating jurisdiction, which required Elements for each jurisdiction were 'Met' or 'Not Met,' and when the adoption resolutions were received. This Summary Sheet does not imply that a mini-plan be developed for each jurisdiction; it should be used as an optional worksheet to ensure that each jurisdiction participating in the Plan has been documented and has met the requirements for those Elements (A through E).

MULTI-JURISDICTION SUMMARY SHEET												
#	Jurisdiction Name	Jurisdiction Type (city/borough/ township/ village, etc.)	Plan POC	Mailing Address	Email	Phone	Requirements Met (Y/N)					
							A. Planning Process	B. Hazard Identification & Risk Assessment	C. Mitigation Strategy	D. Plan Review, Evaluation & Implementation	E. Plan Adoption	F. State Require-ments
1	Chatham County	County	Randall Mathews	124 Bull Street Room 140 Savannah, GA 31401	rjmathews@chathamcounty.org	912-201-4500						
2	City of Bloomingdale	City	Ferman Tyler	PO BOX 216 Bloomingdale, GA 31302	chieftyler@bloomingdale-ga.gov	912-748-7261						
3	City of Garden City	City	Corbin Medeiros	160 Main Street Garden City, GA 31408	cmedeiros@gardencity-ga.gov	912-966-7780						
4	City of Pooler	City	Robert Byrd	100 SW US HW 80, Pooler, GA 31322	rbyrd@pooler-ga.gov	912-748-7261						

MULTI-JURISDICTION SUMMARY SHEET												
#	Jurisdiction Name	Jurisdiction Type (city/borough/ township/ village, etc.)	Plan POC	Mailing Address	Email	Phone	Requirements Met (Y/N)					
							A. Planning Process	B. Hazard Identification & Risk Assessment	C. Mitigation Strategy	D. Plan Review, Evaluation & Implementation	E. Plan Adoption	F. State Require-ments
5	City of Port Wentworth	City	Brian Harvey	7224 GA Highway 21 Port Wentworth, Georgia 31407	bharvey@cityofportwentworth.com	912-964-4397						
6	City of Savannah	City	Dave Donnelly	121 East Oglethorpe Avenue Savannah GA 31401	ddonnelly@savannahga.gov	912-652-3812						
7	Town of Thunderbolt	Town	Andrew Bateman	2821 River Drive Thunderbolt, Georgia 31404	abateman@thunderboltga.org	912-354-3892						
8	City of Tybee Island	City	George Shaw	P.O. Box 2749 Tybee Island, GA 31328	gshaw@cityoftybee.org	912-472-5031						
9	Town of Vernonburg	Town	Jimmy Hungerpiller	PO Box 61512 Savannah GA 31420-1512	jrhunger@hungerpiller.com	912-790-7660						

Appendix B Planning Process Documentation

B.1 PLANNING STEP 1: ORGANIZE TO PREPARE THE PLAN

Table B.1 – HMPC Meeting Topics, Dates, and Locations

Meeting Title	Meeting Topic	Meeting Date	Meeting Location
HMPC Mtg. #1 – Project Kickoff	1) Introduction to DMA, CRS, and FMA requirements and the planning process 2) Review of HMPC responsibilities and the project schedule.	March 18, 2019	Crosswinds Gold Club 232 James B. Blackburn Drive, Savannah, GA
HMPC Mtg. #2	1) Review and update plan goals and objectives 2) Report on status of actions from the 2015 plan 3) Complete the capability self-assessment	June 18, 2019	Coastal Botanical Gardens, Main Room 2 Canebrake Road, Savannah, GA
HMPC Mtg. #3	1) Review Draft Hazard Identification & Risk Assessment (HIRA) 2) Draft Mitigation Action Plans	October 17, 2019	Coastal Botanical Gardens, Main Room 2 Canebrake Road, Savannah, GA
HMPC Mtg. #4	1) Review the Draft Hazard Mitigation Plan 2) Solicit comments and feedback	January 15, 2020	City of Savannah, City Hall 4th fl. Conference Room 2 E Bay Street Savannah, GA

Note: All HMPC Meetings were open to the public.

Meeting agendas, minutes, and sign in sheets are provided on the following pages. Presentations referenced in the minutes can be provided upon request.

B.1.1 HMPC Meeting Agendas, Minutes, and Sign-in Sheets

HMPC Meeting 1: March 18, 2019

Chatham County Multi-Jurisdictional Pre-Disaster Hazard Mitigation Plan

Hazard Mitigation Planning Committee Kick-Off Meeting Agenda
Monday, March 18, 2019, 3:00-4:30 p.m.
Held at Crosswinds Golf Club, 232 James B. Blackburn Drive, Savannah, GA 31408

1. Introductions
2. Project Overview
    a. Requirement for Update
    b. Trends in Disasters – Why Plan?
    c. Disaster Mitigation Act (DMA) Requirements
        i. Planning Requirements
        ii. Planning Process Review
            1. Risk Assessment Components and Review of Hazard Identification
    d. Scope of Work
        i. GMIS
3. Project Schedule
4. Plan Website
5. Next Steps
    a. Capability Assessment
    b. Mitigation Action Status Updates
    c. Mitigation Goals Update
6. Questions
7. Adjourn

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2019 Chatham County Multi-Jurisdictional Hazard Mitigation Plan Update

Kick-Off Meeting Notes
March 18, 2019

1. Shelby Myers (GEMA)
    a. Summarized project background
    b. Must update plan every five (5) years
        i. If plan is not updated, then no hazard mitigation funding from FEMA will be available to communities within the County (or will go to bottom of waiting list)
    c. Attendance at this meeting can be used as labor match
    d. All time working on the plan should be documented for labor match
    e. Labor match = hourly rate
        i. Track travel time to and from meeting to include in labor match
        ii. It may be easier to use the FEMA standard match of $25.00 per hour
    f. Current plan expires February 26, 2021

2. David Stroud's Presentation (Wood Environment and Infrastructure Solutions, Inc.)
    a. Melanie Wilson (Executive Director of MPC):
        i. Better development standards needed in areas that flood. If communities are only addressing minimum requirements, then will create problems.
        ii. Wants more details on requirements for redevelopment
        iii. Capability Assessment for each municipality: Wants to know all ordinances, plans, codes, etc. then find gaps that can be addressed.
        iv. Strengthen redevelopment plans
        v. Rather than view areas as either in or out of floodplain, would rather divide County based on flood zones risk (i.e. low risk, medium risk, high risk)
        vi. CEMA and MPC will work together on resiliency issues
        vii. Is Sea Level Rise included in state plan?
            1. Shelby Myers (GEMA): Sea level rise is not addressed in the current HMP but is included in Chatham County's 2015 Disaster Recovery and Redevelopment Plan.
        viii. Georgia Ports Authority should be included due to the Mason Mega Rail railway expansion located at the Port of Savannah's Garden City Terminal. This railway expansion project is currently under construction and scheduled for completion in 2020.
        ix. Property acquisition: Can you rebuild if you engineer way out?

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1. Cannot rebuild if using FEMA funds
    a. Example: If property is acquired using FEMA funds, then cannot rebuild on property in the future

b. Critical Facilities: Add critical facilities from each municipality to existing list
c. Project Schedule: Jurisdictions must provide needed / requested info in timely manner to meet project schedule
d. Capability Assessment
    i. Will be completed by each jurisdiction
    ii. Will be available online
    iii. Any measures not related to mitigation should be called out
    iv. Capability assessment should be completed by mid-May
    v. MPC may not be able to complete its capability assessment by June and may want to provide info first that is more easily obtained.

3. GEMA:
    a. Plan is multijurisdictional
    b. Plan is heavy in nontraditional emergency response
    c. This is a long-range plan and needs participation / input from municipal staff (not just those involved with emergency management issues)
    d. The more projects in multiple plans the better because it reinforces need for these projects to FEMA
    e. Plan will require a lot of work
    f. Plan is important for receiving federal funds in future

Chatham County, GA
Hazard Mitigation Planning Committee – Meeting #1

Monday, March 18th, 3:00 PM

	Name	Organization	Phone	E-Mail
1.	Randall Mathews	CEMA	912-201-4500	rjmathews@chathamcounty.org
2.	DAVID STROUD	WOOD	919-325-6497	david.Stroud@woodplc.com
3.	GERALD ETHRIDGE	GARDEN CITY	912-660-7180	gerald_a_ethridge@yahoo.com
4.	Ferman Tyler	Bloomingdale	912-313-5459	chieftyler@bloomingdale-ga.gov
5.	Corbin Medeiros	Garden City	912-655-6220	cmedeiros@gardencity-ga.gov
6.	Robert Drewry	Chatham Co. Public Works	912-652-6840	rudrewry@chathamcounty.org
7.	Shelby Meyers	GEMA/HS	912 478 7939	Shelby.Meyers@gemaga.gov
8.	CHRIS TOLLESON	GMC	912.660.4847	chris.tolleson@gmcnetwork.com
9.	Jason Patterson	Tybee Fire	912-344-0040	jpatterson@cityoftybee.org
10.	Andrew Cree	ICS	912 652 7345	awcree@chathamcounty.org
11.	DAVE DONNELLY	CoS	912.652.3912	ddonnelly@savannahga.gov
12.	Solomon Roberts	Facilities Maint. & Ops	912 547 3162	SRoberts@ChathamCounty.org
13.	Clinnie Ancrum	Facilities Maint Ops	912 657 7332	cancrum@ChathamCounty.org
14.	Kait Morano	MPC	912	moranok@thempc.org
15.	Melanie Wilson	MPC	912-651-1440	wilsonm@thempc.org
16.	Harold B. Alston	Facilities Maint. Ops.	912 547-3124	lalston@ChathamCounty.org
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HMPC Meeting 2: June 18, 2019

Chatham County Multi-Jurisdictional Pre-Disaster Hazard Mitigation Plan

Hazard Mitigation Planning Committee Meeting #2 Agenda
Time & Date: Tuesday, June 18, 2019, 2:00-4:00 p.m.
Location: Botanical Gardens, 2 Canebrake Rd, Savannah, GA 31419

Agenda

1. Goals and Objectives
    a. Review and update goals from the 2015 plan
    b. Create objectives for each goal
2. Review additional mitigation ideas for new projects
3. Workshop: Review existing mitigation projects
    a. Reporting on actions to be carried forward
4. Next Steps
5. Questions
6. Adjourn

Page 1 of 1

2019 Chatham County Multi-Jurisdictional Hazard Mitigation Plan Update

Meeting #2 Notes
June 18, 2019

1. Additional goals for plan update:
   a. Building resiliency
   b. Addressing new development and post-disaster redevelopment
   c. Protecting natural resources
   d. Adding sustainability to the mitigation goals
2. Order:
   a. Goal – Objective – Project
      i. The mitigation goals are developed in a manner that first identifies a goal, next lists the objectives, and last defines projects that will achieve the goals.
3. New Projects:
   a. Refer to the mitigation ideas document available on the FEMA website to help identify new projects; local planning and regulations, structure and infrastructure projects, natural systems protection, and education and awareness
   b. Also review current Capital Improvement Plans for projects, and other plans such as Comprehensive Plan, Transportation Plans, etc.
   c. Can combine multiple existing projects into new project list
4. Multi-hazard Mitigation Projects
   a. Back-up generators meet requirements for multiple hazards and are funded by FEMA
   b. Safe rooms are fundable by FEMA
   c. FEMA will not fund projects that part of a community's regular duties
5. Miscellaneous
   a. County has Post Development Disaster Recovery Plan that covers all jurisdictions
6. Deadline: July 10, 2019
   a. Deadline for submitting Capability Assessments, Project Status Updates, and Proposed 2020 Mitigation Goals and Objectives

Page 1 of 1

Chatham County, GA
Hazard Mitigation Planning Committee – Meeting #2

Tuesday, June 18th, 2:00 PM

	Name	Organization	Phone	E-Mail
1.	David Stroud	WOOD	919.325 6497	david.stroud@woodplc.com
2.	Ferman Tyler	City of Bloomingdale	912-998-0051	chieftyler@bloomingdale-ga.gov
3.	Michael Whitaker	CEMA	912-429-1463	mawhitaker@chathamcounty.org
4.	James Vickers	CES	912-433-5112	jvickers@chathamems.org
5.	Randall Mathews	CEMA	912-201-4500	rjmathews@chathamcounty.org
6.	Dustin Hetzel	SAC	912-964-0514 x3388	dhetzel@flysav.com
7.	Dave Donnelly	CoS	912.657.3812	ddonnelly@savannahga.gov
8.	John Henry	T'Port	912 665 0365	john.m.henry@[illegible]
9.	Francis A Bateman	Thunderbolt	912-667-9272	abateman@thunderboltga.org
10.	Kait Morano	MPC	912-651-1443	moranok@thempc.org
11.	Nick Batey	ECS.	(912)604-8055	NBATEY@CHATHAMCOUNTY.ORG
12.	Kevin Ralston	SCCPSS	912-675-1816	kevin.ralston@sccpss.com
13.	[illegible]	CEMA	912-233-6333	[illegible]@hotmail.com
14.	Sean Clayton	Thunderbolt P.D.	912-210-2000	sclayton@thunderboltga.org
15.	Ed DiTommaso	GMC	912 596 3407	Ed.DiTommaso@GMCNETWORK.com
16.	Joan Young	APIE	912 547-3180	jyoung@chathamcounty.org
17.	Harold B. Alston	F.M. + OPS	912 547-3124	halston@chathamcounty.org
18.	Ashley Johnson	~~CEMA~~ EMA	912.414.5052	~~ash~~ ajohnson01@csav
19.	Tom McDonald	COS	912 651 6530	tmcdonald@savannahga.gov
20.				

HMPC Meeting 3: October 17, 2019

Chatham County Multi-Jurisdictional Pre-Disaster Hazard Mitigation Plan

Hazard Mitigation Planning Committee Meeting #3 Agenda
Time & Date: Thursday, October 17, 2019, 2:30-4:30 p.m.
Location: Coastal Botanical Gardens, Main Room, 2 Canebrake Road, Savannah, GA 31419

Agenda

1. Review of Planning Process
    a. HIRA Organization in the Plan
2. Review of the HIRA
    a. Hazard Identification
    b. Asset Inventory
    c. Hazard Profiles
    d. Summary of Priority Risk Index
3. Public Outreach Status
4. Review Organization of Jurisdictional Annexes
5. Review of Goals & Objectives
    a. Discuss Mitigation Action Plan Requirements
6. Next Steps
7. Questions
8. Adjourn

Page 1 of 1

Chatham County, GA Hazard Mitigation Plan

Meeting Minutes HMPC Meeting #3
October 17th, 2019 Coastal Botanical Gardens, 2 Canebrake Road, Savannah, GA 31419
October 17, 2019, 2:30 PM

Mr. Stroud from Wood began a presentation on the Hazard Identification and Risk Assessment (HIRA). The presentation described the 6 specific sections that are included in the HIRA from Hazard Identification to the conclusion on the Hazard Risks.

Chatham County questioned the number of Disaster Declarations; however, the Emergency Declarations were not provided in the presentation but were included in the draft HIRA>

Mr. Stroud explained all natural and technological hazards that were profiled including:

- Dam failure
- Drought
- Earthquake
- Erosion
- Extreme Heat
- Flood
- Hurricane and Tropical Storm
- Sea Level Rise
- Severe Weather (Thunderstorm, Lightning & Hail)
- Severe Winter Storm
- Tornado
- Wildfire
- Hazard Materials Incident
- Terror Threat

There were questions on National Center for Environmental Information (NCEI) and how it did not include all storm events or all losses; however, this is national data that is supported by local emergency managers and storm spotters. Updates to this national data by local governments must be footed noted that it was changed by the HMPC.

Additionally, 1 recent tornado was including in the national data base which occurred in the Skidaway area of the County. This will be added to map and to the data for Tornados.

The Priority Risk Index (PRI) was described as a methodology to make accurate comparisons of various natural hazards (comparing apples to apples).

Finally, the rating of hazards was presented from high to medium to low based on the PRI.

Mr. Stroud asks for all to review the HIRA and provide comments via the multi-jurisdictional website at www.chathamcountyga-hmp.com

Chatham County, GA
Hazard Mitigation Planning Committee – Meeting #3

Thursday, October 17th, 2:30 PM

	Name	Organization	Phone	E-Mail
1.	DAVID Stroud	WWD	9193256497	david.Stroud
2.	Randall Matthews	CEMA	912-201-4500	rjmatthews@chathamcounty.org
3.	DENNIS JONES	CEMA	912-201.4500	djones@chathamcounty.org
4.	James Vickers	CES	912-433-5112	jvickers@chatham.org
5.	Justin Pratt	SCCPSS	912 222 6998	Justin.Pratt@sccpss.com
6.	Sean Clayton	Thunderbolt P.D.	912-354-3818	sclayton@thunderboltga.org
7.	DAVID DONNELLY	SAVANNAH	912.652.3802	ddonnelly@savannahga.gov
8.	Dustin Hetzel	Savannah Airport	912 433 5778	dhetzel@flysav.com
9.	Nick Batey	I.C.S.	(912) 652-7344	NBATEY@CHATHAMCOUNTY.ORG
10.	George Shaw	Tybee Island	912 472-5031	gshaw@cityoftybee.org
11.	KAITI MORANO	MPC	912-651-1413	moranok@thempc.org
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HMPC Meeting 4: January 15, 2020

Chatham County Multi-Jurisdictional Pre-Disaster Hazard Mitigation Plan

Hazard Mitigation Planning Committee Meeting #4 Agenda

Time & Date: Wednesday, January 15, 2020, 12:30 p.m.

Location: City of Savannah, City Hall, 4th Floor Conference Room, 2 E. Bay St., Savannah, GA

Agenda

1. Planning Process Review
2. Structure of the Plan Document
3. Review of Key Plan Components
    a. Hazards & Priority Risk Index
    b. Goals & Objectives
    c. Mitigation Actions
4. Plan Implementation and Maintenance
    a. Integration with Other Plans
    b. Completing the Planning Process
5. Next Steps & Questions
6. Adjourn

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2019 Chatham County Multi-Jurisdictional Hazard Mitigation Plan Update

Meeting #4 Notes
January 15, 2020

1. Survey responses
    a. All responses were from website (no response from hard copies)
    b. May have received more responses if survey remained open through October rather than having ended in September
2. Cyber threats not included in terror/technological threats
    a. FEMA only considers natural hazards
    b. HMP is intended to help with funding so no real application for cyber threats
3. The hazard summary is beneficial for those that don't read entire plan
4. GEMA / Randall Mathews:
    a. Once plan is adopted, GEMA will hold meetings with communities for specific projects
    b. Labor match form will be sent along with HMP
5. FEMA likes to see flood mitigation projects (or repetitive loss properties) in multiple plans: Flood Mitigation Plans, Hazard Mitigation Plans, etc.

Page 1 of 1

GMC

wood.

Chatham County, GA
Hazard Mitigation Planning Committee – Meeting #4

Wednesday, January 15th, 12:30 PM

	Name	Organization	Phone	E-Mail
1.	DAVID STROUD	WOOD	(919) 325-6497	david.Stroud@woodplc.com
2.	Dustin Hetzel	Savannah Airport		dhetzel@flysav.com
3.	Vick Batey	CHATHAM EMS.	(912) 652-7344	NBATEY@CHATHAMCOUNTY.ORG
4.	Anthony Stephens	Chatham County EMA	912 651 0481	astephens@chathamcounty.org
5.	Justin Pratt	Chatham BOE	912 328 9649	Justin.Pratt@SCCPSS.com
6.	Randall Mathews	CEMA	912 658 7847	rjmathews@chatham county.org
7.	Gloria Williams	CBVA	(912) 235-6337	gloriawilliams1@hotmail.com
8.	CHRIS TOLLESON	GMC	(912) 660-4847	chris.tolleson@gmcnetwork.com
9.	Michael Blakely	Chatham County	(912) 652-7804	mblakely@chathamcounty.org
10.	Tom McDonald	City of Sav.	(912) 651-6530	tmcdonald@Savannahga.gov
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B.2 PLANNING STEP 2: INVOLVE THE PUBLIC

Table B.2 – Public Meeting Topics, Dates, Locations

Meeting Title	Meeting Topic	Meeting Date	Meeting Location
Public Meeting #1	1) Introduction to DMA, CRS, and FMA requirements and the planning process 2) Review of HMPC responsibilities and the project schedule	March 18, 2019	Crosswinds Golf Club 232 James B. Blackburn Drive, Savannah, GA
Public Meeting #2	1) Review "Draft" Hazard Mitigation Plan 2) Solicit comments and feedback	January 15, 2020	CEMA 124 Bull Street, Rm. 140 Savannah, GA

B.2.1 Public Meeting Agendas, Minutes, Sign-in Sheets, and Announcements

Public Meeting 1: March 18, 2019

Chatham County Multi-Jurisdictional Pre-Disaster Hazard Mitigation Plan

Public Kick-Off Meeting Agenda
Monday, March 18, 2019, 5:30-6:30 p.m.
Held at Crosswinds Golf Club, 232 James B. Blackburn Drive, Savannah, GA 31408

1. Introductions
2. Project Overview
    a. Requirement for Update
    b. Trends in Disasters – Why Plan?
    c. Disaster Mitigation Act (DMA) Requirements
        i. Planning Requirements
        ii. Planning Process Review
            1. Risk Assessment Components and Review of Hazard Identification
    d. Scope of Work
        i. GMIS
3. Project Schedule
4. Plan Website & Public Survey
5. Questions
6. Adjourn

Page 1 of 1

Chatham County, GA
Hazard Mitigation Planning Public Meeting #1

Monday, March 18th, 5:30 PM

	Name	Organization (/ resident of)	Phone	E-Mail
1.	DAVID STROUD	WOOD	919-325-6497	david.Stroud@woodplc.com
2.	Randall Mathews	CEMA	912-201-4500	rjmathews@chathamcounty.org
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Chatham County Board of Commissioners
124 Bull Street, Savannah, GA 31401

NEWS RELEASE

For Immediate Release
March 15, 2019

Process Begins to Update the Chatham County Pre-Disaster Hazard Mitigation Plan

Chatham County, GA (March 15, 2019) - The 2015 Chatham County Pre-Disaster Hazard Mitigation Plan is being updated to meet the Federal Emergency Management Agency (FEMA) Disaster Mitigation Act and Georgia Emergency Management requirements. This plan includes all municipalities in Chatham County and must be updated every 5 years to remain eligible for FEMA pre and post-disaster grant funding.

A public kickoff meeting will begin at 5:30 PM on March 18, 2019, at the Crosswinds Golf Club. The public is encouraged to attend to receive details about the planning process and information on the natural hazards impacting Chatham County. A hazard mitigation planning website has been developed to provide information throughout the planning process at http://www.chathamcountyga-hmp.com/. Included on the website is a public survey to assess citizen's current knowledge on local hazards and what mitigation actions the public considers most effective.

What: Kickoff meeting discussing updates to the 2015 Chatham County Pre-Disaster Hazard Mitigation Plan

When: March 18, 2019, at 5:30 PM

Where: Crosswinds Golf Club, 232 James B. Blackburn Drive, Savannah, GA 31408

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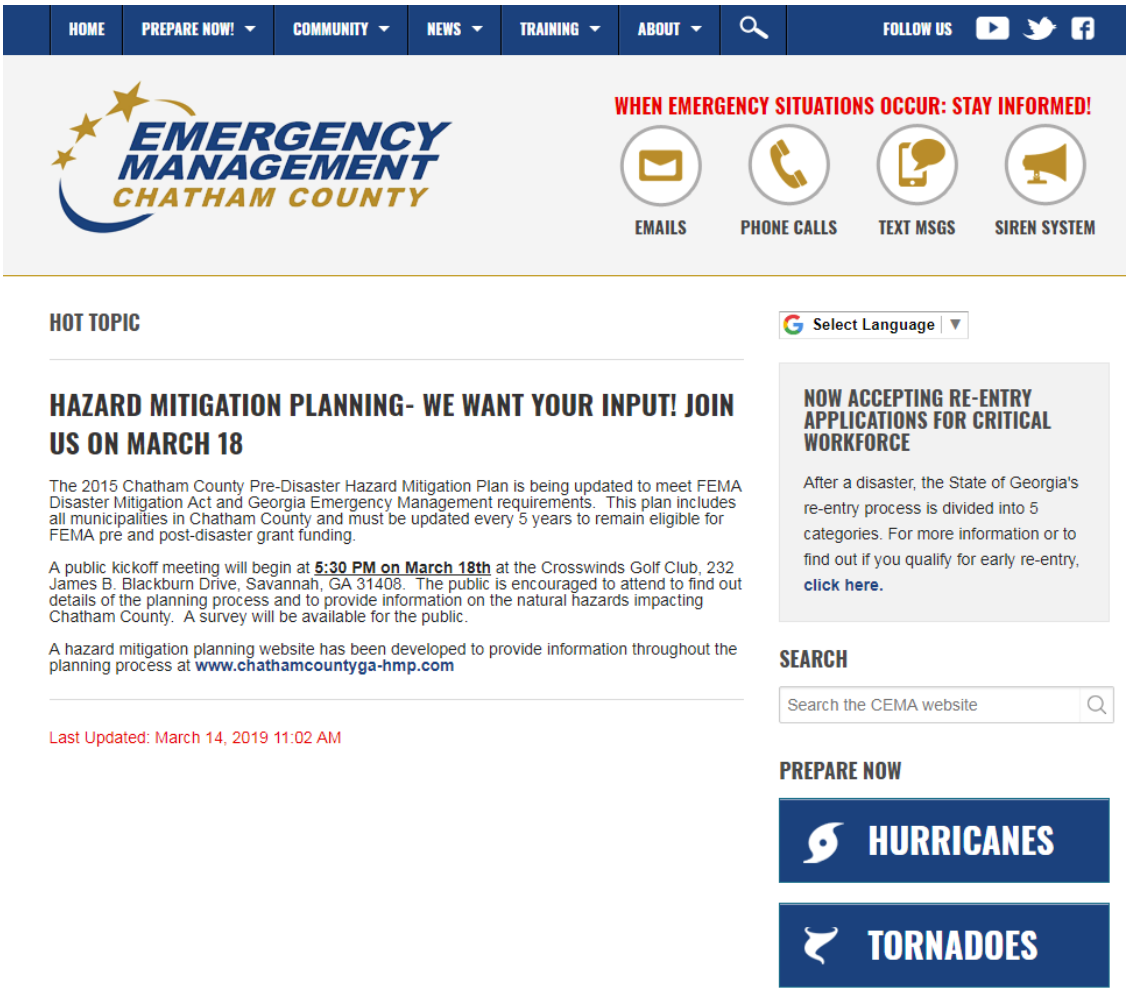
Contact:
Catherine Glasby
Public Information Director
Chatham County, GA
Office: (912)652-7897
Email: cnglasby@chathamcounty.org



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EMERGENCY MANAGEMENT CHATHAM COUNTY

WHEN EMERGENCY SITUATIONS OCCUR: STAY INFORMED!

EMAILS PHONE CALLS TEXT MSGS SIREN SYSTEM

HOT TOPIC

HAZARD MITIGATION PLANNING- WE WANT YOUR INPUT! JOIN US ON MARCH 18

The 2015 Chatham County Pre-Disaster Hazard Mitigation Plan is being updated to meet FEMA Disaster Mitigation Act and Georgia Emergency Management requirements. This plan includes all municipalities in Chatham County and must be updated every 5 years to remain eligible for FEMA pre and post-disaster grant funding.

A public kickoff meeting will begin at **5:30 PM on March 18th** at the Crosswinds Golf Club, 232 James B. Blackburn Drive, Savannah, GA 31408. The public is encouraged to attend to find out details of the planning process and to provide information on the natural hazards impacting Chatham County. A survey will be available for the public.

A hazard mitigation planning website has been developed to provide information throughout the planning process at **www.chathamcountyga-hmp.com**

Last Updated: March 14, 2019 11:02 AM

Select Language

NOW ACCEPTING RE-ENTRY APPLICATIONS FOR CRITICAL WORKFORCE

After a disaster, the State of Georgia's re-entry process is divided into 5 categories. For more information or to find out if you qualify for early re-entry, **click here.**

SEARCH

Search the CEMA website

PREPARE NOW

HURRICANES

TORNADOES


PLEASE REGISTER FOR ALERTS HERE TO RECEIVE EMERGENCY & COMMUNITY NOTIFICATIONS ON YOUR PHONE!
GARDEN CITY
GEORGIA
Calendar
FAQs
Document Central
Contact Us
Staff Login
Translate
Search...
ABOUT GARDEN CITY
CITY GOVERNMENT
PLANNING & ECONOMIC DEVELOPMENT
FOR RESIDENTS
FOR BUSINESS
CONVENTION & VISITORS
City Hall
Garden City Town Center
Visitor's Bureau
FAQ
50th Anniversary Book
News
Event Calendar
About Garden City » Vision CNT Components »
Garden City News Worthy Items
Font Size:
Share & Bookmark
Feedback
Print
Update of 2015 Chatham County Pre-Disaster Hazard Mitigation Plan
Post Date: 03/11/2019 5:10 PM
The 2015 Chatham County Pre-Disaster Hazard Mitigation Plan is being updated to meet FEMA Disaster Mitigation Act and Georgia Emergency Management requirements. This plan includes all municipalities in Chatham County and must be updated every 5 years to remain eligible for FEMA pre and post-disaster grant funding.
A public kickoff meeting will begin at 5:30 PM on March 18th at the Crosswinds Golf Club, 232 James B. Blackburn Drive, Savannah, GA 31408. The public is encouraged to attend to find out details of the planning process and to provide information on the natural hazards impacting Chatham County. A public survey will be available for the public.
A hazard mitigation planning website has been developed to provide information throughout the planning process at www.chathamcountyga-hmp.com

Public Meeting 2: January 15, 2020

Chatham County Multi-Jurisdictional Pre-Disaster Hazard Mitigation Plan

Public Meeting #2 Agenda
Wednesday, January 15, 2020, 2:30 p.m.
Held at CEMA, 124 Bull Street, Room 140, Savannah, GA 31401

1. Introductions
2. Planning Process Overview
3. Structure of the Plan Document
4. Review of Key Plan Components
    a. Hazards & Priority Risk Index
    b. Goals & Objectives
    c. Mitigation Actions
5. Plan Implementation and Maintenance
    a. Integration with Other Plans
    b. Completing the Planning Process
6. Questions
7. Adjourn

Page 1 of 1

Chatham County, GA
Hazard Mitigation Planning Public Meeting #2

Wednesday, January 15th, 2:30 PM

	Name	Organization (/ resident of)	Phone	E-Mail
1.	DAVID STROUD	WOOD	(919) 325-6497	david.stroudewoodpc.com
2.	TOM MCDONALD	CITY OF SAVANNAH	(912) 651-6530 X1895	tmcdonald@savannahga.gov
3.	Jay Jones	Chatham County	(912) 547-7120	jay.jones@chathamcounty.org
4.	Randall Mathews	CEMA	912-201-4500	rjmathews@chathamcounty.org
5.	Michael BLAKELY	Chatham Co. Engr.	912 652-7814	mblakely@chathamcounty
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Chatham County Board of Commissioners
124 Bull Street, Savannah, GA 31401

Public Meeting Notice

For Immediate Release
January 13, 2020

Chatham County, GA Hazard Mitigation Plan Public Meeting

Chatham County, GA (January 13, 2020) - Chatham County and the incorporated municipalities will be holding a public meeting to discuss the 2020 draft hazard mitigation plan. This plan focusing on natural hazards is required by FEMA to be updated every 5 years to remain eligible for future federal disaster assistance funding.

When: January 15, 2020 at 2:30pm

Where: Chatham County Legislative Courthouse, 124 Bull Street, Ste. 140 (CEMA Office)

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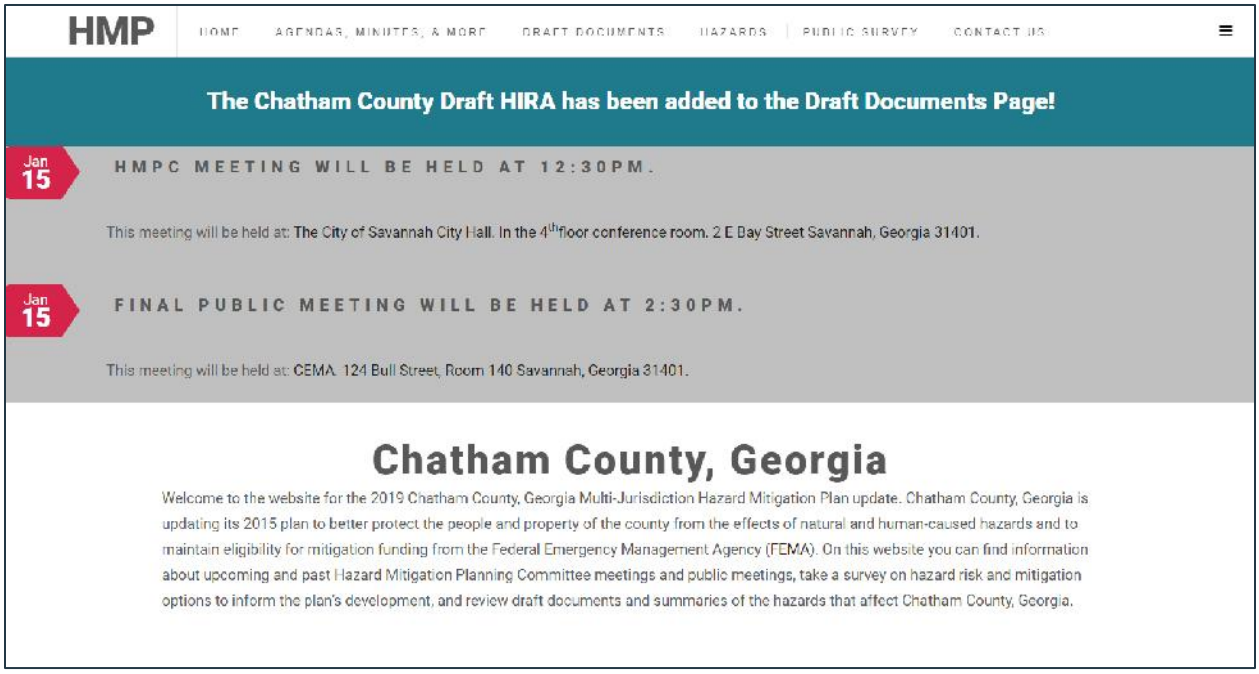
Contact:
Catherine Glasby
Public Information Office
Chatham County, GA
Office: (912)652-7897
Email: cnglasby@chathamcounty.org


HMP
HOME
AGENDAS, MINUTES, & MORE
DRAFT DOCUMENTS
HAZARDS
PUBLIC SURVEY
CONTACT US
The Chatham County Draft HIRA has been added to the Draft Documents Page!
Jan 15
HMPC MEETING WILL BE HELD AT 12:30PM.
This meeting will be held at: The City of Savannah City Hall. In the 4th floor conference room. 2 E Bay Street Savannah, Georgia 31401.
Jan 15
FINAL PUBLIC MEETING WILL BE HELD AT 2:30PM.
This meeting will be held at: CEMA. 124 Bull Street, Room 140 Savannah, Georgia 31401.
Chatham County, Georgia
Welcome to the website for the 2019 Chatham County, Georgia Multi-Jurisdiction Hazard Mitigation Plan update. Chatham County, Georgia is updating its 2015 plan to better protect the people and property of the county from the effects of natural and human-caused hazards and to maintain eligibility for mitigation funding from the Federal Emergency Management Agency (FEMA). On this website you can find information about upcoming and past Hazard Mitigation Planning Committee meetings and public meetings, take a survey on hazard risk and mitigation options to inform the plan's development, and review draft documents and summaries of the hazards that affect Chatham County, Georgia.

B.2.2 Public Survey

Chatham County distributed a public survey, shown below, that requested public input into the Hazard 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 announced at the first public meeting, provided via a link on participating jurisdictions web and social media accounts, and made available online on the plan website.

Chatham County Multi-Jurisdictional Hazard Mitigation Plan
Public Survey

Online version can be found at: https://www.surveymonkey.com/r/ChathamGA-HMP

Chatham County, along with its local jurisdictions, is updating the Multi-Jurisdictional Hazard Mitigation Plan to assess and minimize risk to natural hazards, and your participation is important to us. Your input will help us to better understand the vulnerabilities within the County and how to best mitigate or reduce the impacts of these hazards. **Please help us by completing this survey by Friday, June 28th and returning it to:**

Abby Moore, Wood
4021 Stirrup Creek Drive, Suite 100, Durham, NC 27703
Or by email to: abigail.moore@woodplc.com

This survey can also be completed online at: https://www.surveymonkey.com/r/ChathamGA-HMP

If you have any questions about this survey or want to learn about more ways to participate in the Chatham County Multi-Jurisdictional Hazard Mitigation Plan update, please contact the planning consultant for the project, David Stroud with Wood, at 919-765-9986 or by email at david.stroud@woodplc.com. You can also visit the project website at www.ChathamCountyGA-HMP.com.

BACKGROUND INFORMATION

1. Where do you live?
   - ☐ Unincorporated Chatham County
   - ☐ Bloomingdale
   - ☐ Garden City
   - ☐ Pooler
   - ☐ Port Wentworth
   - ☐ Savannah
   - ☐ Thunderbolt
   - ☐ Tybee Island
   - ☐ Other: _____
2. Do you rent or own your home?
   - ☐ Rent
   - ☐ Own
3. How prepared do you feel for a hazard event?
   - ☐ Not at all prepared ☐ Somewhat prepared ☐ Very prepared
4. Do you know where evacuation centers or storm shelters are?
   - ☐ Yes
   - ☐ No
5. Are you able to evacuate or take shelter if necessary?
   - ☐ Yes
   - ☐ No
6. Do you know where/how to get more information on hazard risk and preparedness?
   - ☐ Yes
   - ☐ No

1

HAZARD INFORMATION

7. The hazards addressed in the Hazard Mitigation Plan are listed below. Please indicate the level of significance that you perceive for each hazard. Please rate these hazards 1 through 3 as follows: 1=low, 2=moderate, 3=high.

_____ Dam/Levee Failure	_____ Sea Level Rise
_____ Drought	_____ Severe Weather (Thunderstorm/Lightning/Hail)
_____ Earthquake	_____ Severe Winter Storm
_____ Extreme Heat	_____ Tornado
_____ Erosion	_____ Wildfire
_____ Flood	_____ Hazardous Materials Incident
_____ Hurricane & Tropical Storm	_____ Terrorism
_____ Storm Surge	_____ Other

8. Describe specific hazard issues/problem areas that you would like the planning committee to consider.

9. Describe any actions you have taken to mitigate hazard risk for your family, home, or neighborhood.

10. Which categories of mitigation actions do you feel would be most effective?

- ☐ Preventive activities (e.g. planning and zoning, building codes)
- ☐ Property protection (e.g. retrofitting, insurance, flood prone property buyout)
- ☐ Natural resource protection (e.g. wetlands protection, erosion control, forest health protection)
- ☐ Emergency services (e.g. hazard threat recognition, hazard warning systems, critical facilities protection)
- ☐ Structural projects (e.g. storm drain improvements, hazardous tree removal,
- ☐ Public information (e.g. outreach projects, environmental education, public education)

11. What is the best way for you to receive information about how to make your family, home, or neighborhood more resilient to hazards? Please check all that apply.

☐ Television News/Advertisements	☐ County/City/Town website
☐ Radio News/Advertisements	☐ County/City/Town social media
☐ Public Forums/Workshops	☐ Email
☐ Public Library	☐ Text messages
☐ Print Media – newspaper, phone book, informational brochures	☐ Other _____

Thank you for your input!

Please provide your name and email below if you would like to be informed of future meetings related to the planning process.

Name: _____ Email: _____

2

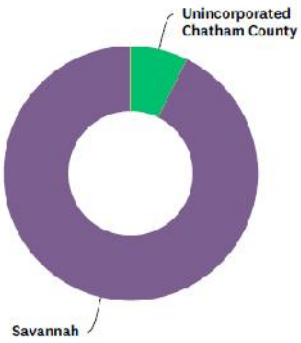
The County received 70 responses to the survey. The following bullet points summarize significant findings from the survey. Key questions and responses are detailed in Figure B.1 through Figure B.11.

- 91% of responses were from the City of Savannah, 7% were from unincorporated Chatham County, and 2% were write-ins with specific neighborhoods.
- Only 5.8% of respondents say they feel not at all prepared for a hazard event; 73.9% feel somewhat prepared and 20.3% feel very prepared.
- 46.4% of respondents do not know where evacuation centers or storm shelters are located; however, 97.1% of respondents say they are able to evacuate or take shelter if necessary, which indicates that most people manage evacuating or taking shelter through their own resources. It is possible that these results skew toward those with more awareness of hazard risk and resources to respond.
- 22.9% of respondents do not know where to get more information on hazard risk and preparedness.
- Hurricane & tropical storm was by far rated the most significant hazard, followed by flood, extreme heat, storm surge, sea level rise, and severe weather. Dam/levee failure was rated the least significant hazard, followed by severe winter storm, and wildfire.
- Many respondents reported having taken steps to mitigate risk at home; these efforts include prevention, property protection, and preparedness measures.
- Respondents largely favored structural projects, natural resource protection, and preventative activities, and emergency services options for mitigation.

Figure B.1 – Survey Response, County of Residence

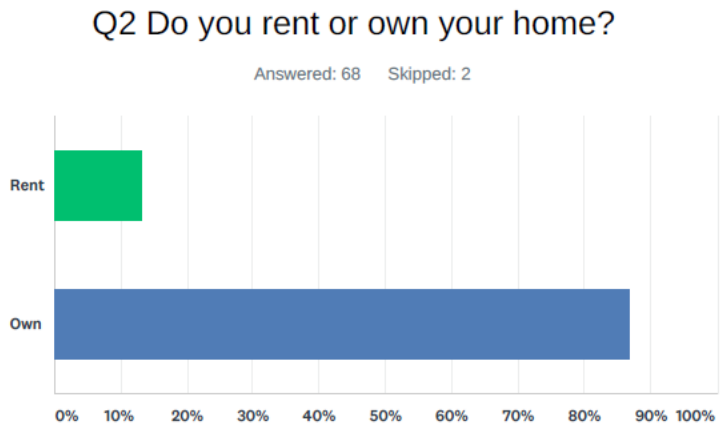
Q1 Where do you live?

Answered: 69 Skipped: 1



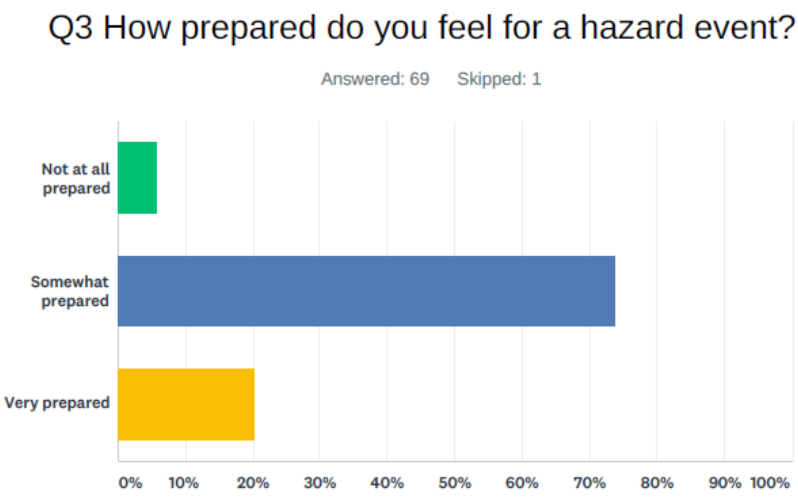
ANSWER CHOICES	RESPONSES	
Unincorporated Chatham County	7.25%	5
Bloomingdale	0.00%	0
Garden City	0.00%	0
Pooler	0.00%	0
Port Wentworth	0.00%	0
Savannah	91.30%	63
Thunderbolt	0.00%	0
Tybee Island	0.00%	0
TOTAL		69

Figure B.2 – Survey Response, Home Ownership



ANSWER CHOICES	RESPONSES	
Rent	13.24%	9
Own	86.76%	59
TOTAL		68

Figure B.3 – Survey Response, Preparedness

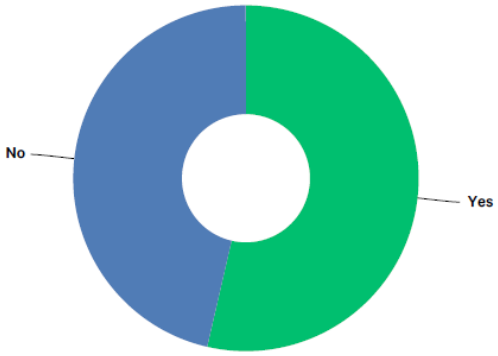


ANSWER CHOICES	RESPONSES	
Not at all prepared	5.80%	4
Somewhat prepared	73.91%	51
Very prepared	20.29%	14
TOTAL		69

Figure B.4 – Survey Response, Evacuation Center/Shelter Awareness

Q4 Do you know where evacuation centers or storm shelters are?

Answered: 69 Skipped: 1

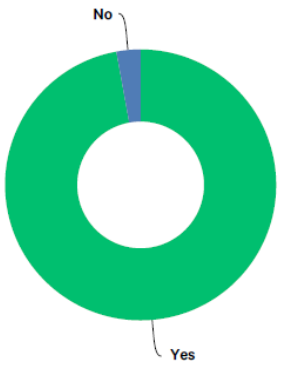


ANSWER CHOICES	RESPONSES	
Yes	53.62%	37
No	46.38%	32
TOTAL		69

Figure B.5 – Survey Response, Ability to Evacuate/Take Shelter

Q5 Are you able to evacuate or take shelter if necessary?

Answered: 70 Skipped: 0

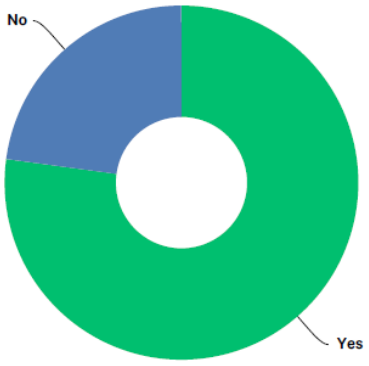


ANSWER CHOICES	RESPONSES	
Yes	97.14%	68
No	2.86%	2
TOTAL		70

Figure B.6 – Survey Response, Knowledge of Where to Find Hazard Information

Q6 Do you know where/how to get more information on hazard risk and preparedness?

Answered: 70 Skipped: 0



ANSWER CHOICES	RESPONSES	
Yes	77.14%	54
No	22.86%	16
TOTAL		70

Figure B.7 – Survey Response, Hazard Significance Ratings

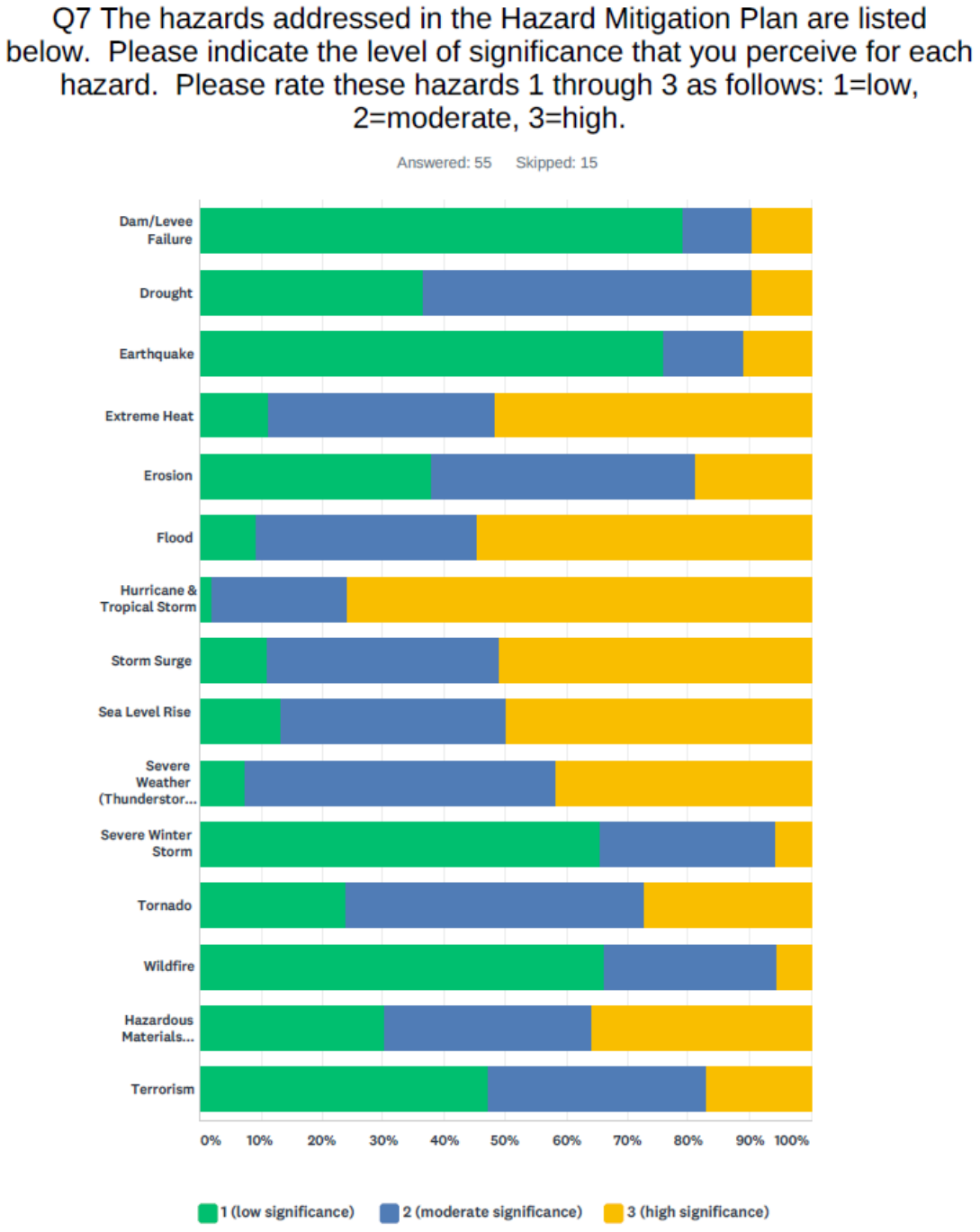


Figure B.8 – Survey Response, Key Hazard Issues/Concerns

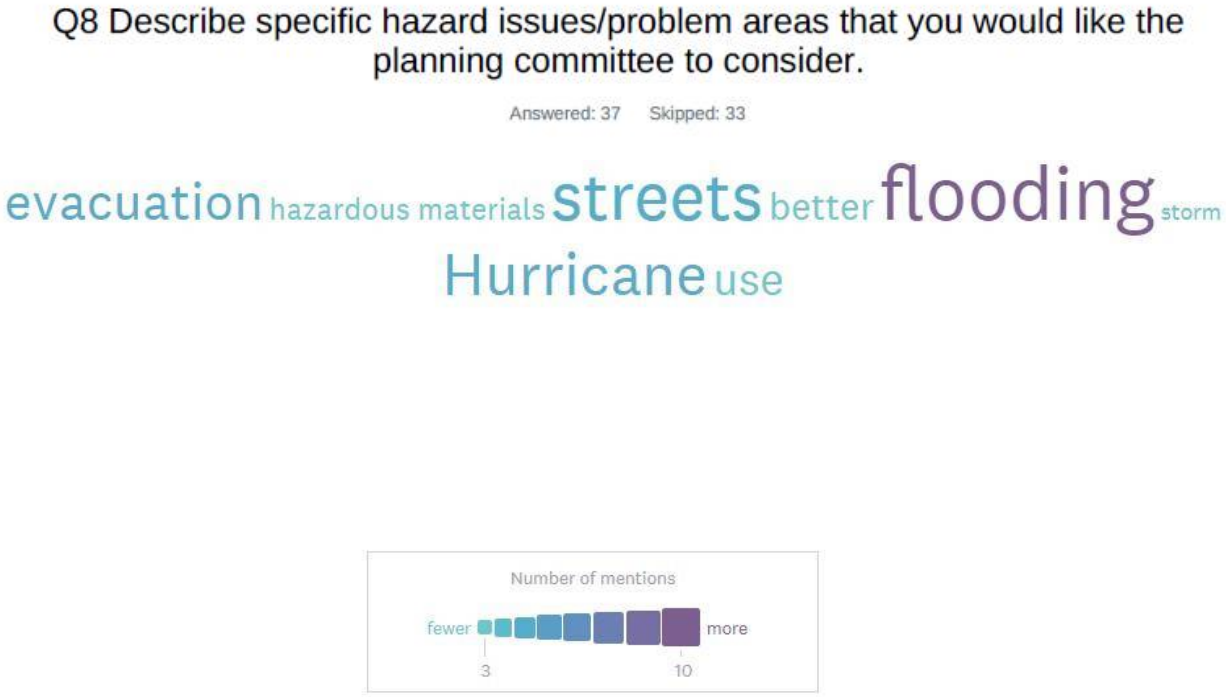


Figure B.9 – Survey Response, Personal Actions Taken for Mitigation

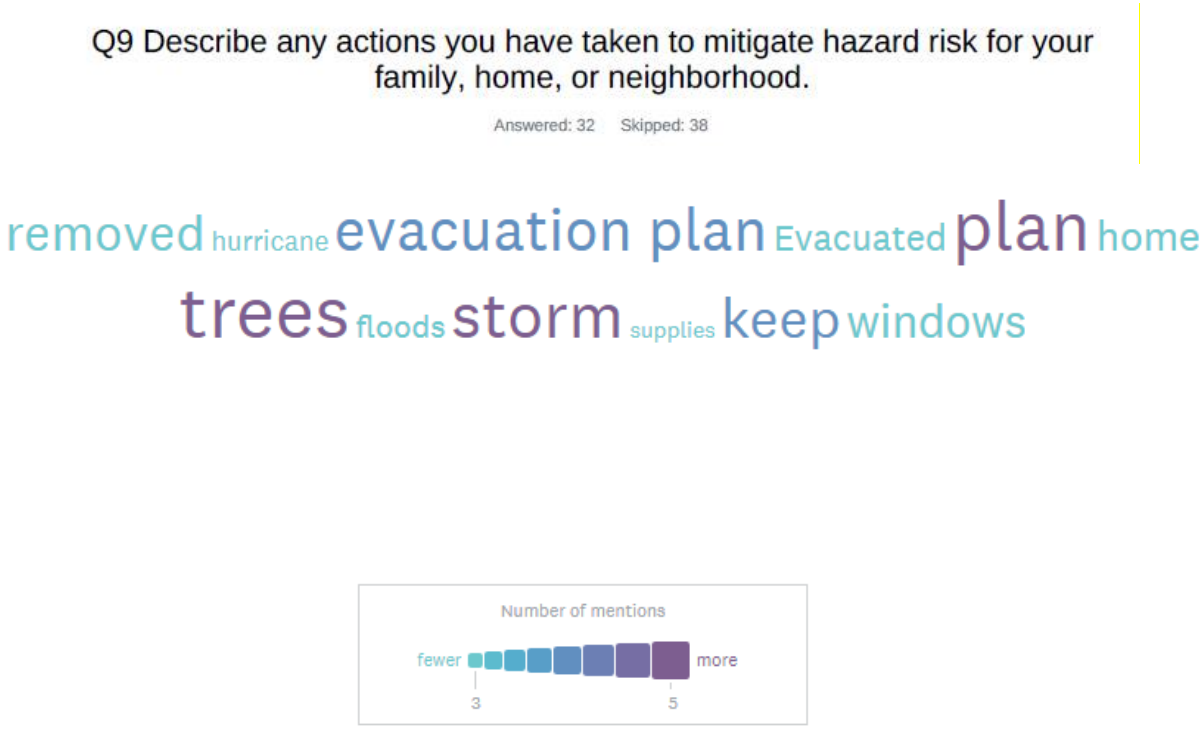
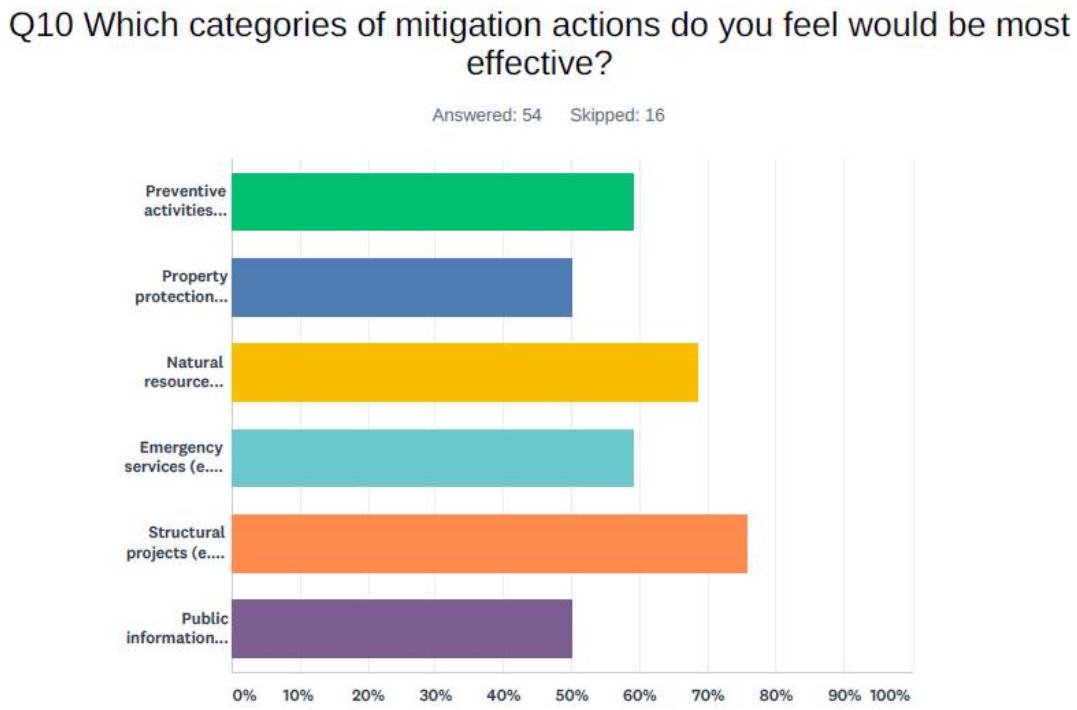
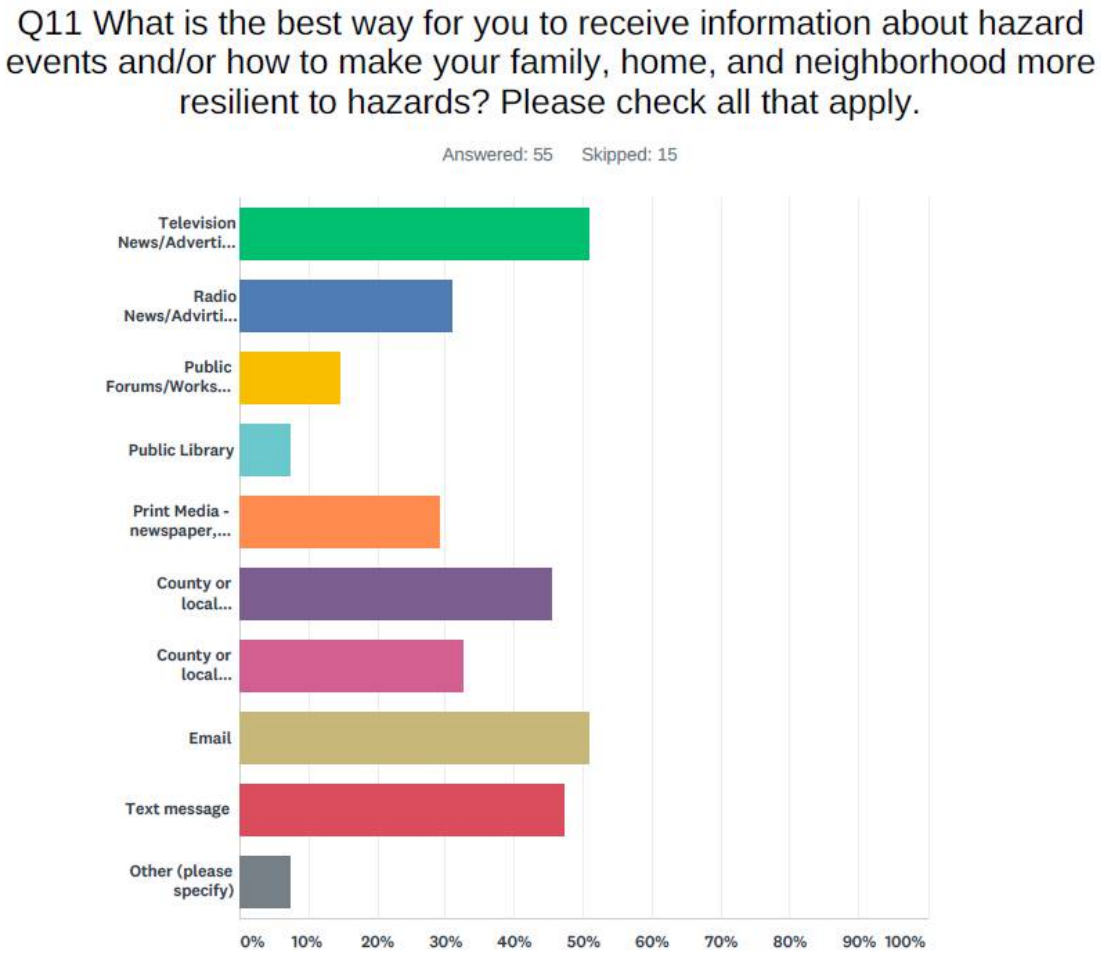


Figure B.10 – Survey Response, Preferred Mitigation Categories



ANSWER CHOICES	RESPONSES	
Preventive activities (e.g. planning and zoning, building codes)	59.26%	32
Property protection (e.g. retrofitting, insurance, flood prone property buyout)	50.00%	27
Natural resource protection (e.g. wetlands protection, erosion control, forest health protection)	68.52%	37
Emergency services (e.g. hazard threat recognition, hazard warning systems, critical facilities protection)	59.26%	32
Structural projects (e.g. storm drain improvements, hazardous tree removal,	75.93%	41
Public information (e.g. outreach projects, environmental education, public education)	50.00%	27
Total Respondents: 54		

Figure B.11 – Survey Response, Preferred Public Outreach Methods



B.3 PLANNING STEP 3: COORDINATE

This planning step credits the incorporation of other plans and other agencies' efforts into the development of the Hazard Mitigation Plan. Other agencies and organizations must be contacted to determine if they have studies, plans and information pertinent to the Hazard 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. Stakeholders were involved through specific requests for data to support the development of the plan, and through direct invitations to participate on the HMPC.

To incorporate additional stakeholder input in the plan, various stakeholders were identified by the HMPC and sent an invitation to review the draft plan and provide feedback and comments. The coordination letter, sent via email, is provided below. A list of stakeholders contacted is provided in Table B.3.

From: Moore, Abigail
Sent: Thursday, January 16, 2020 10:03 AM
To: communications@scad.edu; shearerle@mail.armstrong.edu; chodges@effinghamcounty.org; fhowell@bryan-county.org; larry.logan@libertycountyga.com; neilb@bcgov.net; emergencymanagement@jaspercountsc.gov; susan.wilson@fema.dhs.gov; janice.mitchell@fema.dhs.gov; shopfensperger@iso.com; ewstrom@usgs.gov; nws.charlestonsc@noaa.gov; cesas-rd@usace.army.mil; kristen.higgs@gema.ga.gov; shelby.meyers@gema.ga.gov; terry.lunn@gema.ga.gov; jennifer.kline@dnr.ga.gov; Haydn.blaize@dnr.ga.gov; esther.sheppard@redcross.org; mary.landers@savannahnow.com; sgalloway@wtoc.com; hlloyd@savannahga.gov; ttyus@wsav.com; kmoore@gaconservancy.org; karen@savannahtree.com; karengrainey@bellsouth.net
Cc: Stroud, David A; Randall Mathews; Dennis Jones
Subject: Chatham County Hazard Mitigation Plan Draft Available for Review

Good morning!

Chatham County and its incorporated jurisdictions are developing an update to the Chatham County Pre-Disaster Multi-Jurisdictional Hazard Mitigation Plan. To assist with this process, the County and the Hazard Mitigation Planning Committee are seeking stakeholder input and expertise to support the planning effort by providing feedback on the draft plan.

We invite you to review the draft plan, which has been posted on the plan website, here: http://www.chathamcountyga-hmp.com/draftDocuments.html. This website also contains information on the planning process if you are interested in learning more about this effort. We appreciate any input you may wish to share! Please feel free to share this information with anyone else who may be interested in reviewing the plan, and please email any comments or feedback on the draft plan to david.stroud@woodplc.com by Tuesday, January 28th.

Thank you for your assistance in this important effort to make our communities safer and more resilient to hazards!

Abby Moore, CFM
Hazard Mitigation & Resiliency Planner
Direct: +1 (919) 768 9927
www.woodplc.com

wood.

Table B.3 – Stakeholder List

First Name	Last Name	Organization
Educational Institutions		
Phillip	Adams	Savannah State University, University Advancement
Paula	Wallace	Savannah College of Art & Design
Wei	Tu	Georgia Southern University, Geology & Geography
Letty	Shearer	Armstrong State University
Surrounding Municipalities		
Clint	Hodges	Effingham County, Emergency Management
Freddy	Howell	Bryan County, Emergency Services
Larry	Logan	Liberty County, Emergency Management Agency Director
Lt. Col. Neil	Baxley	Beaufort County, SC Emergency Management
Frank	Edwards	Jasper County, SC Emergency Services Director
Federal Government		
Susan	Wilson	FEMA Region IV, Chief, Floodplain Management & Insurance Branch
Janice	Mitchell	FEMA Region IV, Mitigation Division
Sue	Hopfensperger	ISO/CRS Specialist
Eric	Strom	USGS – GA: Savannah Field Office
Michael	Emlaw	NOAA - National Weather Service
Tom	Charles	U.S. Army Corps of Engineers Savannah District, Regulatory Division
State Government		
Kristen	Higgs	GEMA/HS Area Eight Coordinator
Terry	Lunn	State Hazard Mitigation Officer
Haydn	Blaize	GA DNR Environmental Protection Division – Floodplain Management
Business Community & Non-Profit Organizations		
Esther	Sheppard	American Red Cross
Mary	Landers	Savannah Now
Scott	Galloway	WTOC News
Heath	Lloyd	Savannah Water Supply - I & D WATER
Tina	Tyus-Shaw	WSAV 3: Anchor/Reporter
Katherine	Moore	The GA Conservancy – Sustainable Growth Program Manager
Karen	Jenkins	Savannah Tree Foundation, Executive Director
Karen	Grainey	Sierra Club – Coastal Group

Appendix C Mitigation Alternatives

44 CFR Subsection D §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 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.

As part of the process of developing the mitigation action plans found in Section 3, the HMPC reviewed and considered a comprehensive range of mitigation options before selecting the actions identified for implementation. This section summarizes the full range of mitigation measures evaluated and considered by the HMPC, including a review of the categories of mitigation measures outlined in the 2017 CRS Coordinator's Manual, a discussion of current local implementation and CRS credits earned for those measures, and a list of the specific mitigation projects considered and recommended for implementation.

Mitigation alternatives identified for implementation by the HMPC were evaluated and prioritized using the criteria discussed in Section 3 of this plan.

1.1 CATEGORIES OF MITIGATION MEASURES CONSIDERED

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

- Prevention
- Property Protection
- Natural Resource Protection
- Structural Projects
- Emergency Services
- Public Information and Outreach

1.2 ALTERNATIVE MITIGATION MEASURES PER CATEGORY

Note: the CRS Credit Sections are based on the 2017 CRS Coordinator's Manual.

1.2.1 Preventative and Regulatory Measures

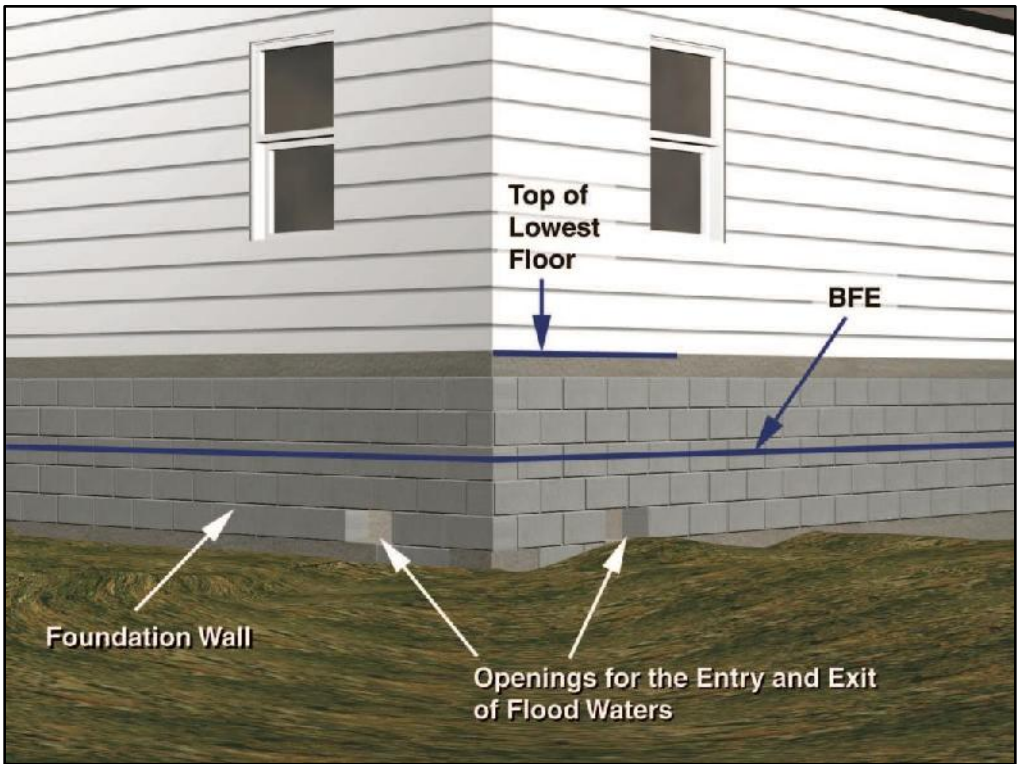
Preventative measures are designed to keep a problem - such as flooding - from occurring or from getting worse. The objective of preventative measures is to ensure that future development is not exposed to damage and does not cause an increase in damages to other properties. Building, zoning, planning and code enforcement offices usually administer preventative measures. Some examples of types of preventative measures include:

- Building codes
- Zoning ordinance
- Comprehensive or land use plan
- Open space preservation
- Floodplain regulations
- Subdivision regulations
- Stormwater management regulations

Building Codes

Building codes provide one of the best methods for 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 C.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 Flood prone House, 2000*

Figure C.1 – Building Codes and Flood Elevations

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.

Comprehensive or Land Use Plan

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.

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.

Zoning Ordinance

Zoning enables a community to designate what uses are acceptable on a given parcel. Zoning can ensure compatibility of land use with the land's level of suitability for development. Planning and zoning activities can also provide benefits by allowing developers more flexibility in arranging improvements on a parcel of land through the planned development approach. Zoning regulations describe what type of land use and specific activities are permitted in each district, and how to regulate how buildings, signs, parking, and other construction may be placed on a lot. Zoning regulations also provide procedures for rezoning and other planning applications. The zoning map and zoning regulations provide properties with certain rights to development.

Floodplain Regulations

A Flood Damage Prevention Ordinance sets development standards for Special Flood Hazard Areas (SFHAs). Communities participating in the National Flood Insurance Program (NFIP) are required to adopt a flood damage prevention ordinance that meets at least the minimum standards of the NFIP; however, a community can incorporate higher standards for increased protection. For example, communities can adopt higher regulatory freeboard requirements, cumulative substantial damage definitions, fill restrictions, and other standards.

Another important consideration in floodplain regulations is the protection of natural and beneficial functions and the preservation of natural barriers such as vegetation. Vegetation along a stream bank is extremely beneficial for the health of the stream. Trees and other plants have an extensive root system that strengthen stream banks and help prevent erosion. Vegetation that has sprouted up near streams should remain undisturbed unless removing it will significantly reduce a threat of flooding or further destruction of the stream channel.

Stormwater Management Regulations

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;

2) Regulating all development to ensure that the post-development peak runoff will not be greater than it was under pre-development conditions; and
3) Set construction standards so buildings are protected from shallow water.

Reducing Future Flood Losses

Zoning and comprehensive planning can work together to reduce future flood losses by directing development away from hazard prone areas. Creating or maintaining open space is the primary way to reduce future flood losses.

Planning for open space must also be supplemented with development regulations to ensure that stormwater runoff is managed, and that development is protected from flooding. Enforcement of the flood damage prevention ordinance and the flood protection elevation requirement provides an extra level of protection for buildings constructed in the planning area.

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

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. In Georgia, communities are not limited by State building codes, only the International Building Code.

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. Communities in Chatham County could receive credit for Activity 430 – Higher Regulatory Standards and for Activity 420 – Open Space Preservation for preserving parcels within the SFHA as open space. Preserving flood prone areas as open space is one of the highest priorities of the Community Rating System. The credits in the 2017 manual have doubled for OSP (Open Space Preservation). The participating communities could also receive credit for Activity 450 – Stormwater Management for enforcing regulations for stormwater management and soil and erosion control. Several prevention actions considered by the HMPC are detailed below.

Table C.1 – Prevention Mitigation Options and Recommended Projects

Action #	Mitigation Action	Reason for Pursuing / Not Pursuing	Funding
Prevention Measures Considered by HMPC and Not Recommended			
-	Complete a County Engineering and Public Works drainage SOP that includes post-storm recovery information.	Not currently a high priority given time, energy, and budget.	n/a
-	Assist nursing homes and assisted living facilities with writing a County Emergency Management approved emergency plan that includes evacuation.	Not currently a high priority given time, energy, and budget.	n/a
-	Develop a local directory of cultural and historical critical facilities to include interior and exterior images of structures, grounds, and collections. This will be integrated with state efforts.	Not currently a high priority given time, energy, and budget.	n/a

Action #	Mitigation Action	Reason for Pursuing / Not Pursuing	Funding
Prevention Measures and Funding Recommended for Implementation			
Chatham County P-2	Prioritize the critical facilities for the purpose of an engineering study. Undertake engineering study to evaluate critical facilities, including cultural and historical facilities, for safe room needs.	Carried forward. Multiple measures spoke of creating a safe room for emergencies.	HMGP, PDM, Federal Grants
Garden City P-1	Revise and adopt Garden City Local Design Manual and flood damage prevention ordinance to higher regulatory and design standards.	Revised. Part of CRS program.	Local Funds
Savannah P-2	Study potential storm surge effects on cemeteries	Carried forward. No progress as funds are not available locally at this time. Funding for this project is expected to be available in 2024.	Local funds (CIP)

1.2.2 Property Protection Measures

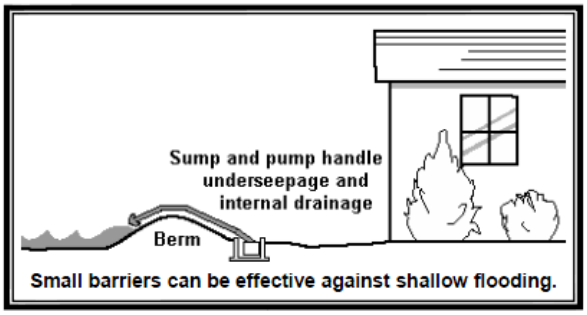
Property protection measures are used to modify buildings or property subject to damage. Property protection measures fall under three approaches:

- 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.

The latter three approaches are the most effective types to consider for the planning area.

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.

This low floodwall has landscaping to minimize the adverse impact on the property's appearance.

Relocation

Moving a building out of a flood prone area 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. 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.

Small, wood frame buildings are the easiest to relocate

Source: Kennedy House Movers, Huntsville, AL

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 cost-beneficial to protect.

Demolishing a repetitively flooded home

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.

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.

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, so 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.

Local Implementation/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. Communities in Chatham County could receive credit for Activity 520 – Acquisition and Relocation, for acquiring and relocating buildings from the SFHA.

The CRS also credits barriers and elevating existing buildings under Activity 530. 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. Communities could receive credit for Activity 360 – Flood Protection Assistance by providing advice and assistance to homeowners who may want to flood proof their home or business. Advice is provided both on property protection techniques and on financial assistance programs to help fund mitigation.

Flood insurance information for each community is provided in Section 4 and in greater detail in each community's Annex. There is no credit for purchasing flood insurance, but the CRS does provide credit for local public information programs that, among other topics, explain flood insurance to property owners. The CRS also reduces the premiums for those people who do buy NFIP coverage. Communities in Chatham County could receive credit for Activity 330 – Outreach Projects. Property protection mitigation options considered by the HMPC are described below.

Table C.2 – Property Protection Mitigation Options and Recommended Projects

Action #	Mitigation Action	Reason for Pursuing / Not Pursuing	Funding
Prevention Measures Considered by HMPC and Not Recommended			
-	Purchase and Install storm shutters for Police Department	Not currently a high priority given time, energy, and budget.	n/a
-	Large 4-inch diesel water pump to be used to remove water from the Main Electrical room and other flooded areas (Estimated cost $12,500.00)	Not currently a high priority given time, energy, and budget.	n/a
-	Replace patient tower roofs because current roofs cannot handle the amount of rain and winds a hurricane produces (Estimated cost 2.8 million)	Not currently a high priority given time, energy, and budget.	n/a
Prevention Measures and Funding Recommended for Implementation			
Thunderbolt PP-4	Retrofit Community Park Piers, Decks and Pavilions	Revised. New After Irma - Thomson Park was inundated with water during Hurricane Irma; would like to retrofit the pier, deck and pavilion with higher impact/flood resistant materials.	HMGP, CIP
(Multiple Jurisdictions)	Acquire or elevate or mitigate repetitive loss and other flood properties.	Revised. These measures will mitigate future losses to repetitive loss and flood properties.	HMGP, PDM, SRL, FMA
Chatham County PP-19	Institute security measures for exposed pipelines.	Carry forward. This will protect people and the environment from potentially hazardous substances.	Local Funds and Staff Time

1.2.3 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 stormwater 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 were 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.

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.

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.

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

Communities are required by state and federal regulations to monitor storm water drainage outfalls and control storm water runoff.

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.

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 re-grading 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.

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.

Local Implementation/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. Communities in Chatham County could receive credit for Activity 420 – Open Space Preservation for preserving a portion of the SFHA as open space.

Additionally, credit is available for Activity 540 – Drainage System Maintenance. Having a portion of the drainage system inspected regularly throughout the year and maintenance performed as needed would earn a community credit. Communities could also get credit under this activity for providing a listing of problem sites that are inspected more frequently, and for implementing an ongoing Capital Improvements Program.

Table C.3 – Natural Resource Protection Mitigation Options and Recommended Projects

Action #	Mitigation Action	Reason for Pursuing / Not Pursuing	Funding
Natural Resource Protection Measures Considered by HMPC and Not Recommended			
-	Regulate dock construction to reduce damage to native marsh grass.	Not enough administrative or fiscal resources to complete.	n/a
Natural Resource Protection Measures and Funding Recommended for Implementation			
Tybee Island NRP-2	Build additional sand dunes.	Carry forward. This will keep a critical habitat intact and potentially help protect the inland from the hazardous effects of more water.	Local Funds
Chatham County NRP-1	Promote the acquisition by conservation organizations of flood areas for community green space.	Carry forward. This will help keep property owners from building in known flood areas while providing recreational open space for residents.	Local Staff Time

1.2.4 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.

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:

- CodeRED countywide mass telephone emergency communication system
- 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

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 (NWS) 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 as an NWS StormReady community is a good measure of a community's emergency warning program for weather hazards.

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.

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 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.

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., disabled persons, prisoners, hospital patients, 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 /CRS Credit

Flash flood warnings are issued by National Weather Service Offices, which have the local and county warning responsibility. Flood warnings are forecasts of coming floods, are distributed to the public by the NOAA Weather Radio, commercial radio and television, and through local emergency agencies. The warning message tells the expected degree of flooding, the affected river, when and where flooding will begin, and the expected maximum river level at specific forecast points during flood crest.

Communities in Chatham County could receive credit for Activity 610 – Flood Warning Program for maintaining a program that provides timely identification of impending flood threats, disseminates warnings to appropriate floodplain residents, and coordinates flood response activities. 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 for additional measures, like telephone trees. Being designated as a StormReady community also provides additional credits.

Table C.4 – Emergency Services Mitigation Options and Recommended Projects

Action #	Mitigation Action	Reason for Pursuing / Not Pursuing	Funding
Emergency Services Measures Considered by HMPC and Not Recommended			
-	Purchase generator for fire station to provide power to station due to power outage.	Not currently a high priority given time, energy, and budget.	n/a
-	Relocate Emergency Coordination Center, Backup 911 Center, City Server Room, Traffic Engineering and Law Enforcement / Fire / HAZMAT / SAR / Special Operations to co-located hardened facility outside of storm surge zone that can maintain 24-hour operations in all-weather events.	Major undertaking. Not currently a high priority given time, energy, and budget.	n/a
-	Install generators at Rogers Street and Skinner Street water wells.	Redundant and already covered by a recommended emergency services project.	n/a
Emergency Services Measures and Funding Recommended for Implementation			
(Multiple Jurisdictions)	Fixed site generators for critical facilities	New. These will help in the event of a power outage and will stay in place in the event of a flood.	Local Funds
(Multiple Jurisdictions)	Purchase and install generator quick connects and transfer switches for critical facilities	New. Safety and upgrade measures for critical facilities will help in the event of an emergency or storm.	HMGP, General Fund
Savannah ES-1	Emergency power to Wells, Lift Stations and Pumps (portable generators). Estimated size ranges from 60 kw and 100 kw	New post-Matthew: Various sites across the city to include both water wells and lift stations. Citywide implementation approximately 240 lift stations and 50 water wells. Approximate down time due to Matthew was 96 hours.	HMGP

1.2.5 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.

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).

Retention pond

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.

Local Implementation /CRS Credit

Structural flood control projects that provide at least 100-year flood protection and that result in revisions to the Flood Insurance Rate Map are not credited by the CRS so as not to duplicate the larger premium reduction provided by removing properties from the mapped floodplain. Other flood control projects can be accepted by offering a 25-year flood protection.

Table C.5 – Structural Projects Mitigation Options and Recommended Projects

Action #	Mitigation Action	Reason for Pursuing / Not Pursuing	Funding
Structural Project Measures Considered by HMPC and Not Recommended			
-	Area drainage basins improvement to prevent further flooding.	Redundant and already covered by a recommended structural project.	n/a
-	Pipe various drainage ditches to further prevent ditch erosion and undermining immediately adjacent to buildings.	Redundant and already covered by a recommended structural project.	n/a
-	Culvert construction to prevent further flooding.	Not currently a high priority given time, energy, and budget.	n/a
Structural Project Measures and Funding Recommended for Implementation			
(Multiple jurisdictions)	Construct and/or improve drainage systems to alleviate drainage issues.	New. Keep water from pooling and allow it to drain properly.	HMGP
TI SP-1	Remove submerged hazards from North Beach (pieces of old jetties protrude at low tide but are covered at high tide creating a safety hazard for swimmers).	Carry forward. Make beaches safer while cleaning up the ocean.	Local Funds
TI SP-2	Construct flood prevention barriers	New. Help alleviate flooding where possible.	Local Funds

1.2.6 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.

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.

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 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.

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 /CRS Credit

Communities in Chatham County could receive credit under Activity 330 – Outreach Projects as well as Activity 350 – Flood Protection Information. Credit is available for targeted and general outreach projects. Credit is also provided for making publications relating to floodplain management available in the reference section of the local library.

Table C.6 – Public Information and Outreach Mitigation Options and Recommended Projects

Action #	Mitigation Action	Reason for Pursuing / Not Pursuing	Funding
Public Information and Outreach Measures Considered by HMPC and Not Recommended			
-	Conduct workshops related to FEMA hazard mitigation grant programs as needed.	Redundant and already covered by an ongoing public information and outreach project.	n/a
Public Information and Outreach Measures and Funding Recommended for Implementation			
GC PEA-1	Increase public education and awareness utilizing an all-hazards approach in the City via various outreach methods (print, tv, radio, social media, etc.)	Recurring outreach. Communicate hazards to citizens quickly and reach a wider audience.	Local Funds
S PEA-1	Remove building code/insurance disconnect through education of builders/realtors and modification of technical review checklist (cross-check NFIP/Insurance/Ordinance/IBC). Provide documents that clearly display the difference with the 2018 International Building Codes, NFIP 44 CFR, and Local Flood Damage Prevention Ordnance.	Need to continue to have open communications with the Development community. Need to ensure smart floodplain construction is relayed to the development community through workshops and information fliers.	City Operating Budget
S PEA-2	Implement FEMA's High-Water Mark Initiative	On 1/10/2016 at the Coastal Georgia CRS User Group meeting in City of Savannah conference room, Lynn Keating of FEMA presented a webinar of FEMA's High-Water Mark Initiative. (HWMI). Waiting on personal and funds.	City Operating Budget

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Appendix E Risk Assessment Supplemental Documentation

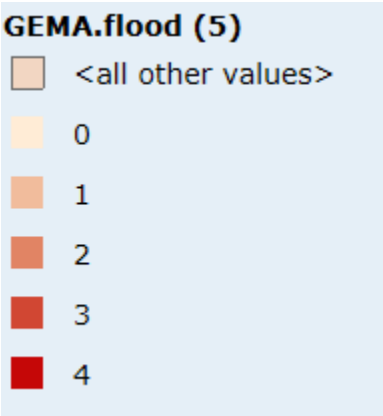
E.1 GMIS REPORT

The table on the following pages presents data from the Georgia Mitigation Information System (GMIS) regarding critical facility exposure to flood. GMIS also provides reports on critical facility exposure to wind, seismic hazard, storm surge, and wildfire.

The hazard scores for flood provided by GMIS are derived using the following methodology, described by GEMA:

The flood hazard scores are derived from the FEMA Q3 "Zone" values. The Q3 layer is derived from the FEMA paper flood insurance rate maps. Although the resolution is 1:24,000, which has an allowable error of 40 feet, FEMA recommends using 250 feet as the potential error. This layer cannot be used for a legal flood determination.

Score	Original Value	Description
4	Floodway	Floodway (within zone AE)
	V	1% with Velocity no Base Flood Elevation (BFE)
	VE	1% with Velocity BFE
3	A	1% Annual Chance no BFE
	A99	1% Federal flood protection system
	AE	1% has BFE
	AH	1% Ponding has BFE
	AO	1% Sheet Flow has depths
	AR	1% Federal flood protection system
2	X500	0.2% Annual Chance
1	ANI	Area not included in survey
	D	Undetermined but possible
0	UNDES	Undesignated
	X	Outside Flood Zones



GMIS Report for Facility Flood Hazard Grouped by Hazard Score										
Jurisdiction	Name	Hazard Score	Value	Replacement Value Year	Building size	Content value	Content value year	Functional Use value	Facility type	Risk
Bloomingdale city	Natural Gas Pressure Center	4	$167,000	2010	275			0	Law Enforcement, Police	
Chatham County	Chatham County Water Well	4	$0	2010	230			0	Government, Water/Sewer	Lifeline
Pooler city	Pooler Lift Station	4	$3,400	2010	0			0	Government, Water/Sewer	Lifeline
Pooler city	Pooler Lift Station	4	$1,100	2010	0			0	Government, Water/Sewer	Lifeline
Pooler city	Pooler Lift Station	4	$0	2010	0			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #099	4	$0	2010	230			0	Government, Water/Sewer	Lifeline
Tybee Island city	Tybee Lift Station # 1	4	$0	2010	0			0	Government, Water/Sewer	Lifeline
Tybee Island city	Tybee Island Marine Science Center	4	$254,200	2010	0			0	Emergency Services, Fire Fighters	Historic Consideration
Tybee Island city	Lazarretto Creek Bridge	4	$0	2010	0			0	Law Enforcement, Police	Transportation
Tybee Island city	Lazarretto Creek Ramp	4	$131,600	2010	0			0	Law Enforcement, Police	Transportation
Tybee Island city	Tybee Lift Station #14	4	$0	2010	0			0	Government, Water/Sewer	Lifeline
Tybee Island city	Tybee Lift Station #13	4	$0	2010	0			0	Government, Water/Sewer	Lifeline
Bloomingdale city	Bloomingdale Public Works Dept	3	$671,700	2010	1640			0	Government, Private	Important
Bloomingdale city	Bloomingdale Well #2	3	$81,600	2010	275			0	Government, Water/Sewer	Lifeline
Bloomingdale city	Bloomingdale City Hall	3	$465,500	2010	6974			0	Government, Private	Essential, Important
Bloomingdale city	Bloomingdale Lift Station	3	$0	2010	230			0	Government, Water/Sewer	Lifeline
Bloomingdale city	Bloomingdale Fire Department	3	$102,500	2010	4800			0	Emergency Services, Fire Fighters	Essential, Important
Bloomingdale city	Bloomingdale Police Department	3	$465,500	2010	5974			0	Law Enforcement, Police	Essential
Bloomingdale city	Georgia Power Sub-Station	3	$0	2010	275			0	Law Enforcement, Police	
Chatham County	Southside Fire Station #23	3	$0					0	Emergency Services, Fire Fighters	
Chatham County	Southside Fire Station #15	3	$0					0	Emergency Services, Fire Fighters	
Chatham County	Savannah Lift Stations #176	3	$0	2010	230			0	Government, Water/Sewer	Lifeline
Chatham County	Savannah Lift Stations #191	3	$0	2010	230			0	Government, Water/Sewer	Lifeline
Chatham County	Chatham County Water Well	3	$19,800	2010	230			0	Government, Water/Sewer	Lifeline
Chatham County	Savannah Lift Stations #168	3	$84,900	2010	230			0	Government, Water/Sewer	Lifeline
Chatham County	Crawford Landing Airport	3	$83,500	2010	0			0	NGO, Transportation	Transportation

GMIS Report for Facility Flood Hazard Grouped by Hazard Score										
Jurisdiction	Name	Hazard Score	Value	Replacement Value Year	Building size	Content value	Content value year	Functional Use value	Facility type	Risk
Chatham County	Chatham County Lift Station	3	$0	2010	230			0	Government, Water/Sewer	Lifeline
Chatham County	Chatham County Skidaway Isl Draw Brid	3	$0	2010	5800			0	Government, Water/Sewer	Transportation
Chatham County	Chatham County Lift Station	3	$0	2010	230			0	Government, Water/Sewer	Lifeline
Chatham County	Chatham County Lift Station	3	$0	2010	230			0	Government, Water/Sewer	Lifeline
Chatham County	Chatham County Lift Station	3	$0	2010	230			0	Government, Water/Sewer	Lifeline
Chatham County	Chatham County Lift Station	3	$0	2010	230			0	Government, Water/Sewer	Lifeline
Chatham County	Chatham County Lift Station	3	$0	2010	230			0	Government, Water/Sewer	Lifeline
Chatham County	Savannah Lift Stations #196	3	$0	2010	230			0	Government, Water/Sewer	Lifeline
Chatham County	Savannah Booster Station	3	$138,500	2010	1205			0	Government, Water/Sewer	Lifeline
Chatham County	Chatham County Lift Station	3	$1,042,440	2010	230			0	Government, Water/Sewer	Lifeline
Chatham County	Chatham County Lift Station	3	$217,400	2010	230			0	Government, Water/Sewer	Lifeline
Chatham County	Chatham County Lift Station	3	$6,500	2010	230			0	Government, Water/Sewer	Lifeline
Chatham County	Chatham County Water Well	3	$0	2010	230			0	Government, Water/Sewer	Lifeline
Chatham County	Southside Fire Station #14	3	$0					0	Emergency Services, Fire Fighters	
Chatham County	Chatham County Causton Mechanical Bri	3	$0	2010	4500			0	Government, Water/Sewer	Transportation
Chatham County	Chatham County Lift Station	3	$0	2010	230			0	Government, Water/Sewer	Lifeline
Chatham County	Savannah Lift Stations #037	3	$0	2010	230			0	Government, Water/Sewer	Lifeline
Chatham County	Savannah-Ogeechee Canal Society	3	$112,000	2010	5698			0	Emergency Services, Fire Fighters	Historic Consideration
Chatham County	Old Fort Jackson	3	$0	2010	32156			0	Emergency Services, Fire Fighters	Historic Consideration
Chatham County	Cottage #9	3	$69,500	2004	2780	$27,350	2004	0	Education, Government Offices	Important
Chatham County	Savannah Lift Stations #121	3	$0	2010	230			0	Government, Water/Sewer	Lifeline
Chatham County	Southside Fire Dept Sta # 02	3	$391,000	2010	6300			0	Emergency Services, Fire Fighters	Essential, Important
Chatham County	Chatham County Public Works Fuel Site	3						0	Government, Government Offices	
Chatham County	Lake Mayer Park Admin Office	3						0	Government, Government Offices	
Chatham County	Savannah Well #33	3	$0	2010	230			0	Government, Water/Sewer	Lifeline

GMIS Report for Facility Flood Hazard Grouped by Hazard Score										
Jurisdiction	Name	Hazard Score	Value	Replacement Value Year	Building size	Content value	Content value year	Functional Use value	Facility type	Risk
Chatham County	Savannah Lift Stations #012	3	$66,200	2010	230			0	Government, Water/Sewer	Lifeline
Chatham County	Southside Fire Station #19	3	$0					0	Emergency Services, Fire Fighters	
Chatham County	Savannah Lift Stations #162	3	$0	2010	230			0	Government, Water/Sewer	Lifeline
Chatham County	Savannah Lift Stations #134	3	$0	2010	230			0	Government, Water/Sewer	Lifeline
Chatham County	Savannah Lift Stations #158	3	$0	2010	230			0	Government, Water/Sewer	Lifeline
Chatham County	Savannah Well #28	3	$68,300	2010	230			0	Government, Water/Sewer	Lifeline
Chatham County	Savannah Well #39	3	$315,000	2010	230			0	Government, Water/Sewer	Lifeline
Chatham County	Savannah Lift Stations #144	3	$0	2010	230			0	Government, Water/Sewer	Lifeline
Chatham County	Savannah Well #32	3	$0	2010	230			0	Government, Water/Sewer	Lifeline
Chatham County	Savannah Lift Stations #117	3	$115,200	2010	230			0	Government, Water/Sewer	Lifeline
Chatham County	Savannah Well #21	3	$1,700	2010	230			0	Government, Water/Sewer	Lifeline
Chatham County	Savannah Lift Stations #161	3	$2,838,100	2010	230			0	Government, Water/Sewer	Lifeline
Chatham County	Savannah Lift Stations #039	3	$150,300	2010	230			0	Government, Water/Sewer	Lifeline
Chatham County	Savannah Lift Stations #048	3	$0	2010	230			0	Government, Water/Sewer	Lifeline
Chatham County	Savannah Lift Stations #110	3	$0	2010	230			0	Government, Water/Sewer	Lifeline
Chatham County	Savannah Lift Stations #105	3	$214,600	2010	230			0	Government, Water/Sewer	Lifeline
Chatham County	Savannah Water Tank	3	$0	2010	0			0	Government, Water/Sewer	Lifeline
Chatham County	Savannah Well #20	3	$1,763,300	2010	230			0	Government, Water/Sewer	Lifeline
Chatham County	SCCPSS Oatland Island Education Cent	3	$1,488,000	2010	42006			0	Medical, Hospital	Historic Consideration
Chatham County	Savannah Lift Stations #118	3	$0	2010	230			0	Government, Water/Sewer	Lifeline
Chatham County	Metro Police Precinct #5 (County)	3	$6,000,000	2010	12487			0	Law Enforcement, Police	Essential
Chatham County	Southside Fire Dept Sta # 08	3	$101,000	2010	3840			0	Emergency Services, Fire Fighters	Essential, Important
Chatham County	Savannah Lift Stations #070	3	$0	2010	230			0	Government, Water/Sewer	Lifeline
Chatham County	Savannah Lift Stations #102	3	$0	2010	230			0	Government, Water/Sewer	Lifeline
Chatham County	Savannah Lift Stations #103	3	$217,600	2010	230			0	Government, Water/Sewer	Lifeline
Chatham County	Savannah Lift Stations #058	3	$188,500	2010	230			0	Government, Water/Sewer	Lifeline

GMIS Report for Facility Flood Hazard Grouped by Hazard Score										
Jurisdiction	Name	Hazard Score	Value	Replacement Value Year	Building size	Content value	Content value year	Functional Use value	Facility type	Risk
Chatham County	Savannah Lift Stations #146	3	$5	2010	230			0	Government, Water/Sewer	Lifeline
Chatham County	Savannah Well #22	3	$1,490	2010	230			0	Government, Water/Sewer	Lifeline
Chatham County	Southside Fire Dept Sta # 05	3	$56,500	2010	2800			0	Emergency Services, Fire Fighters	Essential, Important
Chatham County	Skidaway Institute of Oceanography Library	3	$1,763,000	2010	0			0	Government, Water/Sewer	Historic Consideration
Chatham County	Savannah Lift Stations #126	3	$0	2010	230			0	Government, Water/Sewer	Lifeline
Chatham County	Savannah Lift Stations #125	3	$0	2010	230			0	Government, Water/Sewer	Lifeline
Chatham County	Savannah Well #36	3	$0	2010	230			0	Government, Water/Sewer	Lifeline
Chatham County	Southside Fire Dept Sta # 07	3	$42,200	2010	3600			0	Emergency Services, Fire Fighters	Essential, Important
Garden City city	Garden City Lift Station #4	3	$0	2010	230			0	Government, Water/Sewer	Lifeline
Garden City city	Garden City Lift Station #8	3	$0	2010	230			0	Government, Water/Sewer	Lifeline
Garden City city	Garden City Lift Station #6	3	$0	2010	230			0	Government, Water/Sewer	Lifeline
Garden City city	Garden City Lift Station #2	3	$700	2010	230			0	Government, Water/Sewer	Lifeline
Garden City city	Garden City Lift Station #6	3	$0	2010	230			0	Government, Water/Sewer	Lifeline
Garden City city	Garden City Lift Station #6	3	$24,500	2010	230			0	Government, Water/Sewer	Lifeline
Garden City city	Garden City Lift Station #6	3	$24,500	2010	230			0	Government, Water/Sewer	Lifeline
Garden City city	Garden City Lift Station	3	$0	2010	230			0	Government, Water/Sewer	Lifeline
Garden City city	Main St/ US 17 Alt Bridge	3	$0	2010	0			0	Government, Water/Sewer	Transportation
Garden City city	Garden City Well #3	3	$60,000	2010	1100			0	Government, Water/Sewer	Lifeline
Garden City city	Garden City Lift Station #6	3	$6,200	2010	230			0	Government, Water/Sewer	Lifeline
Garden City city	Garden City Lift Station #13	3	$1,120	2010	230			0	Government, Water/Sewer	Lifeline
Garden City city	Garden City Police Department	3	$4,012,700	2010	5000			0	Law Enforcement, Police	Essential
Pooler city	Pooler Lift Station	3	$0	2010	0			0	Government, Water/Sewer	Lifeline
Pooler city	Pooler Lift Station	3	$0	2010	0			0	Government, Water/Sewer	Lifeline
Pooler city	Pooler Lift Station	3	$122,500	2010	0			0	Government, Water/Sewer	Lifeline
Pooler city	Pooler Lift Station	3	$2,200	2010	0			0	Government, Water/Sewer	Lifeline
Pooler city	Pooler Lift Station	3	$0	2010	0			0	Government, Water/Sewer	Lifeline

GMIS Report for Facility Flood Hazard Grouped by Hazard Score										
Jurisdiction	Name	Hazard Score	Value	Replacement Value Year	Building size	Content value	Content value year	Functional Use value	Facility type	Risk
Pooler city	I-95 @ RR crossing overpass	3	$0	2010	0			0	Government, Water/Sewer	Transportation
Pooler city	Wisteria Gardens	3	$605,900	2010	3000			0	Emergency Services, Fire Fighters	Vulnerable Population
Pooler city	Pooler Lift Station	3	$0	2010	0			0	Government, Water/Sewer	Lifeline
Pooler city	Pooler Lift Station	3	$0	2010	0			0	Government, Water/Sewer	Lifeline
Pooler city	Pooler Lift Station	3	$84,600	2010	0			0	Government, Water/Sewer	Lifeline
Pooler city	Pooler Lift Station	3	$0	2010	0			0	Government, Water/Sewer	Lifeline
Pooler city	Pooler Lift Station	3	$206,500	2010	0			0	Government, Water/Sewer	Lifeline
Pooler city	Pooler Lift Station	3	$1,000	2010	0			0	Government, Water/Sewer	Lifeline
Pooler city	Savannah Lift Stations #194	3	$0	2010	230			0	Government, Water/Sewer	Lifeline
Port Wentworth city	Fort Stewart Federal Credit Union	3	$97,000	2010	2400			0	Emergency Services, Fire Fighters	Important
Port Wentworth city	Port Wentworth Pump Station	3	$0	2010	0			0	Government, Water/Sewer	Lifeline
Port Wentworth city	Port Wentworth Pump Station #3	3	$0	2010	20			0	Government, Water/Sewer	Lifeline
Port Wentworth city	Pt. Wentworth & Savannah I&D Interconnection	3	$0	2010	0			0	Government, Water/Sewer	Transportation, Vulnerable Population
Port Wentworth city	Port Wentwoth Community Center	3	$97,000	2010	2496			0	Government, Water/Sewer	
Port Wentworth city	Port Wentworth Pump Station #2	3	$0	2010	100			0	Government, Water/Sewer	Lifeline
Port Wentworth city	Houlihan Bridge	3	$0	2010	60			0	Government, Private	Transportation
Port Wentworth city	Port Wentworth Pump Station #1	3	$0	2010	480			0	Government, Water/Sewer	Lifeline
Port Wentworth city	I-95 and Savannah River Overp	3	$0	2010	200			0	Government, Water/Sewer	Transportation
Savannah city	Metro Police Precinct #2 (Leased)	3	$721,100	2010	2500			0	Law Enforcement, Police	Essential
Savannah city	Savannah Maintenance Bldg	3	$0	2010	10000			0	Emergency Services, Fire Fighters	Important
Savannah city	Wormsloe State Historic Site	3	$68,290	2010	128500			0	Emergency Services, Fire Fighters	Historic Consideration
Savannah city	Savannah Lift Stations #074	3	$99,000	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Forest City Branch Library	3	$123,180	2010	65498			0	Education, Library	Historic Consideration
Savannah city	Savannah Lift Stations #073	3	$32,600	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #026	3	$0	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Storm Water Pump Station	3	$138,500	2010	230			0	Government, Water/Sewer	Lifeline

GMIS Report for Facility Flood Hazard Grouped by Hazard Score										
Jurisdiction	Name	Hazard Score	Value	Replacement Value Year	Building size	Content value	Content value year	Functional Use value	Facility type	Risk
Savannah city	Savannah Lift Stations #075	3	$41,000	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Old Water Plant	3	$328,000	2010	150000			0	Government, Water/Sewer	Historic Consideration
Savannah city	Savannah Traffic Engineering	3	$328,000	2010	25000			0	Government, Private	Important
Savannah city	Savannah City Lot	3	$328,000	2010	25000			0	Government, Private	Important
Savannah city	Savannah Well #03	3	$0	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #137	3	$0	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Storm Water Pump Station	3	$182,000	2010	1450			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #023	3	$0	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #190	3	$0	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Chatham County Public Health	3	$2,065,500	2010	31745			0	Government, Private	Important
Savannah city	Savannah Storm Water Pump Station	3	$0	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Generator Bldg	3	$0	2010	1205			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Exposition & Visitors Center	3	$85,271,800	2010	300000			0	Government, Water/Sewer	Historic Consideration
Savannah city	Savannah Lift Stations #021	3	$315,300	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #169	3	$0	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #163	3	$137,200	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Hitch Branch Library	3	$0	2010	45789			0	Education, Library	Historic Consideration
Savannah city	Savannah Lift Stations #143	3	$0	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #187	3	$0	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #170	3	$0	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Radio Tower	3	$33,050	2010	298			0	Government, Water/Sewer	
Savannah city	Savannah Water Booster Station	3	$4,509,900	2010	1205			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Storm Water Pump Station	3	$5,216,310	2010	0			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Generator - Kayton Canal Water	3	$5,216,310	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #002	3	$0	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #180	3	$0	2010	230			0	Government, Water/Sewer	Lifeline

GMIS Report for Facility Flood Hazard Grouped by Hazard Score										
Jurisdiction	Name	Hazard Score	Value	Replacement Value Year	Building size	Content value	Content value year	Functional Use value	Facility type	Risk
Savannah city	Savannah Lift Stations #028	3	$0	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Recreation Center - Tremont Park Neighborhood	3	$0	2010	9877			0	Government, Water/Sewer	Important
Savannah city	Savannah Lift Stations #123	3	$0	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Raw Water Station	3	$0	2010	1450			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #193	3	$6,800	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #175	3	$0	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #164	3	$0	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #198	3	$0	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #197	3	$0	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Chatham County Public Health	3						0	Medical, Clinics	
Savannah city	Savannah President St. WPCP	3	$5,216,310	2010	0			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #043	3	$158,200	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Well #41	3	$0	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #093	3	$1,400	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #034	3	$0	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #062	3	$0	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #008	3	$0	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #022	3	$43,600	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #052	3	$0	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #140	3	$138,500	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #054	3	$0	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #042	3	$2,103,460	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #128	3	$0	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #115	3	$0	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Georgia Regional Hospital	3	$6,850,280	2010	0			0	Medical, EMS	Important, Vulnerable Population

GMIS Report for Facility Flood Hazard Grouped by Hazard Score										
Jurisdiction	Name	Hazard Score	Value	Replacement Value Year	Building size	Content value	Content value year	Functional Use value	Facility type	Risk
Savannah city	Savannah Lift Stations #045	3	$0	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #082	3	$0	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #060	3	$2,103,460	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #080	3	$0	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Waste Water Mgmt Bldg	3	$5,216,310	2010	10000			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #129	3	$0	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #014	3	$1,000	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #096	3	$496,000	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Storm Water Pump Station	3	$328,000	2010	300000			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Storm Water Pump Station	3	$0	2010	0			0	Government, Water/Sewer	Lifeline
Savannah city	SCCPSS Scott Alternative Learning Center	3	$4,338,040	2010	0			0	Medical, Hospital	Essential
Savannah city	Savannah Lift Stations #148	3	$0	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #015	3	$0	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #092	3	$0	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #046	3	$3,500	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #156	3	$0	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #101	3	$107,400	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #036	3	$0	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #016	3	$2,400	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #091	3	$0	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #113	3	$0	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #141	3	$0	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #100	3	$1,100	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #098	3	$0	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #097	3	$0	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #081	3	$0	2010	230			0	Government, Water/Sewer	Lifeline

GMIS Report for Facility Flood Hazard Grouped by Hazard Score										
Jurisdiction	Name	Hazard Score	Value	Replacement Value Year	Building size	Content value	Content value year	Functional Use value	Facility type	Risk
Savannah city	Savannah Lift Stations #108	3	$0	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Well #30	3	$0	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #109	3	$0	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	SCCPSS Largo-Tibet Elementary	3	$837,550	2010	50322			0	Medical, Hospital	Essential
Savannah city	Savannah Lift Stations #090	3	$10,798,500	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #152	3	$0	2010	230			0	Government, Water/Sewer	Lifeline
Thunderbolt town	Thunderbolt Lift Station	3	$0	2010	0			0	Government, Water/Sewer	Lifeline
Thunderbolt town	Thunderbolt Public Works	3	$286,100	2010	0			0	Government, Private	Important
Thunderbolt town	Thunderbolt Marine	3	$6,421,800	2010	200000			0	Law Enforcement, Police	
Tybee Island city	Tybee Water Well #3	3	$0	2010	0			0	Government, Water/Sewer	Lifeline
Tybee Island city	Tybee Lift Station #12	3	$0	2010	0			0	Government, Water/Sewer	Lifeline
Tybee Island city	Tybee Lift Station # 4	3	$0	2010	0			0	Government, Water/Sewer	Lifeline
Tybee Island city	Tybee Community Center	3	$60,130	2010	0			0	Government, Water/Sewer	Important
Tybee Island city	Tybee Island City Records Storage	3	$249,200	2010	0			0	Government, Private	Important, Historic Consideration
Tybee Island city	Tybee Lift Station #11	3	$0	2010	0			0	Government, Water/Sewer	Lifeline
Tybee Island city	Tybee Lift Station #10	3	$1,185,600	2010	0			0	Government, Water/Sewer	Lifeline
Tybee Island city	Tybee Lift Station # 5	3	$363,000	2010	0			0	Government, Water/Sewer	Lifeline
Tybee Island city	Tybee Lift Station # 6	3	$0	2010	0			0	Government, Water/Sewer	Lifeline
Tybee Island city	Tybee City Hall	3	$363,000	2010	0			0	Government, Private	Important
Tybee Island city	Tybee Water Well #2	3	$24,600	2010	0			0	Government, Water/Sewer	Lifeline
Tybee Island city	Tybee Water Tower #1 Main Tower	3	$24,600	2010	0			0	Government, Water/Sewer	Lifeline
Tybee Island city	Tybee Police Department	3	$74,400	2010	3800			0	Law Enforcement, Police	Essential
Tybee Island city	Tybee Fire Department	3	$363,000	2010	9850			0	Emergency Services, Fire Fighters	Essential, Important
Tybee Island city	Cell/Paging Tower	3	$74,400	2010	0			0	Emergency Services, Fire Fighters	
Tybee Island city	Georgia Power Sub Station	3	$0	2010	0			0	Emergency Services, Fire Fighters	
Tybee Island city	Tybee Lighthouse	3	$784,500	2010	0			0	Emergency Services, Fire Fighters	Historic Consideration

GMIS Report for Facility Flood Hazard Grouped by Hazard Score										
Jurisdiction	Name	Hazard Score	Value	Replacement Value Year	Building size	Content value	Content value year	Functional Use value	Facility type	Risk
Tybee Island city	Tybee Island Historical Society	3	$784,500	2010	0			0	Emergency Services, Fire Fighters	Historic Consideration
Tybee Island city	Oceanside Nursing Home	3	$518,200	2010	0			0	Emergency Services, Fire Fighters	Vulnerable Population
Tybee Island city	St. Michael's School	3	$474,900	2010	0			0	Law Enforcement, Police	Essential
Tybee Island city	Tybee Lift Station # 8	3	$0	2010	0			0	Government, Water/Sewer	Lifeline
Tybee Island city	Tybee Water Treatment Plant	3	$187,000	2010	29658			0	Government, Water/Sewer	Lifeline
Tybee Island city	Tybee Public Works	3	$187,000	2010	2400			0	Government, Private	Important
Tybee Island city	Tybee Lift Station # 2	3	$0	2010	0			0	Government, Water/Sewer	Lifeline
Tybee Island city	Hwy 80 Flat Bridge	3	$0	2010	0			0	Government, Water/Sewer	Transportation
Tybee Island city	Tybee Lift Station # 3	3	$0	2010	0			0	Government, Water/Sewer	Lifeline
Tybee Island city	Tybee Water Well #1	3	$74,400	2010	0			0	Government, Water/Sewer	Lifeline
Tybee Island city	Tybee Lift Station # 9	3	$74,400	2010	0			0	Government, Water/Sewer	Lifeline
Tybee Island city	Tybee Water Tower #2 Ft. Screven	3	$74,400	2010	0			0	Government, Water/Sewer	Lifeline
Tybee Island city	Tybee Lift Station # 7	3	$0	2010	0			0	Government, Water/Sewer	Lifeline
Chatham County	Savannah Lift Stations #174	2	$0	2010	230			0	Government, Water/Sewer	Lifeline
Chatham County	Chatham County Lift Station	2	$0	2010	230			0	Government, Water/Sewer	Lifeline
Chatham County	Chatham County Lift Station	2	$86,000	2010	230			0	Government, Water/Sewer	Lifeline
Chatham County	Savannah Lift Stations #199	2	$86,000	2010	230			0	Government, Water/Sewer	Lifeline
Chatham County	Chatham County Lift Station	2	$0	2010	230			0	Government, Water/Sewer	Lifeline
Chatham County	Chatham County Wilmington Land Fill	2	$13,500	2010	0			0	NGO, Water/Sewer	Important
Chatham County	Chatham County Well	2	$0	2010	230			0	Government, Water/Sewer	Lifeline
Chatham County	Chatham County Lift Station	2	$0	2010	230			0	Government, Water/Sewer	Lifeline
Chatham County	Islands Branch Library	2	$101,520	2010	32165			0	Education, Library	Historic Consideration
Chatham County	Lift Station	2	$300,000	2001	300	$0	2004	0	Education, Government Offices	Essential
Chatham County	Savannah Well #25	2	$15,400,000	2010	230			0	Government, Water/Sewer	Lifeline
Chatham County	Savannah Lift Stations #130	2	$350,400	2010	230			0	Government, Water/Sewer	Lifeline
Chatham County	Savannah Well #34	2	$0	2010	230			0	Government, Water/Sewer	Lifeline

GMIS Report for Facility Flood Hazard Grouped by Hazard Score										
Jurisdiction	Name	Hazard Score	Value	Replacement Value Year	Building size	Content value	Content value year	Functional Use value	Facility type	Risk
Chatham County	Savannah Well #38	2	$194,300	2010	230			0	Government, Water/Sewer	Lifeline
Chatham County	SCCPSS Isle of Hope Elementary	2	$1,176,440	2010	55634			0	Medical, Hospital	Essential
Chatham County	Southside Fire Dept Sta # 06	2	$231,200	2010	4148			0	Emergency Services, Fire Fighters	Essential, Important
Chatham County	Savannah Lift Stations #132	2	$109,500	2010	230			0	Government, Water/Sewer	Lifeline
Chatham County	Southside Fire Station #22	2	$0					0	Emergency Services, Fire Fighters	
Chatham County	Savannah Lift Stations #131	2	$3,129,200	2010	230			0	Government, Water/Sewer	Lifeline
Chatham County	Savannah Lift Stations #069	2	$0	2010	230			0	Government, Water/Sewer	Lifeline
Chatham County	Savannah Lift Stations #142	2	$0	2010	230			0	Government, Water/Sewer	Lifeline
Chatham County	Savannah Lift Stations #112	2	$160,800	2010	230			0	Government, Water/Sewer	Lifeline
Chatham County	Savannah Lift Stations #038	2	$0	2010	230			0	Government, Water/Sewer	Lifeline
Chatham County	Savannah Lift Stations #153	2	$0	2010	230			0	Government, Water/Sewer	Lifeline
Chatham County	SCCPSS Islands Elementary	2	$6,000,000	2010	100554			0	Medical, Hospital	Essential
Chatham County	SCCPSS Marshpoint Elementary	2	$6,000,000	2010	93598			0	Medical, Hospital	Essential
Chatham County	SCCPSS Coastal Middle	2	$6,000,000	2010	118558			0	Medical, Hospital	Essential
Chatham County	Savannah Lift Stations #119	2	$0	2010	230			0	Government, Water/Sewer	Lifeline
Chatham County	Southside Fire Dept Sta # 04	2	$103,000	2010	4400			0	Emergency Services, Fire Fighters	Essential, Important
Chatham County	Savannah Lift Stations #104	2	$0	2010	230			0	Government, Water/Sewer	Lifeline
Chatham County	Savannah Well #24	2	$0	2010	230			0	Government, Water/Sewer	Lifeline
Chatham County	SCCPSS Howard Elementary	2	$1,817,320	2010	75908			0	Government, Water/Sewer	Essential
Chatham County	Southside Fire Dept Sta # 09	2	$138,500	2010	2800			0	Emergency Services, Fire Fighters	Essential, Important
Chatham County	Savannah Lift Stations #079	2	$0	2010	230			0	Government, Water/Sewer	Lifeline
Chatham County	Savannah Lift Stations #157	2	$0	2010	230			0	Government, Water/Sewer	Lifeline
Chatham County	Savannah Lift Stations #124	2	$0	2010	230			0	Government, Water/Sewer	Lifeline
Chatham County	Southside Fire Dept Sta # 10	2	$70,310	2010	4000			0	Emergency Services, Fire Fighters	Essential, Important
Garden City city	EFF Generator	2						0	Government, Water/Sewer	
Garden City city	Garden City Water Tower	2	$315,400	2010	6200			0	Government, Water/Sewer	Lifeline

GMIS Report for Facility Flood Hazard Grouped by Hazard Score										
Jurisdiction	Name	Hazard Score	Value	Replacement Value Year	Building size	Content value	Content value year	Functional Use value	Facility type	Risk
Garden City city	Garden City Water/Waste Water	2	$24,500	2010	0			0	Government, Water/Sewer	Lifeline
Garden City city	Garden City Public Works	2	$24,500	2010	0			0	Government, Private	Important
Garden City city	Garden City Lift Station #12	2	$0	2010	230			0	Government, Water/Sewer	Lifeline
Garden City city	Garden City Water Tower	2	$817,700	2010	6200			0	Government, Water/Sewer	Lifeline
Garden City city	Garden City Well #1	2	$104,400	2010	1100			0	Government, Water/Sewer	Lifeline
Garden City city	Garden City Water Tower	2	$104,400	2010	6200			0	Government, Water/Sewer	Lifeline
Garden City city	Garden City Fire Department (EOC)	2	$0	2010	7500			0	Emergency Services, Fire Fighters	Essential, Important
Pooler city	Pooler Lift Station	2	$0	2010	0			0	Government, Water/Sewer	Lifeline
Port Wentworth city	Port Wentworth Branch Library	2	$645,230	2010	21547			0	Education, Library	Historic Consideration
Port Wentworth city	SCPSS Port Wentworth Elementary	2	$1,549,170	2010	72836			0	Emergency Services, Fire Fighters	Essential
Port Wentworth city	Port Wentworth Well House #2	2	$7,000	2010	400			0	Government, Water/Sewer	Lifeline
Port Wentworth city	Savannah Water Tank	2	$0	2010	6200			0	Government, Water/Sewer	Lifeline
Port Wentworth city	Port Wentworth Well House #1	2	$0	2010	400			0	Government, Water/Sewer	Lifeline
Port Wentworth city	Port Wentworth Lift Station #6	2	$0	2010	20			0	Government, Water/Sewer	Lifeline
Port Wentworth city	Port Wentworth Recreation Center	2	$645,230	2010	14791			0	Education, Library	Important
Savannah city	Bethesda Museum	2	$4,102,360	2010	35896			0	Emergency Services, Fire Fighters	Historic Consideration
Savannah city	Savannah Lift Stations #185	2	$0	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #184	2	$991,500	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #027	2	$3,990	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Recreation Center - Hudson Hill Community	2	$0	2010	2658			0	Government, Water/Sewer	Important
Savannah city	Savannah Recreation Center - Richards Street	2	$221,560	2010	6587			0	Government, Water/Sewer	Important
Savannah city	Savannah Well #04	2	$0	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Chatham County Botanical Garden	2	$241,800	2010	9875			0	Government, Water/Sewer	Historic Consideration
Savannah city	Savannah Vehicle Maintenance Garage	2	$486,790	2010	38060			0	Government, Private	Important
Savannah city	Savannah Administrative Offices	2	$119,500	2010	6000			0	Government, Private	Important

GMIS Report for Facility Flood Hazard Grouped by Hazard Score										
Jurisdiction	Name	Hazard Score	Value	Replacement Value Year	Building size	Content value	Content value year	Functional Use value	Facility type	Risk
Savannah city	Savannah Lift Stations #182	2	$28,671,900	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #178	2	$0	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	SCCPSS Oglethorpe Acad. Middle	2	$620,000	2010	122995			0	Medical, Hospital	Essential
Savannah city	Savannah Lift Stations #200	2	$0	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #173	2	$448,000,000	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	SCCPSS Heard Elementary	2	$686,890	2010	45907			0	Medical, Hospital	Essential
Savannah city	Savannah Lift Stations #067	2	$0	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #086	2	$80,000	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #120	2	$1,300	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Well #31	2	$12,100	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #114	2	$2,500	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #147	2	$0	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #065	2	$2,103,460	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Well #42	2	$486,790	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #010	2	$2,103,460	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Fire Station #07	2	$486,790	2010	4500			0	Emergency Services, Fire Fighters	Essential, Important
Savannah city	Savannah Lift Stations #155	2	$0	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	May Howard Elementary School	2						0	Education, K - 12	
Savannah city	Savannah Lift Stations #057	2	$0	2010	230			0	Government, Water/Sewer	Lifeline
Thunderbolt town	Downing St. Well	2						0	Government, Water/Sewer	
Bloomingdale city	Bloomingdale Water Tower	0	$1,300	2010	6200			0	Government, Water/Sewer	Lifeline
Bloomingdale city	Bloomingdale Well #1	0	$1,300	2010	275			0	Government, Water/Sewer	Lifeline
Bloomingdale city	LP Storage Farm	0	$87,200	2010	275			0	Law Enforcement, Police	
Bloomingdale city	AT&T Regional Switching Center	0	$505,370	2010	10000			0	Law Enforcement, Police	
Bloomingdale city	Magnolia Lane Assist Apartments	0	$2,519,000	2010	20000			0	Law Enforcement, Police	Vulnerable Population
Bloomingdale city	Troubled Adolescence Cntr - Ga Regional	0	$1,015,000	2010	10000			0	Government, Water/Sewer	Vulnerable Population

GMIS Report for Facility Flood Hazard Grouped by Hazard Score										
Jurisdiction	Name	Hazard Score	Value	Replacement Value Year	Building size	Content value	Content value year	Functional Use value	Facility type	Risk
Bloomingdale city	SCPSS Bloomingdale Elementary	0	$1,117,840	2010	58540			0	Government, Water/Sewer	Essential
Bloomingdale city	I-16/Bloomingdale Rd Overpass	0	$0	2010	0			0	Government, Water/Sewer	Transportation
Bloomingdale city	Bloomingdale Lift Station	0	$0	2010	0			0	Government, Water/Sewer	Lifeline
Chatham County	AASU Science Center	0	$18,278,120	2007	126056	$3,893,618	2007	0	Education, Government Offices	
Chatham County	Chatham County Dillon Land Fill	0	$0	2010	0			0	NGO, Water/Sewer	Important
Chatham County	Savannah Lift Stations #195	0	$0	2010	230			0	Government, Water/Sewer	Lifeline
Chatham County	Savannah Lift Stations #188	0	$0	2010	230			0	Government, Water/Sewer	Lifeline
Chatham County	Chatham County Water Well	0	$133,270	2010	230			0	Government, Water/Sewer	Lifeline
Chatham County	Savannah Lift Stations #177	0	$133,270	2010	230			0	Government, Water/Sewer	Lifeline
Chatham County	Chatham County Chevis Land Fill	0	$0	2010	0			0	NGO, Water/Sewer	Important
Chatham County	Chatham County Lift Station	0	$0	2010	230			0	Government, Water/Sewer	Lifeline
Chatham County	Chatham County Well	0	$0	2010	230			0	Government, Water/Sewer	Lifeline
Chatham County	Chatham County Well	0	$0	2010	230			0	Government, Water/Sewer	Lifeline
Chatham County	Chatham County Lift Station	0	$1,500	2010	230			0	Government, Water/Sewer	Lifeline
Chatham County	Chatham County Mosquito Control	0	$448,000,000	2010	37578			0	Government, Private	Essential, Important
Chatham County	Chatham County Well	0	$0	2010	230			0	Government, Water/Sewer	Lifeline
Chatham County	Chatham County Thomas Land Fill	0	$0	2010	0			0	NGO, Water/Sewer	Important
Chatham County	Chatham County Lift Station	0	$0	2010	230			0	Government, Water/Sewer	Lifeline
Chatham County	Savannah Lift Stations #167	0	$0	2010	230			0	Government, Water/Sewer	Lifeline
Chatham County	Chatham County Lift Station	0	$0	2010	230			0	Government, Water/Sewer	Lifeline
Chatham County	Chatham County Well	0	$43,500	2010	230			0	Government, Water/Sewer	Lifeline
Chatham County	Chatham County EOC	0	$0	2010	33000			0	Government, Water/Sewer	Essential
Chatham County	Chatham County Public Health	0						0	Medical, Medical Offices	
Chatham County	Chatham County Sheriff's Complex Annex	0	$0	2010	42587			0	Law Enforcement, Police	Essential
Chatham County	Chatham County Lift Station	0	$0	2010	230			0	Government, Water/Sewer	Lifeline
Chatham County	Fort Pulaski National Monument	0	$2,480,000	2010	96541			0	Emergency Services, Fire Fighters	Historic Consideration

GMIS Report for Facility Flood Hazard Grouped by Hazard Score										
Jurisdiction	Name	Hazard Score	Value	Replacement Value Year	Building size	Content value	Content value year	Functional Use value	Facility type	Risk
Chatham County	Southside Fire Dept Sta # 14	0	$393,000	2010	4960			0	Emergency Services, Fire Fighters	Essential, Important
Chatham County	Southside Fire Station #25	0	$0					0	Emergency Services, Fire Fighters	
Chatham County	Evers Physcial Plant	0	$2,947,100	2004	16229	$415,542	2004	0	Education, Government Offices	Essential
Chatham County	Physcial Education Athletic Complex	0	$9,174,070	2004	90823	$368,228	2004	0	Education, Government Offices	Essential
Chatham County	Howard Jordan College of Business	0	$12,925,890	2004	42527	$675,894	2004	0	Education, Government Offices	Essential
Chatham County	Southside Fire Dept HQ, Dispatch, Shop	0	$435,000	2010	7948			0	Emergency Services, Emergency Services, Fire Fighters, Fire Fighters	Essential, Important
Chatham County	Savannah Lift Stations #084	0	$79,228,500	2010	230			0	Government, Water/Sewer	Lifeline
Chatham County	Southside Fire Training Center	0	$0					0	Emergency Services, Fire Fighters	
Chatham County	Southside Fire Dept Sta # 12	0	$400,000	2010	5272			0	Emergency Services, Fire Fighters	Essential, Important
Chatham County	Coastal Empire Montessori School	0	$0	2010	0			0	Law Enforcement, Police	Essential
Chatham County	SCCPSS Hesse Elementary	0	$1,196,500	2010	69159			0	Medical, Hospital	Essential
Chatham County	Savannah Lift Stations #033	0	$161,200	2010	230			0	Government, Water/Sewer	Lifeline
Chatham County	Savannah Lift Stations #150	0	$0	2010	230			0	Government, Water/Sewer	Lifeline
Chatham County	Chatham County Public Works	0	$2,065,500	2010	0			0	Government, Government, Private, Private	Important
Chatham County	SCPSS Coastal GA Academy	0	$806,000	2010	17000			0	Medical, Hospital	Essential, Important
Chatham County	Chatham County Sharon Land Fill	0	$0	2010	0			0	NGO, Water/Sewer	Important
Chatham County	Savannah Lift Stations #089	0	$0	2010	230			0	Government, Water/Sewer	Lifeline
Chatham County	Southside Fire Dept Sta # 03	0	$277,200	2010	8960			0	Emergency Services, Fire Fighters	Essential, Important
Chatham County	AASU Victor Hall	0	$5,099,410	2007	26839	$1,750,117	2007	0	Education, Government Offices	
Chatham County	AASU Gamble Hall	0	$4,843,480	2007	35492	$1,662,282	2007	0	Education, Government Offices	
Chatham County	AASU BurnettHall	0	$3,210,240	2007	16896	$1,101,754	2007	0	Education, Government Offices	
Chatham County	AASU Hawes Hall	0	$5,561,300	2007	29270	$1,908,638	2007	0	Education, Government Offices	
Chatham County	AASU MCC Annex CIS	0	$7,774,270	2007	8603	$265,729.4	2007	0	NGO, Water/Sewer	
Chatham County	AASU Lane Library	0	$9,509,120	2007	50048	$3,925,739	2007	0	Education, Government Offices	

GMIS Report for Facility Flood Hazard Grouped by Hazard Score										
Jurisdiction	Name	Hazard Score	Value	Replacement Value Year	Building size	Content value	Content value year	Functional Use value	Facility type	Risk
Chatham County	AASU Sports Center	0	$7,640,375	2007	80425	$2,506,366	2007	0	Education, Government Offices	
Chatham County	AASU Student Rcreation Center	0	$4,200,000	2007	353885	$405,600	2007	0	Education, Government Offices	
Chatham County	AASU Memorial College Center	0	$5,744,460	2007	30234	$1,971,498	2007	0	Education, Government Offices	
Chatham County	AASU Bookstore	0	$1,911,000	2007	14700	$554,954.4	2007	0	Education, Government Offices	
Chatham County	AASU Annex1	0	$788,500	2007	7885	$202,959	2007	0	Education, Government Offices	
Chatham County	AASU Annex 2	0	$809,700	2007	8097	$250,099.2	2007	0	Education, Government Offices	
Chatham County	AASU Clinics at Savannah Mall	0			14500	$120,795	2007	0	Education, Government Offices	
Chatham County	AASU University Police	0	$12,860	2007	1500	$39,021.84	2007	0	Education, Government Offices	
Chatham County	AASU Solms Hall	0	$5,930,660	2007	31214	$2,035,402	2007	0	Education, Government Offices	
Chatham County	AASU Fine Arts Hall	0	$11,151,670	2007	58693	$3,827,253	2007	0	Education, Government Offices	
Chatham County	AASU Aquatics & Recreation Center	0	$3,571,150	2007	32465	$1,002,778	2007	0	Education, Government Offices	
Chatham County	SCCPSS Southwest Elementary	0	$8,891,700	2010	87882			0	Law Enforcement, Police	Essential
Chatham County	SCCPSS Southwest Middle	0	$6,825,000	2010	118558			0	Law Enforcement, Police	Essential
Chatham County	SCCPSS Georgetown Elementary	0	$0	2010	89089			0	Law Enforcement, Police	Essential
Chatham County	Savannah Lift Stations #107	0	$0	2010	230			0	Government, Water/Sewer	Lifeline
Chatham County	Savannah Lift Stations #154	0	$0	2010	230			0	Government, Water/Sewer	Lifeline
Chatham County	Savannah Lift Stations #151	0	$0	2010	230			0	Government, Water/Sewer	Lifeline
Chatham County	Savannah Water Tank	0	$6,825,000	2010	0			0	Government, Water/Sewer	Lifeline
Chatham County	Savannah Well #35	0	$0	2010	230			0	Government, Water/Sewer	Lifeline
Chatham County	Savannah Georgetown Treatment Plant	0	$0	2010	0			0	Government, Water/Sewer	Lifeline
Chatham County	Savannah Lift Stations #106	0	$0	2010	230			0	Government, Water/Sewer	Lifeline
Chatham County	Southside Fire Dept Sta # 11	0	$136,000	2010	2436			0	Emergency Services, Fire Fighters	Essential, Important
Chatham County	Southside Fire Station #24	0	$0					0	Emergency Services, Fire Fighters	
Garden City city	SCCPSS Gould Elementary	0	$830,020	2010	80730			0	Emergency Services, Fire Fighters	Essential
Garden City city	SCCPSS Rice Creek School	0						0	Education, K - 12	
Garden City city	Garden City Well #5	0						0	Government, Water/Sewer	

GMIS Report for Facility Flood Hazard Grouped by Hazard Score										
Jurisdiction	Name	Hazard Score	Value	Replacement Value Year	Building size	Content value	Content value year	Functional Use value	Facility type	Risk
Garden City city	SCPSS Garden City Elementary	0	$0	2010	89089			0	Emergency Services, Fire Fighters	Essential
Garden City city	SCCPSS Mercer Middle	0	$2,874,390	2010	120536			0	Emergency Services, Fire Fighters	Essential
Garden City city	SCCPSS School to Career Academy	0	$995,000	2010	59500			0	Emergency Services, Fire Fighters	Essential
Garden City city	SCCPSS Groves High	0	$4,205,150	2010	187727			0	Medical, Hospital	Essential, Important
Garden City city	SCCPSS Woodville - Tompkins	0	$4,338,040	2010	126125			0	Medical, Hospital	Essential
Garden City city	Savannah Well #37	0	$0	2010	230			0	Government, Water/Sewer	Lifeline
Garden City city	Garden City City Hall	0	$4,012,700	2010	15000			0	Government, Private	Essential, Important
Garden City city	Savannah Lift Stations #127	0	$0	2010	230			0	Government, Water/Sewer	Lifeline
Garden City city	Garden City Water Tower	0	$12,116,500	2010	25000			0	Government, Water/Sewer	Lifeline
Garden City city	Garden City Lift Station #10	0	$0	2010	230			0	Government, Water/Sewer	Lifeline
Garden City city	Garden City Lift Station #5	0	$0	2010	230			0	Government, Water/Sewer	Lifeline
Garden City city	Garden City Lift Station #3	0	$0	2010	230			0	Government, Water/Sewer	Lifeline
Garden City city	Garden City Lift Station #11	0	$50,000	2010	230			0	Government, Water/Sewer	Lifeline
Garden City city	Garden City Lift Station #7	0	$0	2010	230			0	Government, Water/Sewer	Lifeline
Garden City city	Garden City Fire Department	0	$0	2010	10500			0	Emergency Services, Fire Fighters	Essential, Important
Garden City city	Garden City Fire Department	0	$101,790	2010	5500			0	Emergency Services, Fire Fighters	Essential, Important
Garden City city	Garden City Well #2	0	$0	2010	1100			0	Government, Water/Sewer	Lifeline
Pooler city	Pooler Senior Citizens Center	0	$178,350	2010	3000			0	Government, Water/Sewer	Vulnerable Population
Pooler city	Pooler Meter Station	0	$1,334,500	2010	0			0	Government, Water/Sewer	Lifeline
Pooler city	Pooler Lift Station	0	$0	2010	0			0	Government, Water/Sewer	Lifeline
Pooler city	Pooler Lift Station	0	$56,800	2010	0			0	Government, Water/Sewer	Lifeline
Pooler city	I-95/I-16 Overpass	0	$0	2010	0			0	Government, Water/Sewer	Transportation
Pooler city	Pooler Well & Water Tank	0	$0	2010	2500			0	Government, Water/Sewer	Lifeline
Pooler city	Pooler Meter Station	0	$10,900	2010	0			0	Government, Water/Sewer	Lifeline
Pooler city	I-95/Pooler Parkway Overpass	0	$0	2010	0			0	Government, Water/Sewer	Transportation
Pooler city	I 95/ US Hwy 80 Overpass	0	$0	2010	0			0	Government, Water/Sewer	Transportation

GMIS Report for Facility Flood Hazard Grouped by Hazard Score										
Jurisdiction	Name	Hazard Score	Value	Replacement Value Year	Building size	Content value	Content value year	Functional Use value	Facility type	Risk
Pooler city	Pooler Lift Station	0	$28,103,500	2010	0			0	Government, Water/Sewer	Lifeline
Pooler city	Pooler Lift Station	0	$28,103,500	2010	0			0	Government, Water/Sewer	Lifeline
Pooler city	Pooler Water Tower	0	$0	2010	6200			0	Government, Water/Sewer	Lifeline
Pooler city	Pooler City Hall	0	$280,560	2010	13000			0	Government, Private	Essential, Important
Pooler city	Pooler Well	0	$280,560	2010	2500			0	Government, Water/Sewer	Lifeline
Pooler city	Pooler Water Tower	0	$280,560	2010	6200			0	Government, Water/Sewer	Lifeline
Pooler city	Pooler Lift Station	0	$0	2010	0			0	Government, Water/Sewer	Lifeline
Pooler city	Pooler Lift Station	0	$0	2010	0			0	Government, Water/Sewer	Lifeline
Pooler city	Pooler Fire Station #2/ Medstar Site 5	0	$0	2010	6000			0	Emergency Services, Fire Fighters	Essential, Important
Pooler city	Pooler Police Department	0	$138,500	2010	5100			0	Law Enforcement, Police	Essential
Pooler city	Pooler Fire Station#1	0	$280,560	2010	6300			0	Emergency Services, Fire Fighters	Essential, Important
Pooler city	J.C. Bamford	0	$0	2010	500000			0	Emergency Services, Fire Fighters	
Pooler city	The Place Nursing Home	0	$1,557,500	2010	5000			0	Emergency Services, Fire Fighters	Vulnerable Population
Pooler city	Barrow Dr. Lift Station	0						0	Government, Water/Sewer	
Pooler city	SCCPSS West Chatham Elementary	0	$7,715,800	2010	128548			0	Emergency Services, Fire Fighters	Essential
Pooler city	SCCPSS West Chatham Middle	0	$9,255,900	2010	108500			0	Emergency Services, Fire Fighters	Essential
Pooler city	SCPSS Pooler Elementary	0	$1,660,435	2010	0			0	Emergency Services, Fire Fighters	Essential
Pooler city	SCCPSS Godley Station K-8	0	$12,157,600	2010	128500			0	Emergency Services, Fire Fighters	Essential
Pooler city	Pooler Lift Station	0	$0	2010	0			0	Government, Water/Sewer	Lifeline
Pooler city	Pooler Lift Station	0	$0	2010	0			0	Government, Water/Sewer	Lifeline
Pooler city	Pooler Lift Station	0	$0	2010	0			0	Government, Water/Sewer	Lifeline
Pooler city	I-16 Pooler Parkway Overpass	0	$0	2010	0			0	Government, Water/Sewer	Transportation
Pooler city	Pooler Lift Station	0	$0	2010	0			0	Government, Water/Sewer	Lifeline
Pooler city	Pooler Lift Station	0	$0	2010	0			0	Government, Water/Sewer	Lifeline
Pooler city	Hwy.80/Pooler Parkway Overpass	0	$0	2010	0			0	Government, Water/Sewer	Transportation
Pooler city	Pooler Lift Station	0	$0	2010	0			0	Government, Water/Sewer	Lifeline

GMIS Report for Facility Flood Hazard Grouped by Hazard Score										
Jurisdiction	Name	Hazard Score	Value	Replacement Value Year	Building size	Content value	Content value year	Functional Use value	Facility type	Risk
Pooler city	Pooler Lift Station	0	$4,773,500	2010	0			0	Government, Water/Sewer	Lifeline
Pooler city	Pooler Wastewater treatment plant	0	$0	2010	0			0	Government, Water/Sewer	Lifeline
Pooler city	Pooler Lift Station	0	$0	2010	0			0	Government, Water/Sewer	Lifeline
Pooler city	Pooler/Bdale WPCP	0	$0	2010	3400			0	Government, Water/Sewer	Lifeline
Pooler city	Pooler Lift Station	0	$0	2010	0			0	Government, Water/Sewer	Lifeline
Pooler city	Pooler Lift Station	0	$23,835,000	2010	0			0	Government, Water/Sewer	Lifeline
Pooler city	Pooler Lift Station	0	$0	2010	0			0	Government, Water/Sewer	Lifeline
Pooler city	Pooler Lift Station	0	$0	2010	0			0	Government, Water/Sewer	Lifeline
Pooler city	Pooler Lift Station	0	$0	2010	0			0	Government, Water/Sewer	Lifeline
Pooler city	Pooler Lift Station	0	$0	2010	0			0	Government, Water/Sewer	Lifeline
Pooler city	Pooler Lift Station	0	$0	2010	0			0	Government, Water/Sewer	Lifeline
Pooler city	Pooler Lift Station	0	$115,200	2010	0			0	Government, Water/Sewer	Lifeline
Pooler city	Pooler Public Works Dept	0	$227,500	2010	6150			0	Government, Private	Important
Pooler city	Pooler Lift Station	0	$0	2010	0			0	Government, Water/Sewer	Lifeline
Pooler city	Pooler Lift Station	0	$0	2010	0			0	Government, Water/Sewer	Lifeline
Pooler city	Mighty Eighth Air Force Museum	0	$5,716,500	2010	124598			0	Emergency Services, Fire Fighters	Historic Consideration
Pooler city	West Chatham Branch Library	0	$400,300	2010	128500			0	Education, Library	Historic Consideration
Pooler city	Savannah Lift Stations #165	0	$0	2010	230			0	Government, Water/Sewer	Lifeline
Port Wentworth city	Monteith Road Overpass	0	$0	2010	100			0	Emergency Services, Fire Fighters	Transportation
Port Wentworth city	Monteith Road Overpass	0	$0	2010	100			0	Emergency Services, Fire Fighters	Transportation
Port Wentworth city	Port Wentworth Pump Station #4	0	$0	2010	20			0	Government, Water/Sewer	Lifeline
Port Wentworth city	Port Wentworth Well House #3	0	$0	2010	400			0	Government, Water/Sewer	Lifeline
Port Wentworth city	Hwy 21 and I-95 Overpass	0	$0	2010	100			0	Government, Water/Sewer	Transportation
Port Wentworth city	Port Wentworth Pump Station	0	$0	2010	0			0	Government, Water/Sewer	Lifeline
Port Wentworth city	Port Wentworth Public Works Building	0	$96,900	2010	5200			0	Government, Private	Important
Port Wentworth city	Port Wentworth Recreation Annex	0	$645,230	2010	7754			0	Government, Water/Sewer	Important

GMIS Report for Facility Flood Hazard Grouped by Hazard Score										
Jurisdiction	Name	Hazard Score	Value	Replacement Value Year	Building size	Content value	Content value year	Functional Use value	Facility type	Risk
Port Wentworth city	Port Wentworth Fire Station #2	0	$0	2010	3600			0	Emergency Services, Fire Fighters	Essential, Important
Port Wentworth city	Port Wentworth City Hall	0	$0	2010	8246			0	Government, Private	Essential, Important
Port Wentworth city	Port Wentworth Lift Station #5	0	$0	2010	20			0	Government, Water/Sewer	Lifeline
Port Wentworth city	Port Wentworth Fire Station #1	0	$362,500	2010	3410			0	Emergency Services, Fire Fighters	Essential, Important
Port Wentworth city	Port Wentworth Police Station	0	$362,500	2010	7806			0	Law Enforcement, Police	Essential
Port Wentworth city	Westview Nursing Home	0	$707,000	2010	20000			0	Law Enforcement, Police	Vulnerable Population
Savannah city	Savannah Morning News	0	$17,168,000	2010	0			0	Government, Water/Sewer	
Savannah city	Metro Police Special Operations	0	$180,500	2010	5784			0	Law Enforcement, Police	Essential
Savannah city	Savannah Fire Station #05	0	$142,000	2010	4500			0	Emergency Services, Fire Fighters	Essential, Important
Savannah city	Savannah Fire Prevention Office	0	$3,567,900	2010	5890			0	Emergency Services, Fire Fighters	Essential, Important
Savannah city	Metro Police Savannah Impacts	0	$453,500	2010	9856			0	Law Enforcement, Police	Essential
Savannah city	Metro Police Professional Standards	0	$171,500	2010	11457			0	Law Enforcement, Police	Essential
Savannah city	Metro Police New Property	0	$1,054,000	2010	11457			0	Law Enforcement, Police	Essential
Savannah city	Savannah Fire Station #03	0	$147,740	2010	20000			0	Emergency Services, Fire Fighters	Essential, Important
Savannah city	Metro Police Headquarters	0	$752,900	2010	41206			0	Law Enforcement, Police	Essential
Savannah city	Metro Police Precinct #3 (New)	0	$541,500	2010	29854			0	Law Enforcement, Police	Essential
Savannah city	Metro Police Precinct #3	0	$265,300	2010	2500			0	Law Enforcement, Police	Essential
Savannah city	Roundhouse Railroad Museum	0	$37,200	2010	32659			0	Emergency Services, Fire Fighters	Historic Consideration
Savannah city	Ralph Mark Gilbert Civil Rights Museum	0	$1,237,300	2010	45896			0	Emergency Services, Fire Fighters	Historic Consideration
Savannah city	Savannah History Museum	0	$598,830	2010	128500			0	Emergency Services, Fire Fighters	Historic Consideration
Savannah city	Ships of the Sea Museum	0	$1,547,200	2010	65432			0	Emergency Services, Fire Fighters	Historic Consideration
Savannah city	Georgia Historical Society	0	$3,736,400	2010	57896			0	Emergency Services, Fire Fighters	Historic Consideration
Savannah city	Savannah Jewish Archives	0	$3,736,400	2010	25698			0	Emergency Services, Fire Fighters	Historic Consideration
Savannah city	First African Baptist Church Museum	0	$286,030	2010	25478			0	Emergency Services, Fire Fighters	Historic Consideration
Savannah city	Mercer Williams House Museum	0	$2,204,500	2010	9658			0	Emergency Services, Fire Fighters	Historic Consideration
Savannah city	Telfair Academy	0	$954,300	2010	56985			0	Emergency Services, Fire Fighters	Historic Consideration

GMIS Report for Facility Flood Hazard Grouped by Hazard Score										
Jurisdiction	Name	Hazard Score	Value	Replacement Value Year	Building size	Content value	Content value year	Functional Use value	Facility type	Risk
Savannah city	Jepson Center for the Arts	0	$13,578,500	2010	124589			0	Emergency Services, Fire Fighters	Historic Consideration
Savannah city	Hurn Museum of Contemporary Folk Art	0	$704,000	2010	12453			0	Emergency Services, Fire Fighters	Historic Consideration
Savannah city	Green-Meldrim House	0	$3,480,000	2010	2896			0	Emergency Services, Fire Fighters	Historic Consideration
Savannah city	Congregation Mickve Israel	0	$455,240	2010	65498			0	Emergency Services, Fire Fighters	Historic Consideration
Savannah city	Girl Scout First Headquarters	0	$96,770	2010	4895			0	Emergency Services, Fire Fighters	Historic Consideration
Savannah city	National Society of the Colonial Dames of America	0	$1,911,200	2010	25645			0	Emergency Services, Fire Fighters	Historic Consideration
Savannah city	Juliette Gordon Low Birthplace	0	$2,437,200	2010	5784			0	Emergency Services, Fire Fighters	Historic Consideration
Savannah city	Flannery Oâ€™Connor Childhood Home	0	$251,900	2010	2547			0	Emergency Services, Fire Fighters	Historic Consideration
Savannah city	Girl Scout Archives	0	$10,662,400	2010	14569			0	Emergency Services, Fire Fighters	Historic Consideration
Savannah city	King-Tisdell Cottage	0	$190,000	2010	2568			0	Emergency Services, Fire Fighters	Historic Consideration
Savannah city	Owens-Thomas House	0	$2,171,500	2010	6854			0	Emergency Services, Fire Fighters	Historic Consideration
Savannah city	Historic Savannah Foundation	0	$582,000	2010	45781			0	Emergency Services, Fire Fighters	Historic Consideration
Savannah city	Isaiah Davenport House Museum	0	$0	2010	6875			0	Emergency Services, Fire Fighters	Historic Consideration
Savannah city	Kennedy Pharmacy Building (HSF)	0	$452,100	2010	12456			0	Emergency Services, Fire Fighters	Historic Consideration
Savannah city	Catholic Diocese of Savannah Archives	0	$2,865,200	2010	69856			0	Emergency Services, Fire Fighters	Historic Consideration
Savannah city	W.W. Law Foundation, Inc.	0	$1,077,500	2010	25413			0	Emergency Services, Fire Fighters	Historic Consideration
Savannah city	Savannah Well #10	0	$5,500	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Recreation Center - Cunningham Golden Age	0	$0	2010	15487			0	Government, Water/Sewer	Important
Savannah city	Savannah Lift Stations #068	0	$0	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Recreation Center - Carver Heights Community	0	$144,900	2010	38956			0	Government, Water/Sewer	Important
Savannah city	Savannah Lift Stations #025	0	$0	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #066	0	$43,900	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Oglethorpe Mall Branch Library	0	$926,400	2010	128500			0	Education, Library	Historic Consideration

GMIS Report for Facility Flood Hazard Grouped by Hazard Score										
Jurisdiction	Name	Hazard Score	Value	Replacement Value Year	Building size	Content value	Content value year	Functional Use value	Facility type	Risk
Savannah city	Savannah Lift Stations #024	0	$47,900	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Recreation Center - Tompkins Center	0	$226,350	2010	1245			0	Government, Water/Sewer	Important
Savannah city	Savannah Well #02	0	$620,000	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #077	0	$83,000	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Recreation Center - Mary Flourney	0	$226,350	2010	2447			0	Government, Water/Sewer	Important
Savannah city	Savannah Warehouse	0	$328,000	2010	300000			0	Government, Water/Sewer	Important
Savannah city	Ogeechee Branch Library	0	$1,025,900	2010	65874			0	Education, Library	Historic Consideration
Savannah city	Kayton Branch Library	0	$1,428,480	2010	32659			0	Education, Library	Historic Consideration
Savannah city	Chatham County Citizens' Service Center	0	$3,299,500	2010	33000			0	Government, Private	Important
Savannah city	Bull Street Library	0	$668,330	2010	47895			0	Education, Library	Historic Consideration
Savannah city	Chatham County Tag Office	0	$3,299,500	2010	9280			0	Government, Private	Important
Savannah city	Savannah Lift Stations #072	0	$0	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Parking Garage - Liberty St.	0	$14,298,500	2010	330000			0	Government, Water/Sewer	Important
Savannah city	Chatham County Jail	0	$19,621,000	2010	70003			0	Government, Water/Sewer	Essential, Vulnerable Population
Savannah city	Chatham County Courthouse Bldg	0	$19,621,000	2010	132253			0	Law Enforcement, Court House	Important, Vulnerable Population
Savannah city	Savannah Civic Center	0	$17,794,000	2010	250000			0	Government, Private	Essential, Important
Savannah city	Savannah Well #05	0	$4,320,000	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Storm Water Pump Station	0	$17,794,000	2010	500000			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Recreation Center - Lincoln Street	0	$236,000	2010	3214			0	Government, Water/Sewer	Important
Savannah city	Savannah Parking Garage - Robinson	0	$4,600,200	2010	144060			0	Government, Water/Sewer	Important
Savannah city	Savannah Lift Stations #133	0	$13,600	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Administrative Offices	0	$0	2010	10000			0	Government, Private	Important
Savannah city	Savannah Parking Garage - Whitaker St	0	$2,300,000	2010	250000			0	Government, Water/Sewer	Important

GMIS Report for Facility Flood Hazard Grouped by Hazard Score										
Jurisdiction	Name	Hazard Score	Value	Replacement Value Year	Building size	Content value	Content value year	Functional Use value	Facility type	Risk
Savannah city	Chatham County Old Courthouse	0	$2,887,600	2010	60000			0	Government, Private	Important
Savannah city	Savannah Lift Stations #004	0	$158,300	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Carnegie Branch Library	0	$23,060	2010	25687			0	Education, Library	Historic Consideration
Savannah city	Savannah City Hall	0	$6,675,300	2010	40748			0	Government, Private	Important, Special Consideration
Savannah city	Savannah Research Library & Municipal Archives	0	$6,675,300	2010	21364			0	Education, Library	Historic Consideration
Savannah city	Savannah Storm Water Pump Station	0	$0	2010	200000			0	Government, Water/Sewer	Lifeline
Savannah city	Ola Wyeth Branch Library	0	$4,951,000	2010	45789			0	Education, Library	Historic Consideration
Savannah city	Savannah Central Office	0	$2,000,000	2010	115800			0	Government, Private	Important
Savannah city	Savannah Administrative Offices	0	$4,951,000	2010	42840			0	Government, Private	Important
Savannah city	Savannah Parking Garage - State St	0	$5,995,500	2010	204078			0	Government, Private	Important
Savannah city	Savannah Parking Garage - Bryan Street	0	$6,097,500	2010	197253			0	Government, Private	Important
Savannah city	Broughton Municipal Building	0	$4,809,300	2010	38708			0	Government, Private	Important
Savannah city	Savannah Storm Water Pump Station	0	$0	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Administrative Offices	0	$1,258,900	2010	25000			0	Government, Private	Important
Savannah city	Ga. Dept. of Human Resources	0	$9,471,000	2010	0			0	Government, Private	Important, Vulnerable Population
Savannah city	Savannah Recreation Center - W.W. Law	0	$234,500	2010	19168			0	Government, Water/Sewer	Important
Savannah city	W.W. Law Branch Library	0	$234,500	2010	128500			0	Education, Library	Historic Consideration
Savannah city	Savannah Recreation Center - Blackshear Basketball Complex	0	$0	2010	13245			0	Government, Water/Sewer	Important
Savannah city	Savannah Grayson Stadium	0	$1,258,900	2010	500000			0	Government, Water/Sewer	
Savannah city	Savannah Recreation Center - Eastside Golden Age	0	$1,868,110	2010	12547			0	Government, Water/Sewer	Important
Savannah city	Savannah Pump Station	0	$67,000	2010	25000			0	Government, Water/Sewer	Lifeline
Savannah city	SCPSS Beach Institute	0	$1,326,500	2010	0			0	Emergency Services, Fire Fighters	Essential

GMIS Report for Facility Flood Hazard Grouped by Hazard Score										
Jurisdiction	Name	Hazard Score	Value	Replacement Value Year	Building size	Content value	Content value year	Functional Use value	Facility type	Risk
Savannah city	Savannah Valve House	0	$620,000	2010	25000			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Administrative Offices	0	$685,000	2010	21000			0	Government, Private	Important
Savannah city	Savannah Well #12	0	$6,560	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Chatham County Courthouse Annex	0	$2,200	2010	187178			0	Law Enforcement, Court House	Important
Savannah city	Chatham County Jail	0	$0	2010	310549			0	Law Enforcement, Jails	Important, Vulnerable Population
Savannah city	Savannah Flocculation Bldg	0	$620,000	2010	100000			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah LOD Booster Bldg	0	$620,000	2010	25000			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Fuel Bldg	0	$620,000	2010	1000			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Pump/Generator Bldg	0	$620,000	2010	25000			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Backwash Bldg	0	$620,000	2010	25000			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Chlorine Bldg	0	$620,000	2010	150000			0	Government, Water/Sewer	Lifeline
Savannah city	Neighborhood Centers (19)	0	$620,000	2010	25000			0	Government, Water/Sewer	Important
Savannah city	Savannah Water Tank	0	$620,000	2010	0			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Maint Garage	0	$620,000	2010	2500			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah I&D Water	0	$620,000	2010	25000			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #179	0	$0	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Water Tank	0	$620,000	2010	0			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Generator Bldg	0	$620,000	2010	25000			0	Government, Water/Sewer	Lifeline
Savannah city	Southwest Branch Library	0	$0	2010	128500			0	Education, Library	Historic Consideration
Savannah city	Savannah Recreation Center - Woodwille Community	0	$0	2010	9875			0	Government, Water/Sewer	Important
Savannah city	Port City Branch Library	0	$131,550	2010	69852			0	Education, Library	Historic Consideration
Savannah city	Savannah Lift Stations #181	0	$153,500	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Administrative Offices	0	$802,500	2010	22000			0	Government, Private	Important
Savannah city	Savannah Lift Stations #095	0	$0	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Metro Poilce Training Unit	0	$23,000,000	2010	12457			0	Law Enforcement, Police	Essential

GMIS Report for Facility Flood Hazard Grouped by Hazard Score										
Jurisdiction	Name	Hazard Score	Value	Replacement Value Year	Building size	Content value	Content value year	Functional Use value	Facility type	Risk
Savannah city	Round House Complex	0	$598,830	2010	150000			0	Law Enforcement, Police	Historic Consideration
Savannah city	SCCPSS Transportation Center	0	$802,500	2010	23200			0	Medical, Hospital	Transportation
Savannah city	SCPSS Bartow Elementary	0	$806,640	2010	61342			0	Medical, Hospital	Essential
Savannah city	SCPSS Butler Elementary	0	$394,320	2010	52297			0	Medical, Hospital	Essential
Savannah city	SCPSS Beach High	0	$3,353,620	2010	189734			0	Medical, Hospital	Essential, Important
Savannah city	SCCPSS Gadsden Elementary	0	$989,520	2010	53811			0	Medical, Hospital	Essential
Savannah city	SCCPSS Ellis Elementary	0	$430,030	2010	53136			0	Medical, Hospital	Essential
Savannah city	SCCPSS Savannah Arts High	0	$4,284,820	2010	133721			0	Medical, Hospital	Essential, Important
Savannah city	Massie Heritage Center	0	$834,500	2010	7310			0	Medical, Hospital	Essential
Savannah city	SCCPSS East Broad Street Elementary	0	$2,609,520	2010	100554			0	Medical, Hospital	Essential
Savannah city	SCCPSS Hubert Middle	0	$1,481,240	2010	88450			0	Medical, Hospital	Essential
Savannah city	SCCPSS Myers Middle	0	$2,093,880	2010	117862			0	Medical, Hospital	Essential
Savannah city	SCAD Museum of Art	0	$2,868,000	2010	57896			0	Education, Government Offices	Historic Consideration
Savannah city	SCAD Jen Library	0	$15,505,000	2010	69854			0	Education, Library	Historic Consideration
Savannah city	Savannah Lift Stations #192	0	$0	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #186	0	$0	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #171	0	$0	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #189	0	$0	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #172	0	$0	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #183	0	$361,500	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	I-95/ Jimmy de Loach Pkwy Overpass	0	$0	2010	0			0	Government, Water/Sewer	Transportation
Savannah city	SCCPSS Spencer Elementary	0	$1,349,150	2010	71682			0	Medical, Hospital	Essential
Savannah city	SCCPSS Shuman Middle	0	$0	2010	117862			0	Medical, Hospital	Essential
Savannah city	SCCPSS Savannah High	0	$14,147,200	2010	244410			0	Medical, Hospital	Essential, Important
Savannah city	SCCPSS Whitney Administrative Complex	0	$568,230	2010	50332			0	Government, Private	Important
Savannah city	SCCPSS Jenkins High	0	$3,873,200	2010	167774			0	Medical, Hospital	Essential, Important

GMIS Report for Facility Flood Hazard Grouped by Hazard Score										
Jurisdiction	Name	Hazard Score	Value	Replacement Value Year	Building size	Content value	Content value year	Functional Use value	Facility type	Risk
Savannah city	SCCPSS Hodge Elementary	0	$1,249,890	2010	50430			0	Medical, Hospital	Essential
Savannah city	SCCPSS Haven Elementary	0	$1,021,090	2010	54069			0	Medical, Hospital	Essential
Savannah city	SCCPSS Derenne Middle	0	$1,495,224	2010	61022			0	Medical, Hospital	Essential
Savannah city	Savannah Fire Station #15	0	$38,400	2010	2000			0	Emergency Services, Fire Fighters	Essential, Important
Savannah city	Savannah Fire Station #12	0	$38,400	2010	4500			0	Emergency Services, Fire Fighters	Essential, Important
Savannah city	Savannah Fire Station #14	0	$0	2010	2000			0	Emergency Services, Fire Fighters	Essential, Important
Savannah city	Savannah Fire Station #13	0	$448,000,000	2010	2000			0	Emergency Services, Fire Fighters	Essential, Important
Savannah city	Savannah Lift Stations #029	0	$0	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #001	0	$14,147,200	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #094	0	$33,100	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #030	0	$62,800	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #063	0	$0	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Well #11	0	$12,770	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Water Tank	0	$13,584,990	2010	0			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Water Tank	0	$13,584,990	2010	0			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #064	0	$498,500	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #003	0	$80,800	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Well #01	0	$68,100	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Well #07	0	$1,258,900	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #007	0	$27,900	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Well #06	0	$5,356,210	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Well #08	0	$174,000	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Fire Station #09	0	$37,000	2010	12000			0	Emergency Services, Fire Fighters	Essential, Important
Savannah city	Savannah Fire Station #08	0	$192,500	2010	3000			0	Emergency Services, Fire Fighters	Essential, Important
Savannah city	Savannah Fire Station #01	0	$62,000	2010	3000			0	Emergency Services, Fire Fighters	Essential, Important
Savannah city	Savannah Fire Station #06	0	$146,230	2010	4500			0	Emergency Services, Fire Fighters	Essential, Important

GMIS Report for Facility Flood Hazard Grouped by Hazard Score										
Jurisdiction	Name	Hazard Score	Value	Replacement Value Year	Building size	Content value	Content value year	Functional Use value	Facility type	Risk
Savannah city	Savannah Lift Stations #006	0	$110,000	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #005	0	$0	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Well #09	0	$8,750	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #031	0	$30,700	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #051	0	$6,372,000	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #076	0	$5,178,832	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #053	0	$0	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #056	0	$65,100	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	SCPSS Pulaski Elementary	0	$838,670	2010	41198			0	Medical, Hospital	Essential
Savannah city	Savannah Lift Stations #087	0	$0	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #055	0	$2,297,409	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #078	0	$105,200	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #139	0	$5,827,000	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #020	0	$0	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #138	0	$0	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #116	0	$3,623,000	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	United Cerebral Palsy QUEENSBURY	0	$100,000	2013	1000			0	Emergency Services, Fire Fighters	Vulnerable Population
Savannah city	Hesse Elementary	0						0	Education, K - 12	
Savannah city	Savannah Fire Training Center	0						0	Emergency Services, Fire Fighters	
Savannah city	Savannah Lift Stations #111	0	$0	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	SCCPSS Low Elementary	0	$3,873,200	2010	53252			0	Medical, Hospital	Essential
Savannah city	SCPSS Bartlett Middle	0	$2,666,890	2010	121486			0	Medical, Hospital	Essential
Savannah city	Candler Hospital	0	$55,000,000	2010	0			0	Emergency Services, EMS	Essential, Important, Vulnerable Population
Savannah city	Memorial Hospital	0	$155,000,000	2010	0			0	Emergency Services, EMS	Essential, Important, Vulnerable Population
Savannah city	SCCPSS J. G. Smith Elementary	0	$910,880	2010	49672			0	Medical, Hospital	Essential

GMIS Report for Facility Flood Hazard Grouped by Hazard Score										
Jurisdiction	Name	Hazard Score	Value	Replacement Value Year	Building size	Content value	Content value year	Functional Use value	Facility type	Risk
Savannah city	Savannah Water Tank	0	$486,790	2010	0			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #009	0	$35,000	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #061	0	$51,500	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #145	0	$9,009,000	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Fire Station #11	0	$277,200	2010	3000			0	Emergency Services, Fire Fighters	Essential, Important
Savannah city	Savannah Lift Stations #088	0	$446,000	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #013	0	$2,328,000	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #135	0	$255,000	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #041	0	$7,896,600	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Well #13	0	$2,666,890	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #136	0	$3,705,100	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #011	0	$0	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #047	0	$94,600	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #032	0	$202,900	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Southside Fire Dept Sta # 01	0	$674,500	2010	9184			0	Emergency Services, Fire Fighters	Essential, Important
Savannah city	Savannah Fire Station #02	0	$90,700	2010	3000			0	Emergency Services, Fire Fighters	Essential, Important
Savannah city	Savannah Crossroads Waste Treatment	0	$0	2010	39456			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #040	0	$448,000,000	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #059	0	$0	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	SCCPSS Garrison Elementary	0	$8,820,000	2010	111105			0	Medical, Hospital	Essential
Savannah city	Savannah Hilton Head International Airport	0	$27,864,000	2010	0			0	Government, Water/Sewer	Transportation
Savannah city	Savannah Well #17	0	$448,000,000	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Well #18	0	$1,370,000	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Water Tank	0	$448,000,000	2010	0			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Well #19	0	$448,000,000	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Water Tank	0	$448,000,000	2010	0			0	Government, Water/Sewer	Lifeline

GMIS Report for Facility Flood Hazard Grouped by Hazard Score										
Jurisdiction	Name	Hazard Score	Value	Replacement Value Year	Building size	Content value	Content value year	Functional Use value	Facility type	Risk
Savannah city	Savannah Water Tank	0	$448,000,000	2010	0			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #149	0	$448,000,000	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Well #40	0	$0	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Fire Station #04	0	$5,500	2010	3000			0	Emergency Services, Fire Fighters	Essential, Important
Savannah city	Sav Water Meter Station	0	$51,500	2010	0			0	Government, Water/Sewer	Vulnerable Population
Savannah city	Metro Police Precinct #1, 911 (County)	0	$0	2010	24568			0	Law Enforcement, Police	Essential
Savannah city	Savannah Lift Stations #159	0	$22,539,500	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #166	0	$0	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #160	0	$0	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #122	0	$4,847,000	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #049	0	$41,100	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Well #14	0	$0	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #017	0	$0	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Water Tank	0	$0	2010	0			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Well #27	0	$40,000	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Well #23	0	$0	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #083	0	$12,569,710	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #019	0	$0	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Well #26	0	$0	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Recreation Center - Crusader Park Neighborhood	0	$339,800	2010	4572			0	Government, Water/Sewer	Important
Savannah city	Savannah Lift Stations #018	0	$76,900	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Well #15	0	$89,500	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Recreation Center - Windsor Forest Community	0	$922,830	2010	6548			0	Government, Water/Sewer	Important
Savannah city	Savannah Lift Stations #050	0	$1,000	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #085	0	$25,000,000	2010	230			0	Government, Water/Sewer	Lifeline

GMIS Report for Facility Flood Hazard Grouped by Hazard Score										
Jurisdiction	Name	Hazard Score	Value	Replacement Value Year	Building size	Content value	Content value year	Functional Use value	Facility type	Risk
Savannah city	Savannah Lift Stations #035	0	$0	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #071	0	$105,100	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Bamboo Farm & Coastal Gardens	0	$49,500	2010	0			0	Government, Water/Sewer	Historic Consideration
Savannah city	Savannah Well #29	0	$0	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	SCCPSS White Bluff Elementary	0	$1,497,450	2010	57671			0	Medical, Hospital	Essential
Savannah city	SCCPSS Windsor Forest High	0	$2,881,950	2010	154043			0	Medical, Hospital	Essential, Important
Savannah city	SCCPSS Windsor Forest Elementary	0	$922,830	2010	75529			0	Medical, Hospital	Essential
Savannah city	St. Joe Hospital	0	$12,569,710	2010	0			0	Emergency Services, EMS	Essential, Important, Vulnerable Population
Savannah city	Metro Police Precinct #4 (Leased)	0	$79,228,500	2010	2500			0	Law Enforcement, Police	Essential
Savannah city	Savannah Fire Station #10	0	$225,000	2010	3000			0	Emergency Services, Fire Fighters	Essential, Important
Savannah city	Savannah Well #16	0	$1,542,000	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	Savannah Lift Stations #044	0	$618,800	2010	230			0	Government, Water/Sewer	Lifeline
Savannah city	United Cerebral Palsy TAVERN	0	$100,000	2013	1000			0	Emergency Services, Fire Fighters	Vulnerable Population
Savannah city	United Cerebral Palsy CANTERBURY	0	$100,000	2000	1000			0	Emergency Services, Fire Fighters	Vulnerable Population
Savannah city	United Cerebral Palsy CORMORANT WAY	0	$100,000	2013	1000			0	Emergency Services, Fire Fighters	Vulnerable Population
Savannah city	United Cerebral Palsy DYCES	0	$100,000	2013	1000			0	Emergency Services, Fire Fighters	Vulnerable Population
Savannah city	United Cerebral Palsy OLD MILL	0						0	Emergency Services, Fire Fighters	Vulnerable Population
Savannah city	Savannah Fire Station #11	0						0	Emergency Services, Fire Fighters	
Savannah city	Savannah Fire Station #12	0						0	Emergency Services, Fire Fighters	
Savannah city	United Cerebral Palsy BARKSDALE	0	$100,000	2000	10000			0	Emergency Services, Fire Fighters	Vulnerable Population
Savannah city	United Cerebral Palsy BEAVER RUN	0	$100,000	2000	1000			0	Emergency Services, Fire Fighters	Vulnerable Population
Thunderbolt town	United Cerebral Palsy BUTLER	0	$100,000	2000	1000			0	Emergency Services, Fire Fighters	Vulnerable Population
Thunderbolt town	Thunderbolt Sewer Pump #1	0	$13,584,990	2010	2500			0	Government, Water/Sewer	Lifeline
Thunderbolt town	Thunderbolt Sewer Pump #2	0	$13,584,990	2010	2500			0	Government, Water/Sewer	Lifeline
Thunderbolt town	Thunderbolt Sewer Pump #3	0	$13,584,990	2010	2500			0	Government, Water/Sewer	Lifeline

GMIS Report for Facility Flood Hazard Grouped by Hazard Score										
Jurisdiction	Name	Hazard Score	Value	Replacement Value Year	Building size	Content value	Content value year	Functional Use value	Facility type	Risk
Thunderbolt town	Thunderbolt Branch Library	0	$141,350	2010	0			0	Education, Library	Historic Consideration
Thunderbolt town	Thunderbolt Water Well #3	0	$0	2010	2500			0	Government, Water/Sewer	Lifeline
Thunderbolt town	Thunderbolt Water Tank	0	$0	2010	0			0	Government, Water/Sewer	Lifeline
Thunderbolt town	Thunderbolt Municipal Complex	0	$0	2010	10000			0	Government, Private	Important
Thunderbolt town	Thunderbolt Fire Department	0	$50,360	2010	8000			0	Emergency Services, Fire Fighters	Essential, Important
Thunderbolt town	Thunderbolt Police Dept	0	$0	2010	0			0	Law Enforcement, Police	Essential
Thunderbolt town	Thunderbolt Museum	0	$0	2010	3000			0	Law Enforcement, Police	Historic Consideration
Thunderbolt town	Tara Nursing Home	0	$6,525,400	2010	12000			0	Law Enforcement, Police	Vulnerable Population
Thunderbolt town	Thunderbolt Senior's Center	0	$0	2010	2100			0	Law Enforcement, Police	Vulnerable Population
Thunderbolt town	Totally Kids, Inc.	0	$192,310	2010	2500			0	Emergency Services, Fire Fighters	Vulnerable Population
Thunderbolt town	SCCPSS Johnson High	0	$0	2010	195124			0	Medical, Hospital	Essential, Important
Thunderbolt town	SCCPSS Thunderbolt Elementary	0	$1,141,480	2010	50551			0	Medical, Hospital	Essential

E.2 HAZUS REPORTS

Hazus-MH: Earthquake Global Risk Report

Region Name Chatham_Co_EQ

Earthquake Scenario: Chatham_250yr_EQ

Print Date: October 10, 2019

Disclaimer:
This version of Hazus utilizes 2010 Census Data.
Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using Hazus loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific earthquake. These results can be improved by using enhanced inventory, geotechnical, and observed ground motion data.

Table of Contents

General Description of the Region

Hazus is a regional earthquake loss estimation model that was developed by the Federal Emergency Management Agency and the National Institute of Building Sciences. The primary purpose of Hazus is to provide a methodology and software application to develop earthquake losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from earthquakes and to prepare for emergency response and recovery.

The earthquake loss estimates provided in this report was based on a region that includes 1 county(ies) from the following state(s):

Georgia

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 462.29 square miles and contains 72 census tracts. There are over 103 thousand households in the region which has a total population of 265,128 people (2010 Census Bureau data). The distribution of population by State and County is provided in Appendix B.

There are an estimated 101 thousand buildings in the region with a total building replacement value (excluding contents) of 30,854 (millions of dollars). Approximately 92.00 % of the buildings (and 76.00% of the building value) are associated with residential housing.

The replacement value of the transportation and utility lifeline systems is estimated to be 3,249 and 1,022 (millions of dollars) , respectively.

Building and Lifeline Inventory

Building Inventory

Hazus estimates that there are 101 thousand buildings in the region which have an aggregate total replacement value of 30,854 (millions of dollars) . Appendix B provides a general distribution of the building value by State and County.

In terms of building construction types found in the region, wood frame construction makes up 79% of the building inventory. The remaining percentage is distributed between the other general building types.

Critical Facility Inventory

Hazus breaks critical facilities into two (2) groups: essential facilities and high potential loss facilities (HPL). Essential facilities include hospitals, medical clinics, schools, fire stations, police stations and emergency operations facilities. High potential loss facilities include dams, levees, military installations, nuclear power plants and hazardous material sites.

For essential facilities, there are 11 hospitals in the region with a total bed capacity of 1,717 beds. There are 104 schools, 40 fire stations, 14 police stations and 1 emergency operation facilities. With respect to high potential loss facilities (HPL), there are 0 dams identified within the inventory. Of these, 0 of the dams are classified as 'high hazard'. The inventory also includes 124 hazardous material sites, 0 military installations and 0 nuclear power plants.

Transportation and Utility Lifeline Inventory

Within Hazus, the lifeline inventory is divided between transportation and utility lifeline systems. There are seven (7) transportation systems that include highways, railways, light rail, bus, ports, ferry and airports. There are six (6) utility systems that include potable water, wastewater, natural gas, crude & refined oil, electric power and communications. The lifeline inventory data are provided in Tables 1 and 2.

The total value of the lifeline inventory is over 4,271.00 (millions of dollars). This inventory includes over 332 kilometers of highways, 186 bridges, 9,186 kilometers of pipes.

Table 1: Transportation System Lifeline Inventory

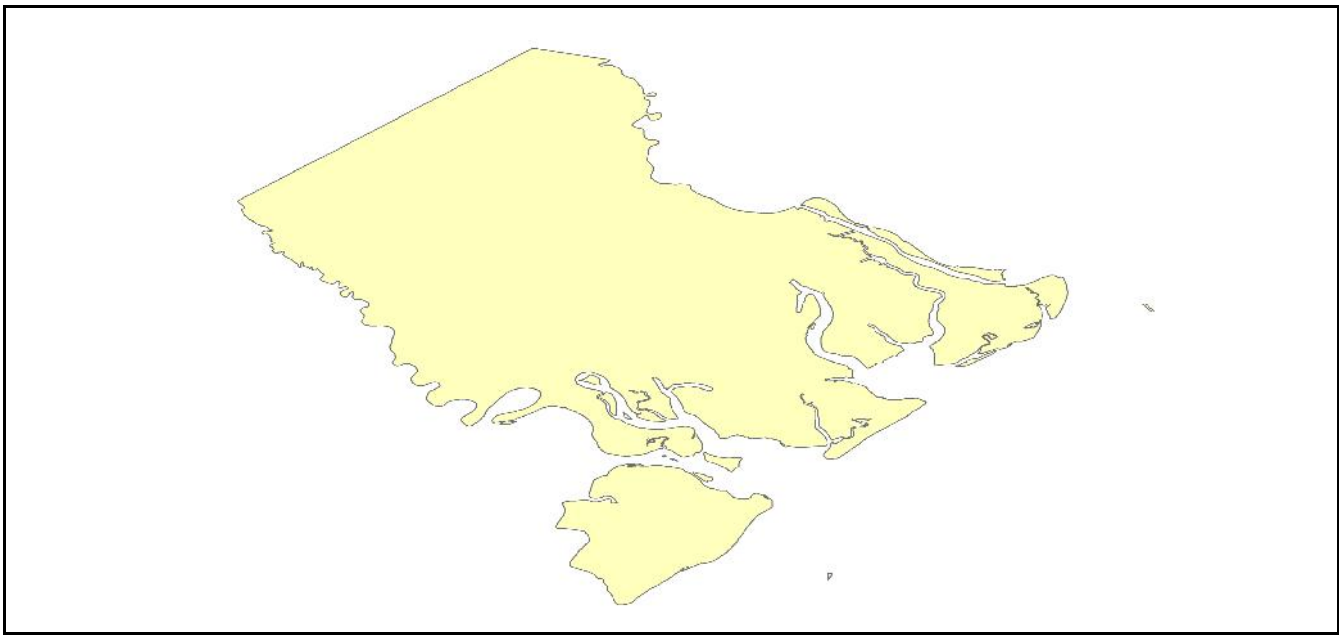
System	Component	# Locations/ # Segments	Replacement value (millions of dollars)
Highway	Bridges	186	619.80
	Segments	240	2,156.50
	Tunnels	0	0.00
	Subtotal		**2,776.20**
Railways	Bridges	6	0.60
	Facilities	8	21.30
	Segments	345	249.00
	Tunnels	0	0.00
	Subtotal		**270.80**
Light Rail	Bridges	0	0.00
	Facilities	0	0.00
	Segments	0	0.00
	Tunnels	0	0.00
	Subtotal		**0.00**
Bus	Facilities	3	2.90
	Subtotal		**2.90**
Ferry	Facilities	4	5.30
	Subtotal		**5.30**
Port	Facilities	54	107.80
	Subtotal		**107.80**
Airport	Facilities	1	10.70
	Runways	2	75.90
	Subtotal		**86.60**
	Total		**3,249.70**

Table 2: Utility System Lifeline Inventory

System	Component	# Locations / Segments	Replacement value (millions of dollars)
Potable Water	Distribution Lines	NA	91.90
	Facilities	0	0.00
	Pipelines	0	0.00
		Subtotal	**91.90**
Waste Water	Distribution Lines	NA	55.10
	Facilities	6	351.60
	Pipelines	0	0.00
		Subtotal	**406.80**
Natural Gas	Distribution Lines	NA	36.70
	Facilities	1	1.00
	Pipelines	0	0.00
		Subtotal	**37.70**
Oil Systems	Facilities	4	0.40
	Pipelines	0	0.00
		Subtotal	**0.40**
Electrical Power	Facilities	5	484.00
		Subtotal	**484.00**
Communication	Facilities	23	2.00
		Subtotal	**2.00**
		Total	**1,022.70**

Earthquake Scenario

Hazus uses the following set of information to define the earthquake parameters used for the earthquake loss estimate provided in this report.



Scenario Name	Chatham_250yr_EQ
Type of Earthquake	Probabilistic
Fault Name	NA
Historical Epicenter ID #	NA
Probabilistic Return Period	250.00
Longitude of Epicenter	NA
Latitude of Epicenter	NA
Earthquake Magnitude	5.00
Depth (km)	NA
Rupture Length (Km)	NA
Rupture Orientation (degrees)	NA
Attenuation Function	NA

Building Damage

Building Damage

Hazus estimates that about 21,938 buildings will be at least moderately damaged. This is over 22.00 % of the buildings in the region. There are an estimated 1,555 buildings that will be damaged beyond repair. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the Hazus technical manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 below summarizes the expected damage by general building type.

Damage categories by General Occupancy Type

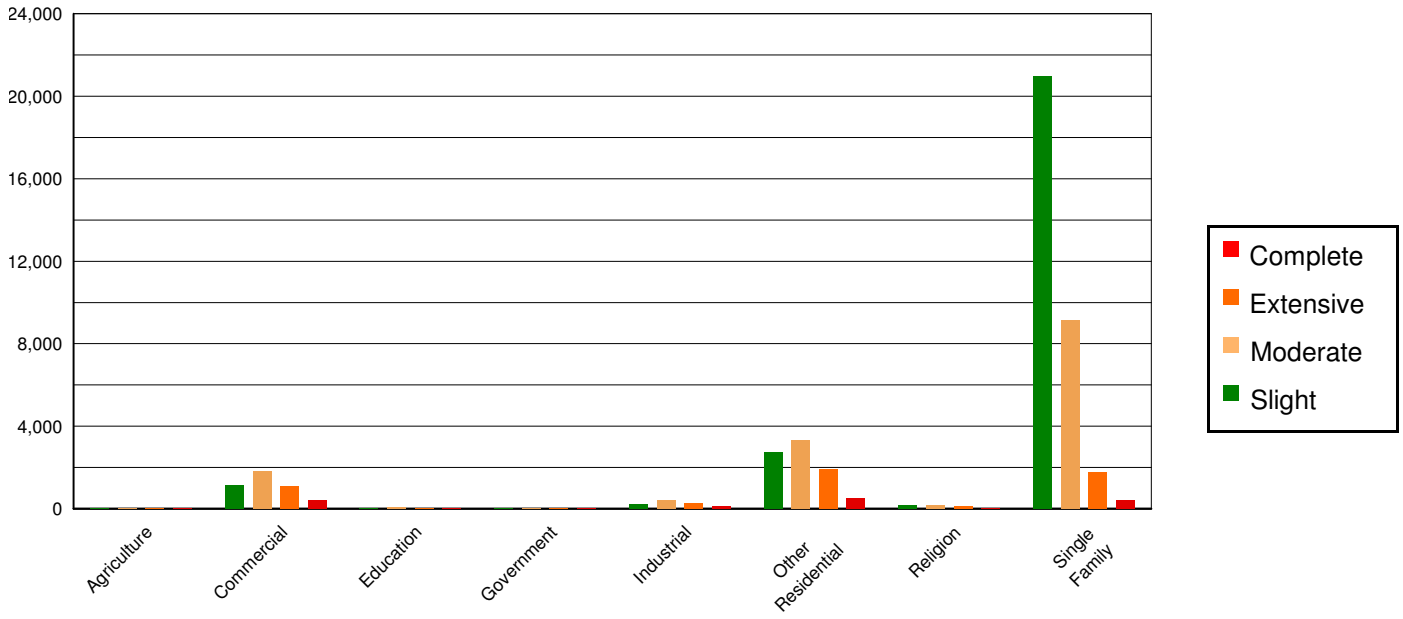


Table 3: Expected Building Damage by Occupancy

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	50	0.09	40	0.16	55	0.36	26	0.49	9	0.61
Commercial	1,421	2.61	1,124	4.44	1,832	12.16	1,102	20.74	434	27.91
Education	47	0.09	36	0.14	62	0.41	38	0.71	15	0.94
Government	35	0.06	28	0.11	53	0.35	35	0.65	14	0.87
Industrial	330	0.61	236	0.93	420	2.79	271	5.10	105	6.75
Other Residential	3,964	7.28	2,728	10.77	3,309	21.96	1,945	36.60	535	34.40
Religion	285	0.52	176	0.70	185	1.23	111	2.09	44	2.83
Single Family	48,335	88.74	20,960	82.75	9,152	60.74	1,788	33.63	400	25.69
Total	**54,466**		**25,329**		**15,067**		**5,316**		**1,555**	

Table 4: Expected Building Damage by Building Type (All Design Levels)

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Wood	49,155	90.25	21383	84.42	8,783	58.29	1,233	23.19	102	6.56
Steel	883	1.62	613	2.42	1,275	8.46	865	16.28	343	22.08
Concrete	161	0.30	118	0.47	282	1.87	204	3.83	73	4.67
Precast	53	0.10	31	0.12	80	0.53	88	1.66	37	2.39
RM	348	0.64	161	0.63	371	2.46	341	6.42	84	5.37
URM	2,860	5.25	1949	7.70	2,253	14.95	1,253	23.57	591	38.03
MH	1,006	1.85	1074	4.24	2,024	13.43	1,331	25.04	325	20.90
Total	**54,466**		**25,329**		**15,067**		**5,316**		**1,555**	

*Note:
RM Reinforced Masonry
URM Unreinforced Masonry
MH Manufactured Housing

Essential Facility Damage

Before the earthquake, the region had 1,717 hospital beds available for use. On the day of the earthquake, the model estimates that only 292 hospital beds (17.00%) are available for use by patients already in the hospital and those injured by the earthquake. After one week, 37.00% of the beds will be back in service. By 30 days, 68.00% will be operational.

Table 5: Expected Damage to Essential Facilities

Classification	Total	# Facilities		
		At Least Moderate Damage > 50%	Complete Damage > 50%	With Functionality > 50% on day 1
Hospitals	11	11	0	0
Schools	104	71	0	17
EOCs	1	1	0	0
PoliceStations	14	5	0	5
FireStations	40	16	0	15

Transportation Lifeline Damage

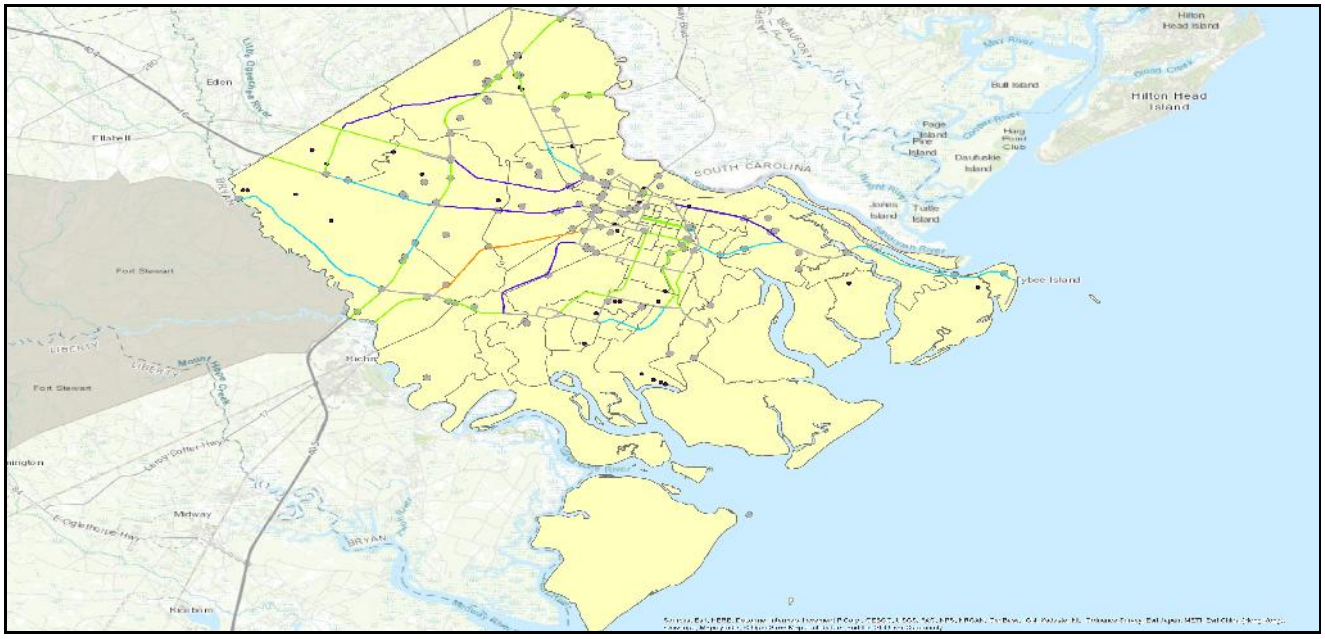


Table 6: Expected Damage to the Transportation Systems

System	Component		Number of Locations			
		Locations/ Segments	With at Least Mod. Damage	With Complete Damage	With Functionality > 50 %	
					After Day 1	After Day 7
Highway	Segments	240	0	0	0	0
	Bridges	186	0	0	0	0
	Tunnels	0	0	0	0	0
Railways	Segments	345	0	0	0	0
	Bridges	6	0	0	0	0
	Tunnels	0	0	0	0	0
	Facilities	8	0	0	0	0
Light Rail	Segments	0	0	0	0	0
	Bridges	0	0	0	0	0
	Tunnels	0	0	0	0	0
	Facilities	0	0	0	0	0
Bus	Facilities	3	0	0	0	0
Ferry	Facilities	4	0	0	0	0
Port	Facilities	54	0	0	0	0
Airport	Facilities	1	0	0	0	0
	Runways	2	0	0	0	0

Table 6 provides damage estimates for the transportation system.

Note: Roadway segments, railroad tracks and light rail tracks are assumed to be damaged by ground failure only. If ground failure maps are not provided, damage estimates to these components will not be computed.

Tables 7-9 provide information on the damage to the utility lifeline systems. Table 7 provides damage to the utility system facilities. Table 8 provides estimates on the number of leaks and breaks by the pipelines of the utility systems. For electric power and potable water, Hazus performs a simplified system performance analysis. Table 9 provides a summary of the system performance information.

Table 7 : Expected Utility System Facility Damage

System	# of Locations				
	Total #	With at Least Moderate Damage	With Complete Damage	with Functionality > 50 %	
				After Day 1	After Day 7
Potable Water	0	0	0	0	0
Waste Water	6	0	0	0	0
Natural Gas	1	0	0	0	0
Oil Systems	4	0	0	0	0
Electrical Power	5	0	0	0	0
Communication	23	0	0	0	0

Table 8 : Expected Utility System Pipeline Damage (Site Specific)

System	Total Pipelines Length (kms)	Number of Leaks	Number of Breaks
Potable Water	4,593	0	0
Waste Water	2,756	0	0
Natural Gas	1,837	0	0
Oil	0	0	0

Table 9: Expected Potable Water and Electric Power System Performance

	Total # of Households	Number of Households without Service				
		At Day 1	At Day 3	At Day 7	At Day 30	At Day 90
Potable Water	0	0	0	0	0	0
Electric Power		0	0	0	0	0

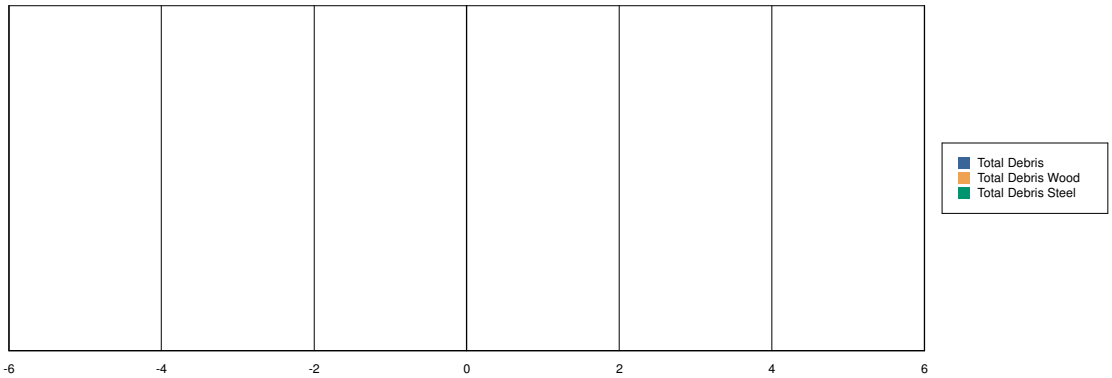
Induced Earthquake Damage

Debris Generation

Hazus estimates the amount of debris that will be generated by the earthquake. The model breaks the debris into two general categories: a) Brick/Wood and b) Reinforced Concrete/Steel. This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 0.00 million tons of debris will be generated. Of the total amount, Brick/Wood comprises 0.00% of the total, with the remainder being Reinforced Concrete/Steel. If the debris tonnage is converted to an estimated number of truckloads, it will require 0 truckloads (@25 tons/truck) to remove the debris generated by the earthquake.

Earthquake Debris (millions of tons)



Brick/ Wood	Reinforced Concrete/Steel	Total Debris	Truck Load
		0.00	0 (@25 tons/truck)

Social Impact

Shelter Requirement

Hazus estimates the number of households that are expected to be displaced from their homes due to the earthquake and the number of displaced people that will require accommodations in temporary public shelters. The model estimates 0 households to be displaced due to the earthquake. Of these, 0 people (out of a total population of 265,128) will seek temporary shelter in public shelters.

Displaced Households/ Persons Seeking Short Term Public Shelter

Displaced households as a result of the earthquake	Persons seeking temporary public shelter
0	0

Casualties

Hazus estimates the number of people that will be injured and killed by the earthquake. The casualties are broken down into four (4) severity levels that describe the extent of the injuries. The levels are described as follows;

- Severity Level 1: Injuries will require medical attention but hospitalization is not needed.
- Severity Level 2: Injuries will require hospitalization but are not considered life-threatening
- Severity Level 3: Injuries will require hospitalization and can become life threatening if not promptly treated.
- Severity Level 4: Victims are killed by the earthquake.

The casualty estimates are provided for three (3) times of day: 2:00 AM, 2:00 PM and 5:00 PM. These times represent the periods of the day that different sectors of the community are at their peak occupancy loads. The 2:00 AM estimate considers that the residential occupancy load is maximum, the 2:00 PM estimate considers that the educational, commercial and industrial sector loads are maximum and 5:00 PM represents peak commute time.

Table 10 provides a summary of the casualties estimated for this earthquake

Table 10: Casualty Estimates

		Level 1	Level 2	Level 3	Level 4
	Total				

Economic Loss

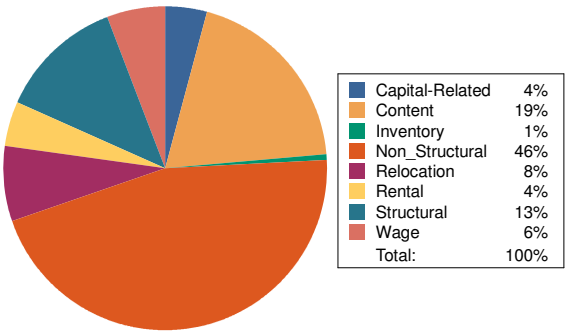
The total economic loss estimated for the earthquake is 4,223.66 (millions of dollars), which includes building and lifeline related losses based on the region's available inventory. The following three sections provide more detailed information about these losses.

Building-Related Losses

The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the earthquake. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the earthquake.

The total building-related losses were 4,223.66 (millions of dollars); 22 % of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies which made up over 48 % of the total loss. Table 11 below provides a summary of the losses associated with the building damage.

Earthquake Losses by Loss Type ($ millions)



Earthquake Losses by Occupancy Type ($ millions)

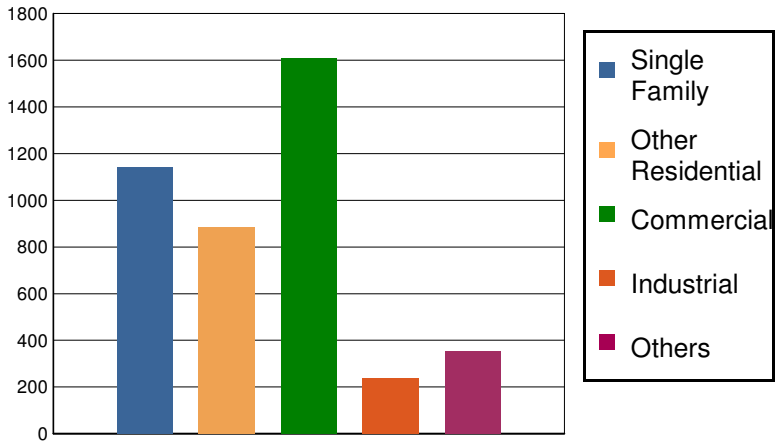


Table 11: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Single Family	Other Residential	Commercial	Industrial	Others	Total
Income Losses							
	Wage	0.00	31.27	195.67	5.41	13.16	245.50
	Capital-Related	0.00	13.34	158.44	3.23	3.34	178.34
	Rental	26.05	68.49	78.32	1.83	6.36	181.06
	Relocation	91.65	39.13	130.74	9.92	53.35	324.78
	Subtotal	**117.71**	**152.23**	**563.16**	**20.38**	**76.21**	**929.68**
Capital Stock Losses							
	Structural	124.92	110.99	214.68	32.62	47.96	531.17
	Non_Structural	632.48	491.56	547.28	102.77	149.86	1,923.95
	Content	267.16	127.76	276.66	67.14	77.65	816.36
	Inventory	0.00	0.00	8.70	13.44	0.35	22.49
	Subtotal	**1,024.56**	**730.32**	**1,047.31**	**215.97**	**275.82**	**3,293.97**
	Total	**1,142.26**	**882.55**	**1,610.46**	**236.35**	**352.03**	**4,223.66**

Transportation and Utility Lifeline Losses

For the transportation and utility lifeline systems, Hazus computes the direct repair cost for each component only. There are no losses computed by Hazus for business interruption due to lifeline outages. Tables 12 & 13 provide a detailed breakdown in the expected lifeline losses.

Table 12: Transportation System Economic Losses
(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Highway	Segments	2,156.47	$0.00	0.00
	Bridges	619.75	$0.00	0.00
	Tunnels	0.00	$0.00	0.00
	Subtotal	**2,776**	**0.00**	
Railways	Segments	248.95	$0.00	0.00
	Bridges	0.56	$0.00	0.00
	Tunnels	0.00	$0.00	0.00
	Facilities	21.30	$0.00	0.00
	Subtotal	**271**	**0.00**	
Light Rail	Segments	0.00	$0.00	0.00
	Bridges	0.00	$0.00	0.00
	Tunnels	0.00	$0.00	0.00
	Facilities	0.00	$0.00	0.00
	Subtotal	**0**	**0.00**	
Bus	Facilities	2.88	$0.00	0.00
	Subtotal	**3**	**0.00**	
Ferry	Facilities	5.32	$0.00	0.00
	Subtotal	**5**	**0.00**	
Port	Facilities	107.84	$0.00	0.00
	Subtotal	**108**	**0.00**	
Airport	Facilities	10.65	$0.00	0.00
	Runways	75.93	$0.00	0.00
	Subtotal	**87**	**0.00**	
	Total	**3,249.70**	**0.00**	

Table 13: Utility System Economic Losses

(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Potable Water	Pipelines	0.00	$0.00	0.00
	Facilities	0.00	$0.00	0.00
	Distribution Line	91.90	$0.00	0.00
	Subtotal	**91.87**	**$0.00**	
Waste Water	Pipelines	0.00	$0.00	0.00
	Facilities	351.60	$0.00	0.00
	Distribution Line	55.10	$0.00	0.00
	Subtotal	**406.77**	**$0.00**	
Natural Gas	Pipelines	0.00	$0.00	0.00
	Facilities	1.00	$0.00	0.00
	Distribution Line	36.70	$0.00	0.00
	Subtotal	**37.71**	**$0.00**	
Oil Systems	Pipelines	0.00	$0.00	0.00
	Facilities	0.40	$0.00	0.00
	Subtotal	**0.35**	**$0.00**	
Electrical Power	Facilities	484.00	$0.00	0.00
	Subtotal	**484.00**	**$0.00**	
Communication	Facilities	2.00	$0.00	0.00
	Subtotal	**2.02**	**$0.00**	
	Total	**1,022.71**	**$0.00**	

Appendix A: County Listing for the Region

Chatham,GA

Appendix B: Regional Population and Building Value Data

State	County Name	Population	Building Value (millions of dollars)		
			Residential	Non-Residential	Total
Georgia	Chatham	265,128	23,499	7,354	30,854
Total State		**265,128**	**23,499**	**7,354**	**30,854**
Total Region		**265,128**	**23,499**	**7,354**	**30,854**

Hazus-MH: Earthquake Global Risk Report

Region Name Chatham_Co_EQ

Earthquake Scenario: Chatham_500yr_7mag

Print Date: October 17, 2019

Disclaimer:
This version of Hazus utilizes 2010 Census Data.
Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using Hazus loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific earthquake. These results can be improved by using enhanced inventory, geotechnical, and observed ground motion data.

Table of Contents

General Description of the Region

Hazus is a regional earthquake loss estimation model that was developed by the Federal Emergency Management Agency and the National Institute of Building Sciences. The primary purpose of Hazus is to provide a methodology and software application to develop earthquake losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from earthquakes and to prepare for emergency response and recovery.

The earthquake loss estimates provided in this report was based on a region that includes 1 county(ies) from the following state(s):

Georgia

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 462.29 square miles and contains 72 census tracts. There are over 103 thousand households in the region which has a total population of 265,128 people (2010 Census Bureau data). The distribution of population by State and County is provided in Appendix B.

There are an estimated 101 thousand buildings in the region with a total building replacement value (excluding contents) of 30,854 (millions of dollars). Approximately 92.00 % of the buildings (and 76.00% of the building value) are associated with residential housing.

The replacement value of the transportation and utility lifeline systems is estimated to be 3,249 and 1,022 (millions of dollars) , respectively.

Building and Lifeline Inventory

Building Inventory

Hazus estimates that there are 101 thousand buildings in the region which have an aggregate total replacement value of 30,854 (millions of dollars) . Appendix B provides a general distribution of the building value by State and County.

In terms of building construction types found in the region, wood frame construction makes up 79% of the building inventory. The remaining percentage is distributed between the other general building types.

Critical Facility Inventory

Hazus breaks critical facilities into two (2) groups: essential facilities and high potential loss facilities (HPL). Essential facilities include hospitals, medical clinics, schools, fire stations, police stations and emergency operations facilities. High potential loss facilities include dams, levees, military installations, nuclear power plants and hazardous material sites.

For essential facilities, there are 11 hospitals in the region with a total bed capacity of 1,717 beds. There are 104 schools, 40 fire stations, 14 police stations and 1 emergency operation facilities. With respect to high potential loss facilities (HPL), there are 0 dams identified within the inventory. Of these, 0 of the dams are classified as 'high hazard'. The inventory also includes 124 hazardous material sites, 0 military installations and 0 nuclear power plants.

Transportation and Utility Lifeline Inventory

Within Hazus, the lifeline inventory is divided between transportation and utility lifeline systems. There are seven (7) transportation systems that include highways, railways, light rail, bus, ports, ferry and airports. There are six (6) utility systems that include potable water, wastewater, natural gas, crude & refined oil, electric power and communications. The lifeline inventory data are provided in Tables 1 and 2.

The total value of the lifeline inventory is over 4,271.00 (millions of dollars). This inventory includes over 332 kilometers of highways, 186 bridges, 9,186 kilometers of pipes.

Table 1: Transportation System Lifeline Inventory

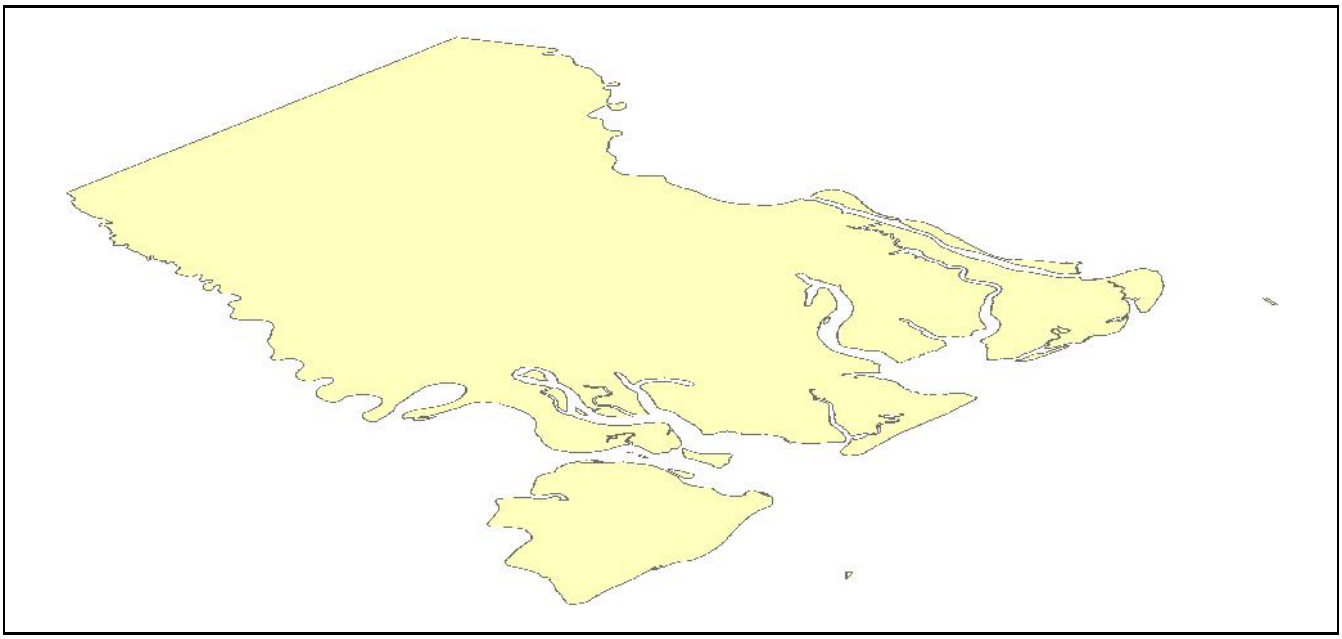
System	Component	# Locations/ # Segments	Replacement value (millions of dollars)
Highway	Bridges	186	619.80
	Segments	240	2,156.50
	Tunnels	0	0.00
	Subtotal		**2,776.20**
Railways	Bridges	6	0.60
	Facilities	8	21.30
	Segments	345	249.00
	Tunnels	0	0.00
	Subtotal		**270.80**
Light Rail	Bridges	0	0.00
	Facilities	0	0.00
	Segments	0	0.00
	Tunnels	0	0.00
	Subtotal		**0.00**
Bus	Facilities	3	2.90
	Subtotal		**2.90**
Ferry	Facilities	4	5.30
	Subtotal		**5.30**
Port	Facilities	54	107.80
	Subtotal		**107.80**
Airport	Facilities	1	10.70
	Runways	2	75.90
	Subtotal		**86.60**
	Total		**3,249.70**

Table 2: Utility System Lifeline Inventory

System	Component	# Locations / Segments	Replacement value (millions of dollars)
Potable Water	Distribution Lines	NA	91.90
	Facilities	0	0.00
	Pipelines	0	0.00
		Subtotal	**91.90**
Waste Water	Distribution Lines	NA	55.10
	Facilities	6	351.60
	Pipelines	0	0.00
		Subtotal	**406.80**
Natural Gas	Distribution Lines	NA	36.70
	Facilities	1	1.00
	Pipelines	0	0.00
		Subtotal	**37.70**
Oil Systems	Facilities	4	0.40
	Pipelines	0	0.00
		Subtotal	**0.40**
Electrical Power	Facilities	5	484.00
		Subtotal	**484.00**
Communication	Facilities	23	2.00
		Subtotal	**2.00**
		Total	**1,022.70**

Earthquake Scenario

Hazus uses the following set of information to define the earthquake parameters used for the earthquake loss estimate provided in this report.



Scenario Name	Chatham_500yr_7mag
Type of Earthquake	Probabilistic
Fault Name	NA
Historical Epicenter ID #	NA
Probabilistic Return Period	500.00
Longitude of Epicenter	NA
Latitude of Epicenter	NA
Earthquake Magnitude	7.00
Depth (km)	NA
Rupture Length (Km)	NA
Rupture Orientation (degrees)	NA
Attenuation Function	NA

Building Damage

Building Damage

Hazus estimates that about 22,280 buildings will be at least moderately damaged. This is over 22.00 % of the buildings in the region. There are an estimated 1,841 buildings that will be damaged beyond repair. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the Hazus technical manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 below summarizes the expected damage by general building type.

Damage categories by General Occupancy Type

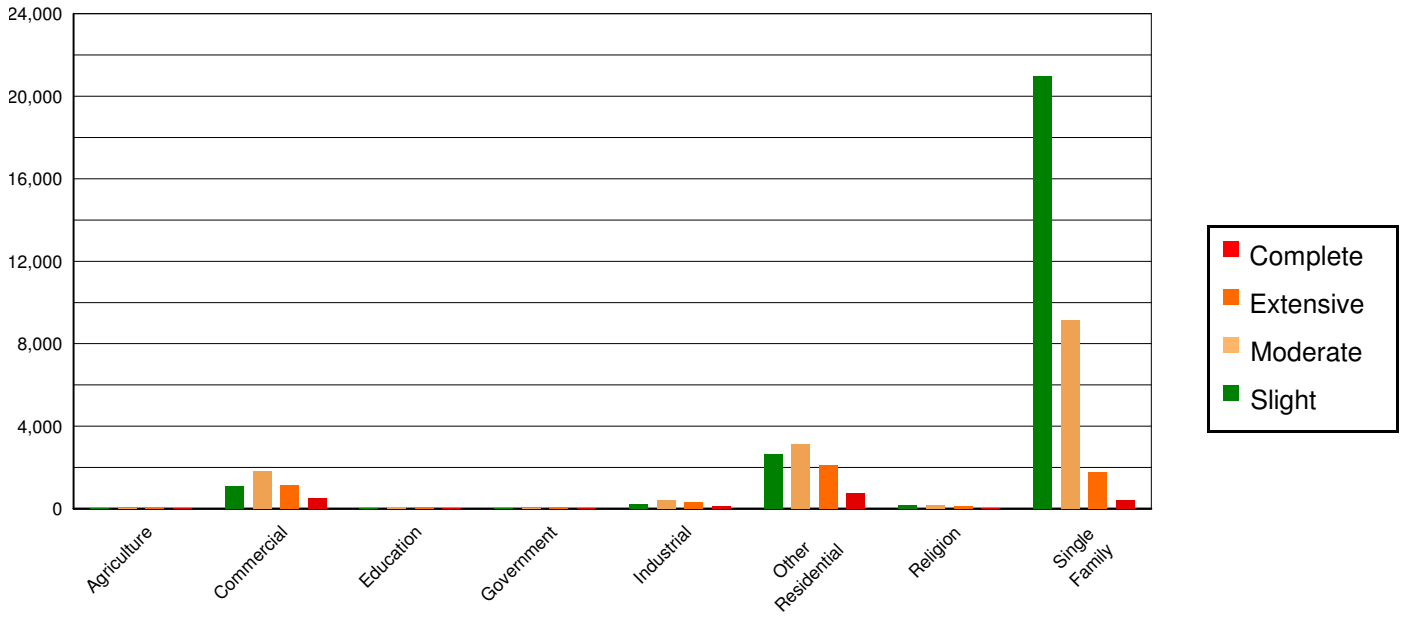


Table 3: Expected Building Damage by Occupancy

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	49	0.09	40	0.16	54	0.36	27	0.48	11	0.58
Commercial	1,351	2.49	1,084	4.30	1,808	12.16	1,170	21.02	500	27.17
Education	44	0.08	34	0.14	61	0.41	41	0.73	17	0.92
Government	32	0.06	26	0.10	52	0.35	38	0.68	16	0.89
Industrial	308	0.57	224	0.89	413	2.78	292	5.25	125	6.80
Other Residential	3,880	7.15	2,630	10.45	3,148	21.17	2,097	37.67	726	39.41
Religion	282	0.52	174	0.69	184	1.24	115	2.06	47	2.54
Single Family	48,335	89.05	20,960	83.27	9,152	61.54	1,788	32.11	400	21.69
Total	**54,281**		**25,172**		**14,872**		**5,567**		**1,842**	

Table 4: Expected Building Damage by Building Type (All Design Levels)

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Wood	49,155	90.56	21383	84.95	8,783	59.05	1,233	22.14	102	5.54
Steel	781	1.44	556	2.21	1,243	8.36	964	17.32	436	23.66
Concrete	147	0.27	109	0.43	273	1.84	220	3.94	89	4.83
Precast	52	0.10	30	0.12	79	0.53	89	1.60	39	2.11
RM	348	0.64	161	0.64	371	2.49	341	6.13	84	4.54
URM	2,860	5.27	1949	7.74	2,253	15.15	1,253	22.51	591	32.11
MH	937	1.73	984	3.91	1,870	12.58	1,467	26.36	501	27.21
Total	**54,281**		**25,172**		**14,872**		**5,567**		**1,842**	

*Note:
RM Reinforced Masonry
URM Unreinforced Masonry
MH Manufactured Housing

Essential Facility Damage

Before the earthquake, the region had 1,717 hospital beds available for use. On the day of the earthquake, the model estimates that only 292 hospital beds (17.00%) are available for use by patients already in the hospital and those injured by the earthquake. After one week, 37.00% of the beds will be back in service. By 30 days, 68.00% will be operational.

Table 5: Expected Damage to Essential Facilities

Classification	Total	# Facilities		
		At Least Moderate Damage > 50%	Complete Damage > 50%	With Functionality > 50% on day 1
Hospitals	11	11	0	0
Schools	104	71	0	17
EOCs	1	1	0	0
PoliceStations	14	5	0	5
FireStations	40	16	0	15

Transportation Lifeline Damage

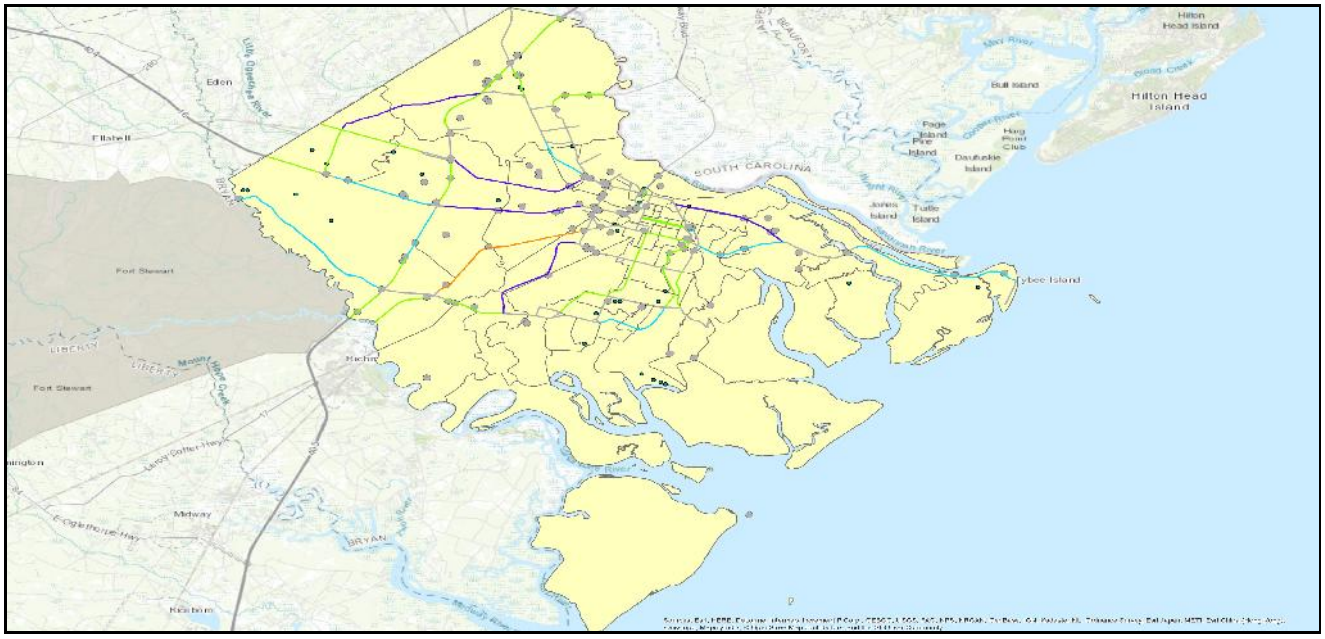


Table 6: Expected Damage to the Transportation Systems

System	Component		Number of Locations			
		Locations/ Segments	With at Least Mod. Damage	With Complete Damage	With Functionality > 50 %	
					After Day 1	After Day 7
Highway	Segments	240	0	0	0	0
	Bridges	186	0	0	0	0
	Tunnels	0	0	0	0	0
Railways	Segments	345	0	0	0	0
	Bridges	6	0	0	0	0
	Tunnels	0	0	0	0	0
	Facilities	8	0	0	0	0
Light Rail	Segments	0	0	0	0	0
	Bridges	0	0	0	0	0
	Tunnels	0	0	0	0	0
	Facilities	0	0	0	0	0
Bus	Facilities	3	0	0	0	0
Ferry	Facilities	4	0	0	0	0
Port	Facilities	54	0	0	0	0
Airport	Facilities	1	0	0	0	0
	Runways	2	0	0	0	0

Table 6 provides damage estimates for the transportation system.

Note: Roadway segments, railroad tracks and light rail tracks are assumed to be damaged by ground failure only. If ground failure maps are not provided, damage estimates to these components will not be computed.

Tables 7-9 provide information on the damage to the utility lifeline systems. Table 7 provides damage to the utility system facilities. Table 8 provides estimates on the number of leaks and breaks by the pipelines of the utility systems. For electric power and potable water, Hazus performs a simplified system performance analysis. Table 9 provides a summary of the system performance information.

Table 7 : Expected Utility System Facility Damage

System	# of Locations				
	Total #	With at Least Moderate Damage	With Complete Damage	with Functionality > 50 %	
				After Day 1	After Day 7
Potable Water	0	0	0	0	0
Waste Water	6	0	0	0	0
Natural Gas	1	0	0	0	0
Oil Systems	4	0	0	0	0
Electrical Power	5	0	0	0	0
Communication	23	0	0	0	0

Table 8 : Expected Utility System Pipeline Damage (Site Specific)

System	Total Pipelines Length (kms)	Number of Leaks	Number of Breaks
Potable Water	4,593	0	0
Waste Water	2,756	0	0
Natural Gas	1,837	0	0
Oil	0	0	0

Table 9: Expected Potable Water and Electric Power System Performance

	Total # of Households	Number of Households without Service				
		At Day 1	At Day 3	At Day 7	At Day 30	At Day 90
Potable Water	0	0	0	0	0	0
Electric Power		0	0	0	0	0

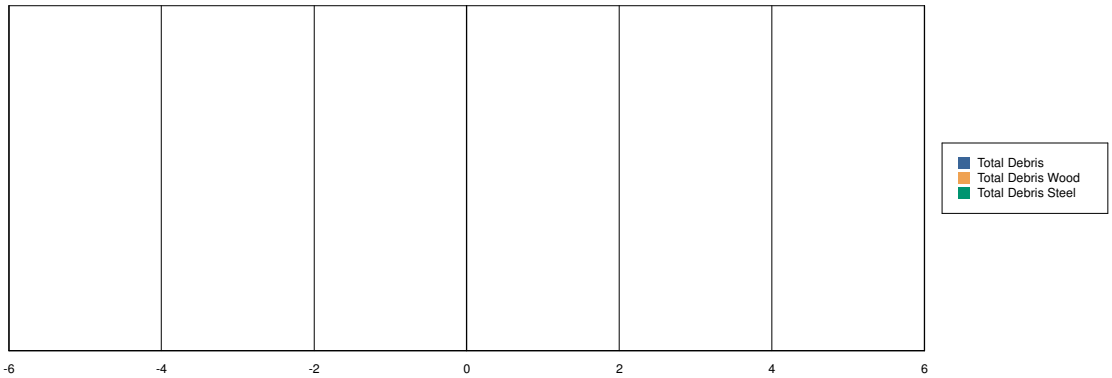
Induced Earthquake Damage

Debris Generation

Hazus estimates the amount of debris that will be generated by the earthquake. The model breaks the debris into two general categories: a) Brick/Wood and b) Reinforced Concrete/Steel. This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 0.00 million tons of debris will be generated. Of the total amount, Brick/Wood comprises 0.00% of the total, with the remainder being Reinforced Concrete/Steel. If the debris tonnage is converted to an estimated number of truckloads, it will require 0 truckloads (@25 tons/truck) to remove the debris generated by the earthquake.

Earthquake Debris (millions of tons)



Brick/ Wood	Reinforced Concrete/Steel	Total Debris	Truck Load
		0.00	0 (@25 tons/truck)

Social Impact

Shelter Requirement

Hazus estimates the number of households that are expected to be displaced from their homes due to the earthquake and the number of displaced people that will require accommodations in temporary public shelters. The model estimates 0 households to be displaced due to the earthquake. Of these, 0 people (out of a total population of 265,128) will seek temporary shelter in public shelters.

Displaced Households/ Persons Seeking Short Term Public Shelter

Displaced households as a result of the earthquake	Persons seeking temporary public shelter
0	0

Casualties

Hazus estimates the number of people that will be injured and killed by the earthquake. The casualties are broken down into four (4) severity levels that describe the extent of the injuries. The levels are described as follows;

- Severity Level 1: Injuries will require medical attention but hospitalization is not needed.
- Severity Level 2: Injuries will require hospitalization but are not considered life-threatening
- Severity Level 3: Injuries will require hospitalization and can become life threatening if not promptly treated.
- Severity Level 4: Victims are killed by the earthquake.

The casualty estimates are provided for three (3) times of day: 2:00 AM, 2:00 PM and 5:00 PM. These times represent the periods of the day that different sectors of the community are at their peak occupancy loads. The 2:00 AM estimate considers that the residential occupancy load is maximum, the 2:00 PM estimate considers that the educational, commercial and industrial sector loads are maximum and 5:00 PM represents peak commute time.

Table 10 provides a summary of the casualties estimated for this earthquake

Table 10: Casualty Estimates

		Level 1	Level 2	Level 3	Level 4
	Total				

Economic Loss

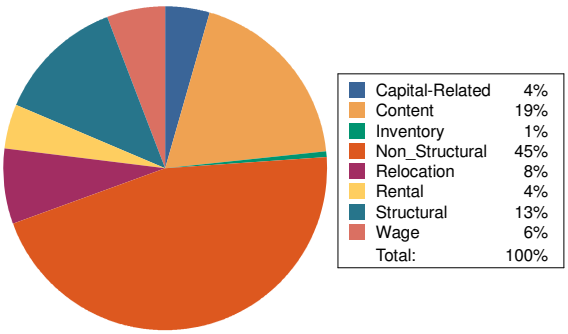
The total economic loss estimated for the earthquake is 4,441.85 (millions of dollars), which includes building and lifeline related losses based on the region's available inventory. The following three sections provide more detailed information about these losses.

Building-Related Losses

The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the earthquake. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the earthquake.

The total building-related losses were 4,441.85 (millions of dollars); 22 % of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies which made up over 47 % of the total loss. Table 11 below provides a summary of the losses associated with the building damage.

Earthquake Losses by Loss Type ($ millions)



Earthquake Losses by Occupancy Type ($ millions)

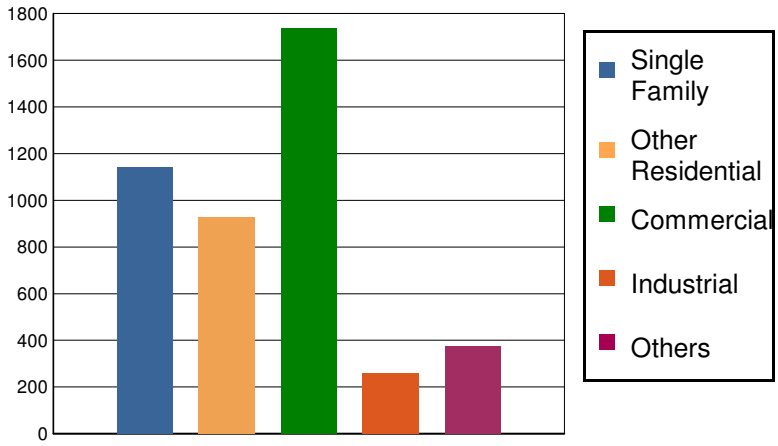


Table 11: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Single Family	Other Residential	Commercial	Industrial	Others	Total
Income Losses							
	Wage	0.00	33.57	210.41	5.93	14.20	264.11
	Capital-Related	0.00	14.32	170.23	3.54	3.57	191.65
	Rental	26.05	71.53	83.38	1.98	6.83	189.78
	Relocation	91.65	40.99	139.23	10.62	56.65	339.13
	Subtotal	**117.71**	**160.40**	**603.25**	**22.07**	**81.24**	**984.67**
Capital Stock Losses							
	Structural	124.92	118.26	234.02	36.05	51.17	564.43
	Non_Structural	632.48	516.20	595.23	113.53	160.20	2,017.65
	Content	267.16	132.13	296.54	73.22	81.57	850.62
	Inventory	0.00	0.00	9.43	14.68	0.37	24.48
	Subtotal	**1,024.56**	**766.60**	**1,135.23**	**237.48**	**293.31**	**3,457.17**
	Total	**1,142.26**	**927.00**	**1,738.48**	**259.55**	**374.55**	**4,441.85**

Transportation and Utility Lifeline Losses

For the transportation and utility lifeline systems, Hazus computes the direct repair cost for each component only. There are no losses computed by Hazus for business interruption due to lifeline outages. Tables 12 & 13 provide a detailed breakdown in the expected lifeline losses.

Table 12: Transportation System Economic Losses
(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Highway	Segments	2,156.47	$0.00	0.00
	Bridges	619.75	$0.00	0.00
	Tunnels	0.00	$0.00	0.00
	Subtotal	**2,776**	**0.00**	
Railways	Segments	248.95	$0.00	0.00
	Bridges	0.56	$0.00	0.00
	Tunnels	0.00	$0.00	0.00
	Facilities	21.30	$0.00	0.00
	Subtotal	**271**	**0.00**	
Light Rail	Segments	0.00	$0.00	0.00
	Bridges	0.00	$0.00	0.00
	Tunnels	0.00	$0.00	0.00
	Facilities	0.00	$0.00	0.00
	Subtotal	**0**	**0.00**	
Bus	Facilities	2.88	$0.00	0.00
	Subtotal	**3**	**0.00**	
Ferry	Facilities	5.32	$0.00	0.00
	Subtotal	**5**	**0.00**	
Port	Facilities	107.84	$0.00	0.00
	Subtotal	**108**	**0.00**	
Airport	Facilities	10.65	$0.00	0.00
	Runways	75.93	$0.00	0.00
	Subtotal	**87**	**0.00**	
	Total	**3,249.70**	**0.00**	

Table 13: Utility System Economic Losses

(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Potable Water	Pipelines	0.00	$0.00	0.00
	Facilities	0.00	$0.00	0.00
	Distribution Line	91.90	$0.00	0.00
	Subtotal	**91.87**	**$0.00**	
Waste Water	Pipelines	0.00	$0.00	0.00
	Facilities	351.60	$0.00	0.00
	Distribution Line	55.10	$0.00	0.00
	Subtotal	**406.77**	**$0.00**	
Natural Gas	Pipelines	0.00	$0.00	0.00
	Facilities	1.00	$0.00	0.00
	Distribution Line	36.70	$0.00	0.00
	Subtotal	**37.71**	**$0.00**	
Oil Systems	Pipelines	0.00	$0.00	0.00
	Facilities	0.40	$0.00	0.00
	Subtotal	**0.35**	**$0.00**	
Electrical Power	Facilities	484.00	$0.00	0.00
	Subtotal	**484.00**	**$0.00**	
Communication	Facilities	2.00	$0.00	0.00
	Subtotal	**2.02**	**$0.00**	
	Total	**1,022.71**	**$0.00**	

Appendix A: County Listing for the Region

Chatham,GA

Appendix B: Regional Population and Building Value Data

State	County Name	Population	Building Value (millions of dollars)		
			Residential	Non-Residential	Total
Georgia	Chatham	265,128	23,499	7,354	30,854
Total State		**265,128**	**23,499**	**7,354**	**30,854**
Total Region		**265,128**	**23,499**	**7,354**	**30,854**

Hazard Risk Analyses
Supplement to the Chatham County Joint Hazard Mitigation Plan

Carl Vinson
Institute of Government
UNIVERSITY OF GEORGIA

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Introduction

The Federal Disaster Mitigation Act of 2000 (DMA2K) requires state, local, and tribal governments to develop and maintain a mitigation plan to be eligible for certain federal disaster assistance and hazard mitigation funding programs.

Mitigation seeks to reduce a hazard's impacts, which may include loss of life, property damage, disruption to local and regional economies, and the expenditure of public and private funds for recovery. Sound mitigation must be based on a sound risk assessment that quantifies the potential losses of a disaster by assessing the vulnerability of buildings, infrastructure, and people.

In recognition of the importance of planning in mitigation activities, FEMA Hazus-MH, a powerful disaster risk assessment tool based on geographic information systems (GIS). This tool enables communities of all sizes to predict estimated losses from floods, hurricanes, earthquakes, and other related phenomena and to measure the impact of various mitigation practices that might help reduce those losses.

In 2020, the Georgia Department of Emergency Management partnered with the Carl Vinson Institute of Government at the University of Georgia to develop a detailed risk assessment focused on defining hurricane, riverine flood, and tornado risks in Chatham County, Georgia. This assessment identifies the characteristics and potential consequences of the disaster, how much of the community could be affected by the disaster, and the impact on community assets.

Risk Assessment Process Overview

Hazus-MH Version 2.2 SP1 was used to perform the analyses for Chatham County. The Hazus-MH application includes default data for every county in the US. This Hazus-MH data was derived from a variety of national sources and in some cases the data are also several years old. Whenever possible, using local provided data is preferred. Chatham County provided building inventory information from the county's property tax assessment system. This section describes the changes made to the default Hazus-MH inventory and the modeling parameters used for each scenario.

County Inventory Changes

The default Hazus-MH site-specific point inventory was updated using data compiled from the Georgia Emergency Management Agency (GEMA). The default Hazus-MH aggregate inventory (General Building Stock) was also updated prior to running the scenarios. Reported losses reflect the updated data sets.

General Building Stock Updates

General Building Stock (GBS) is an inventory category that consists of aggregated data (grouped by census geography — tract or block). Hazus-MH generates a combination of site-specific and aggregated loss estimates based on the given analysis and user input.

The GBS records for Chatham County were replaced with data derived from parcel and property assessment data obtained from Chatham County. The county provided property assessment data was current as of June 2020 and the parcel data current as of December 2019. Records without improvements were deleted. The parcel boundaries were converted to parcel points located in the centroids of each parcel boundary; then, each parcel point was linked to an assessor record based upon matching parcel numbers. The parcel assessor match-rate for Chatham County is 96.0%. The generated building inventory represents the approximate locations (within a parcel) of structures. The building inventory was aggregated by census block. Both the tract and block tables were updated. Table 1 shows the results of the changes to the GBS tables by occupancy class.

Table 1: GBS Building Exposure Updates by Occupancy Class*

General Occupancy	Default Hazus-MH Count	Updated Count	Default Hazus-MH Exposure	Updated Exposure
Agricultural	180	0	$44,461,000	$0
Commercial	5,914	5,025	$4,670,204,000	$5,654,541,000
Education	197	258	$390,447,000	$823,906,000
Government	164	164	$137,772,000	$434,008,000
Industrial	1,362	1,283	$907,791,000	$5,483,385,000
Religious	802	603	$684,358,000	$534,353,000
Residential	93,115	93,345	$23,911,712,000	$19,799,250,000
Total	101,734	100,678	$30,746,745,000	$32,729,443,000

*The exposure values represent the total number and replacement cost for all Chatham County Buildings

For Chatham County, the updated GBS was used to calculate hurricane wind losses. The flood losses and tornado losses were calculated from building inventory modeled in Hazus-MH as User-Defined Facility

(UDF)[1], or site-specific points. Figure 1 shows the distribution of buildings as points based on the county provided data.

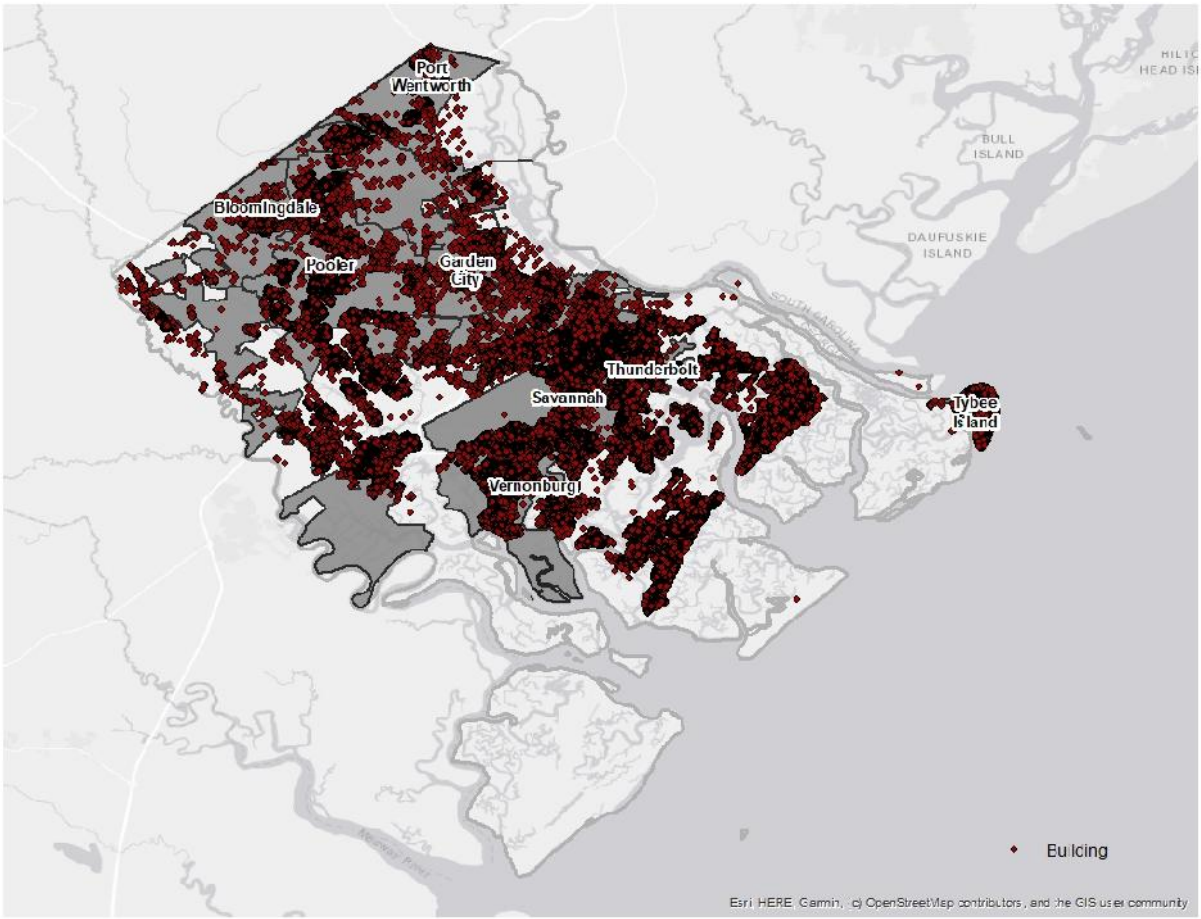

Figure 1: Chatham County Overview

Essential Facility Updates

The default Hazus-MH essential facility data was updated to reflect improved information available in the Georgia Mitigation Information System (GMIS) as of June 2020. For these risk analyses, only GMIS data for buildings that Hazus-MH classified as Essential Facilities was integrated into Hazus-MH because the application provides specialized reports for these five facilities. Essential Facility inventory was updated for the analysis conducted for this report. The following table summarizes the counts and exposures, where available, by Essential Facility classification of the updated data.

Essential facilities include:

- Care facilities
- EOCs
- Fire stations
- Police stations
- Schools

[1] The UDF inventory category in Hazus-MH allows the user to enter site-specific data in place of GBS data.

Table 2: Updated Essential Facilities

Classification	Updated Count	Updated Exposure
Bloomingdale		
EOC	0	$0
Care	0	$0
Fire	1	$1,018,000
Police	1	$562,000
School	1	$1,117,000
Total	3	$2,697,000
Garden City		
EOC	0	$0
Care	0	$0
Fire	3	$6,675,000
Police	1	$1,695,000
School	4	$12,294,000
Total	8	$20,664,000
Pooler		
EOC	0	$0
Care	1	$1,557,000
Fire	4	$4,644,000
Police	1	$1,312,000
School	3	$19,603,000
Total	9	$27,116,000
Port Wentworth		
EOC	0	$0
Care	1	$707,000
Fire	2	$932,000
Police	1	$662,000
School	2	$22,048,000
Total	6	$24,349,000

Classification	Updated Count	Updated Exposure
Savannah		
EOC	2	$6,604,000
Care	7	$212,504,000
Fire	17	$503,370,000
Police	5	$82,886,000
School	62	$417,349,000
Total	93	$1,222,713,000
Thunderbolt		
EOC	0	$0
Care	1	$6,525,000
Fire	1	$480,000
Police	1	$240,000
School	1	$1,214,000
Total	4	$8,459,000
Tybee Island		
EOC	0	$0
Care	1	$518,000
Fire	1	$419,000
Police	1	$2,399,000
School	1	$343,000
Total	4	$3,679,000
Vernonburg		
EOC	0	$0
Care	0	$0
Fire	0	$0
Police	0	$0
School	0	$0
Total	0	$0

Classification	Updated Count	Updated Exposure
Unincorporated Areas of Chatham County		
EOC	0	$0
Care	0	$0
Fire	13	$5,157,000
Police	4	$7,908,000
School	31	$70,600,000
Total	48	$83,665,000

Assumptions and Exceptions

Hazus-MH loss estimates may be impacted by certain assumptions and process variances made in this risk assessment.

- The Chatham County analysis used Hazus-MH Version 2.2 SP1, which was released by FEMA in May 2015.
- County provided parcel and property assessment data may not fully reflect all buildings in the county. For example, some counties do not report not-for-profit buildings such as government buildings, schools and churches in their property assessment data. This data was used to update the General Building Stock as well as the User Defined Facilities applied in this risk assessment.
- Georgia statute requires that the Assessor's Office assign a code to all of the buildings on a parcel based on the buildings primary use. If there is a residential or a commercial structure on a parcel and there are also agricultural buildings on the same parcel Hazus-MH looks at the residential and commercial "primary" structures first and then combines the value of all secondary structures on that parcel with the value of the primary structure. The values and building counts are still accurate but secondary structures are accounted for under the same classification as the primary structure. Because of this workflow, the only time that a parcel would show a value for an agricultural building is when there are no residential or commercial structures on the parcel thus making the agricultural building the primary structure. This is the reason that agricultural building counts and total values seem low or are nonexistent.
- GBS updates from assessor data will skew loss calculations. The following attributes were defaulted or calculated:
  - Foundation Type was set from Occupancy Class
  - First Floor Height was set from Foundation Type
  - Content Cost was calculated from Replacement Cost
- It is assumed that the buildings are located at the centroid of the parcel.
- The essential facilities extracted from the GMIS were only used in the portion of the analysis designated as essential facility damage. They were not used in the update of the General Building Stock or the User Defined Facility inventory.

The hazard models included in this risk assessment included:

- Hurricane assessment which was comprised of a wind only damage assessment.
- Flood assessment based on the 1% annual chance event that includes riverine assessments.
- Tornado assessment based on GIS modeling.

Hurricane Risk Assessment

Hazard Definition

The National Hurricane Center describes a hurricane as a tropical cyclone in which the maximum sustained wind is, at minimum, 74 miles per hour (mph)[2]. The term hurricane is used for Northern Hemisphere tropical cyclones east of the International Dateline to the Greenwich Meridian. The term typhoon is used for Pacific tropical cyclones north of the Equator west of the International Dateline. Hurricanes in the Atlantic Ocean, Gulf of Mexico, and Caribbean form between June and November with the peak of hurricane season occurring in the middle of September. Hurricane intensities are measured using the Saffir-Simpson Hurricane Wind Scale (Table 3). This scale is a 1 to 5 categorization based on the hurricane's intensity at the indicated time.

Hurricanes bring a complex set of impacts. The winds from a hurricane produce a rise in the water level at landfall called storm surge. Storm surges produce coastal flooding effects that can be as damaging as the hurricane's winds. Hurricanes bring very intense inland riverine flooding. Hurricanes can also produce tornadoes that can add to the wind damages inland. In this risk assessment, only hurricane winds, and coastal storm surge are considered.

Table 3: Saffir-Simpson Hurricane Wind Scale

Category	Wind Speed (mph)	Damage
1	74 - 95	Very dangerous winds will produce some damage
2	96 - 110	Extremely dangerous winds will cause extensive damage
3	111 - 130	Devastating damage will occur
4	131 -155	Catastrophic damage will occur
5	> 155	Catastrophic damage will occur

The National Oceanic and Atmospheric Administration's National Hurricane Center created the HURDAT database, which contains all of the tracks of tropical systems since the mid-1800s. This database was used to document the number of tropical systems that have affected Chatham County by creating a 20-mile buffer around the county to include storms that didn't make direct landfall in Chatham County but impacted the county. Since 1854, Chatham County has had 70 tropical systems within 20 miles of its county borders (Table 4).

Table 4: Tropical Systems affecting Chatham County[3]

YEAR	DATE RANGE	NAME	MAX WIND(Knots)	MAX PRESSURE	MAX CAT
1854	September 07-12	UNNAMED	127	950	H3

[2] National Hurricane Center (2011). "Glossary of NHC Terms." National Oceanic and Atmospheric Administration. http://www.nhc.noaa.gov/aboutgloss.shtml#h. Retrieved 2012-23-02.

[3] Atlantic Oceanic and Meteorological Laboratory (2012). "Data Center." National Oceanic and Atmospheric Administration. http://www.aoml.noaa.gov/hrd/data_sub/re_anal.html. Retrieved 7-20-2015.

YEAR	DATE RANGE	NAME	MAX WIND(Knots)	MAX PRESSURE	MAX CAT
1860	August 08-16	UNNAMED	127	0	H3
1868	October 01-07	UNNAMED	81	0	EX
1871	August 14-23	UNNAMED	115	955	H3
1871	August 17-30	UNNAMED	115	965	H3
1871	September 30 - October 07	UNNAMED	81	0	H1
1873	September 18-20	UNNAMED	81	0	H1
1874	September 25 - October 01	UNNAMED	92	981	H1
1878	September 01-13	UNNAMED	104	985	H2
1878	October 09-15	UNNAMED	81	982	H1
1881	August 21-29	UNNAMED	104	1002	H2
1882	October 05-15	UNNAMED	138	0	H4
1884	September 10-20	UNNAMED	92	988	H1
1885	August 29-31	UNNAMED	58	0	TS
1888	September 06-13	UNNAMED	58	1002	TS
1893	June 12-20	UNNAMED	75	0	H1
1893	August 15 - September 02	UNNAMED	121	972	H3
1894	September 18 - October 01	UNNAMED	121	994	H3
1894	October 01-12	UNNAMED	121	0	H3
1896	September 22-30	UNNAMED	127	988	H3
1898	August 30 - September 01	UNNAMED	86	0	H1
1907	June 24-30	UNNAMED	63	0	TS
1907	September 27-30	UNNAMED	52	0	TS
1909	June 26 - July 04	UNNAMED	52	0	TS
1910	October 09-23	UNNAMED	150	960	H4
1911	August 04-12	UNNAMED	58	0	TS
1911	August 23-31	UNNAMED	98	972	H2
1912	September 02-06	UNNAMED	52	0	TS
1916	May 13-18	UNNAMED	58	1006	EX
1916	October 02-05	UNNAMED	58	1000	TS
1923	June 22-29	UNNAMED	58	1006	TS
1924	September 13-19	UNNAMED	86	980	H1
1924	September 27 - October 01	UNNAMED	75	1001	EX
1928	September 06-21	UNNAMED	161	1008	H5
1940	August 05-14	UNNAMED	98	1008	H2
1944	October 12-24	UNNAMED	144	996	H4
1945	September 12-20	UNNAMED	132	1012	H4
1947	September 20-26	UNNAMED	63	994	TS
1947	October 08-16	UNNAMED	104	1000	H2
1950	October 18-22	LOVE	81	991	H1
1952	August 18 - September 03	ABLE	98	1003	H2

YEAR	DATE RANGE	NAME	MAX WIND(Knots)	MAX PRESSURE	MAX CAT
1953	August 29 - September 01	UNNAMED	40	1008	TS
1953	September 23-27	FLORENCE	115	1001	H3
1954	July 10-14	UNNAMED	52	0	TS
1957	June 08-15	UNNAMED	75	1003	EX
1960	July 27 - August 07	BRENDA	69	1007	TS
1964	August 20 - September 11	CLEO	150	1007	H4
1966	June 04-14	ALMA	127	1006	H3
1970	May 17-27	ALMA	81	1008	H1
1972	September 05-14	DAWN	81	1014	H1
1976	September 13-17	UNNAMED	46	1017	SS
1979	August 25 - September 08	DAVID	173	1008	H5
1981	July 02-04	UNNAMED	35	0	TD
1985	July 21-26	BOB	75	1012	H1
1985	October 07-15	ISABEL	69	1014	TS
1986	August 13-30	CHARLEY	81	1015	H1
1988	August 21-30	CHRIS	52	1010	TS
1994	November 08-21	GORDON	86	1013	H1
1996	October 04-16	JOSEPHINE	69	1003	TS
2000	September 14-21	GORDON	81	1011	H1
2002	September 20 - October 12	KYLE	86	1012	H1
2003	July 25-27	UNNAMED	35	1022	TD
2004	August 03-14	BONNIE	63	1013	TS
2007	May 31 - June 05	BARRY	58	1008	TS
2012	May 25 - June 02	BERYL	69	1010	TS
2013	June 05-08	ANDREA	63	1006	TS
2016	June 05-08	COLIN	58	1005	EX
2016	August 28 - September 08	HERMINE	81	1010	H1
2016	September 13-21	JULIA	52	1012	TS
2016	September 28 - October 10	MATTHEW	167	1009	H5

Category Definitions:

TS – Tropical storm

TD – Tropical depression

H1 – Category 1 (same format for H2, H3, and H4)

E – Extra-tropical cyclone

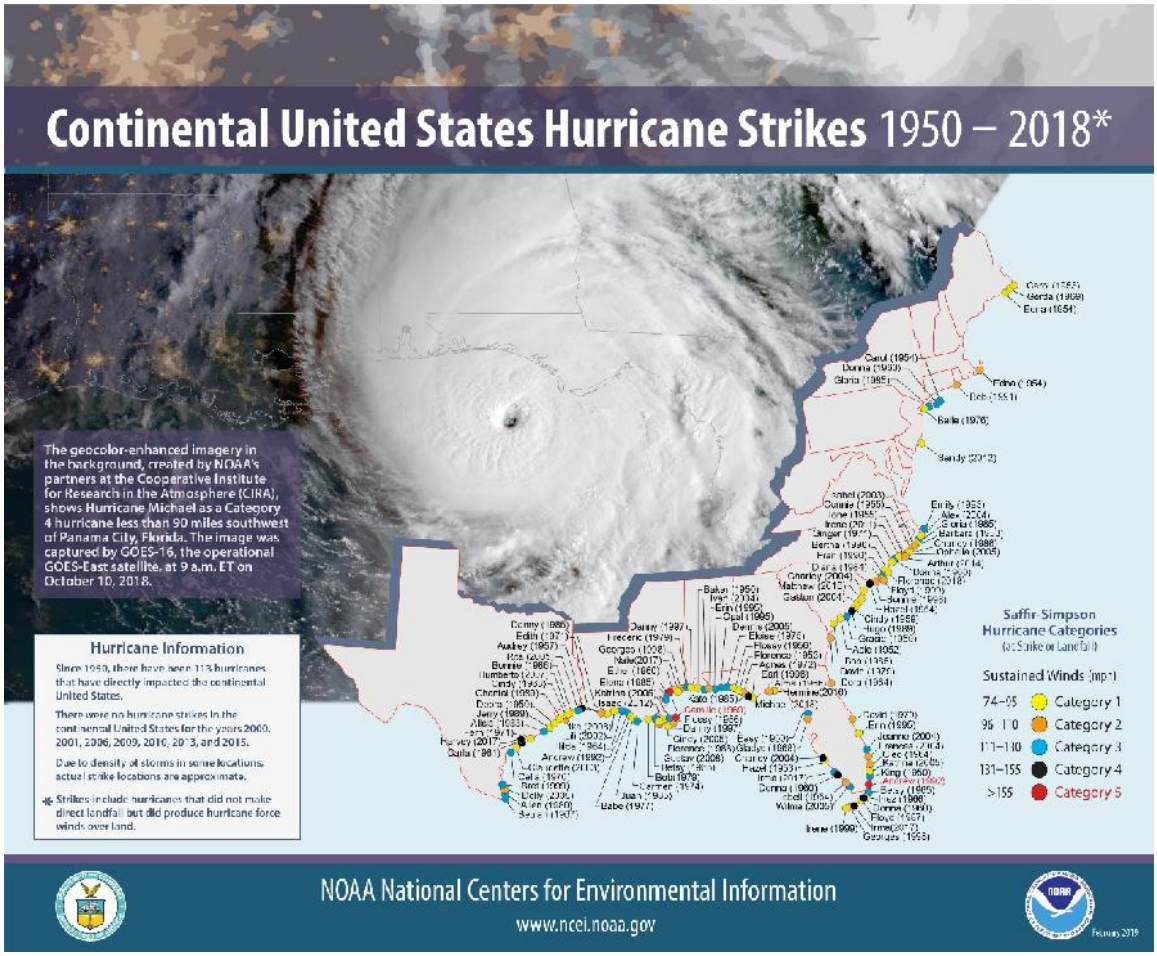

Figure 2: Continental United States Hurricane Strikes: 1950 to 2018[4]

Probabilistic Hurricane Scenario

Storm surge in this risk assessment is modeled using outputs from the SLOSH (Sea, Lake and Overland Surges from Hurricanes) Maximum of Maximums (MOMs) data that is calculated for each hurricane wind category. This analysis modeled a Category 2 hurricane. This data has been revised to flood depths using the flood water elevations and elevation data from the National Elevation Dataset (NED). Each depth grid was put into Hazus-MH and damages and losses were calculated. Although the amount of rainfall from each storm can vary greatly, riverine flooding from hurricanes can have an impact inland. For this risk assessment, the damages and losses from the storm surge provide a flood risk due to hurricane landfalls.

The following probabilistic risk assessment is categorized into two sections:

1. Wind damage assessment

[4] Source: NOAA National Climatic Data Center

2. Flood (storm surge) damage assessment

The following probabilistic wind damage risk assessment modeled a Category 2 storm with maximum winds of 100 mph.

Wind Damage Assessment

Separate analyses were performed to determine wind and hurricane storm surge related flood losses. This section describes the wind-based losses to Chatham County. Wind losses were determined from probabilistic models run for the Category 2 storm which equates to the 1% chance storm event. Figure 3 shows wind speeds for the modeled Tropical Storm.

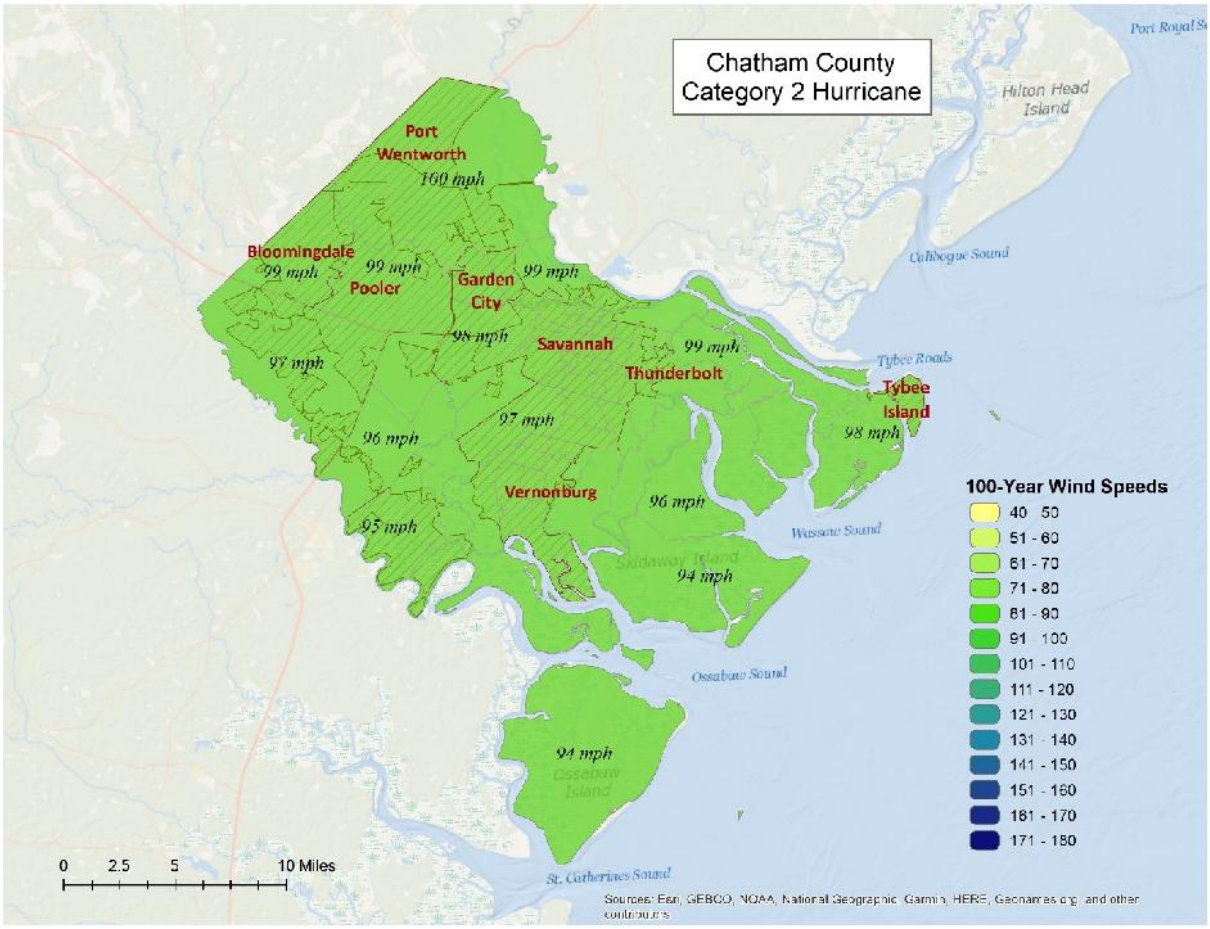

Figure 3: Wind Speeds by Storm Category

Wind-Related Building Damages

Buildings in Chatham County are vulnerable to storm events, and the cost to rebuild may have significant consequences to the community. The following table shows a summary of the results of wind-related building damage in Chatham County for the Category 2 (100 Year Event) storm. The loss ratio expresses building losses as a percentage of total building replacement cost in the county. Figure 4 illustrates the building loss ratios of the modeled Category 2 storm.

Table 5: Hurricane Wind Building Damage

Classification	Number of Buildings Damaged	Total Building Damage	Total Economic Loss[5]	Loss Ratio
Category 2	14,320	$ 358,092,700	$ 471,200,850	1.09%

Note that wind damaged buildings are not reported by jurisdiction. This is due to the fact that census tract boundaries – upon which hurricane building losses are based – do not closely coincide with jurisdiction boundaries.

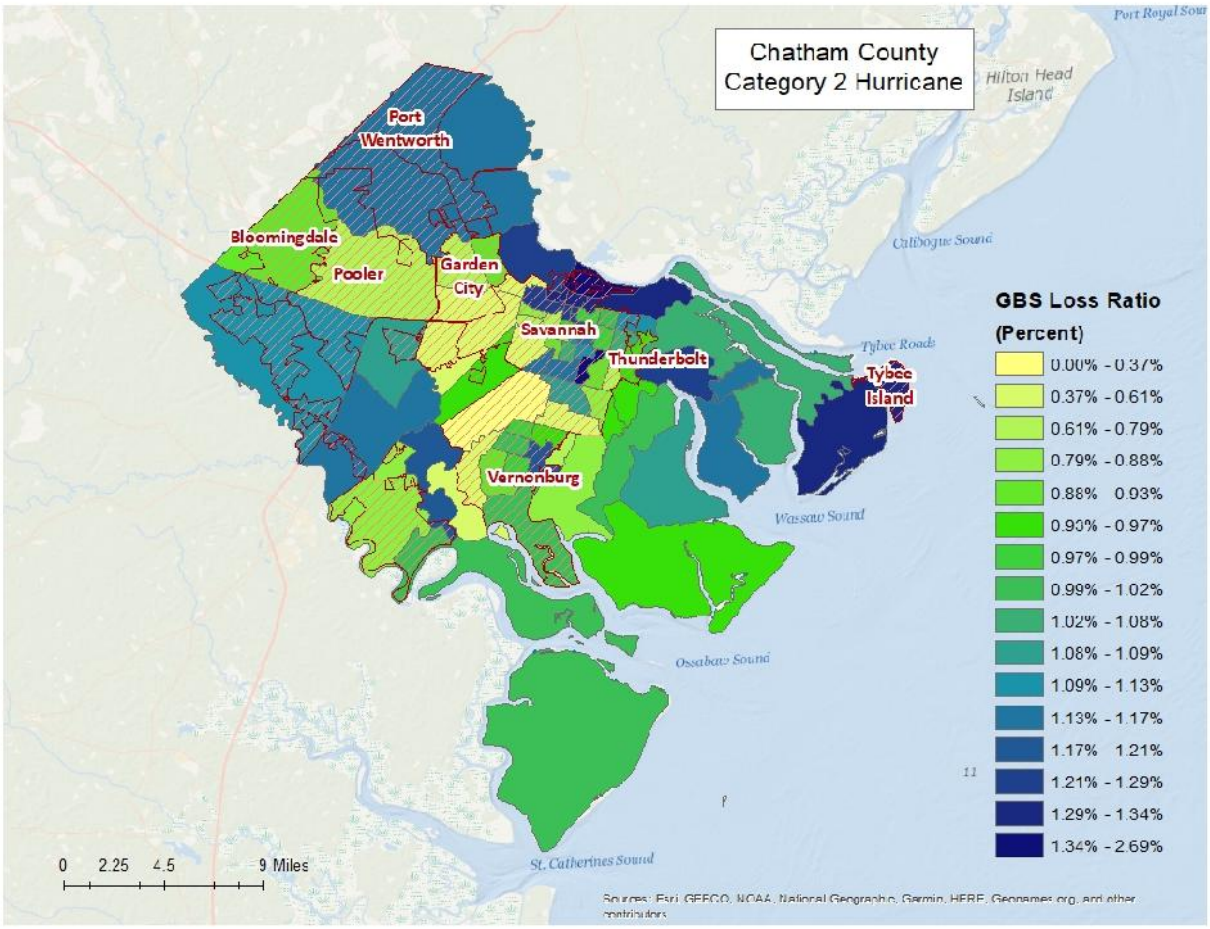

Figure 4: Hurricane Wind Building Loss Ratios

[5] Includes property damage (infrastructure, contents, and inventory) as well as business interruption losses.

Essential Facility Losses

Essential facilities are also vulnerable to storm events, and the potential loss of functionality may have significant consequences to the community. Hazus-MH identified the essential facilities that may be moderately or severely damaged by winds. The results are compiled in Table 6.

There are 175 essential facilities in Chatham County.

Classification	Number
EOCs	2
Fire Stations	42
Care Facilities	11
Police Stations	15
Schools	105

Table 6: Wind-Damaged Essential Facility Losses

Classification	Facilities At Least Moderately Damaged > 50%	Facilities Completely Damaged > 50%	Facilities with Expected Loss of Use (< 1 day)
Category 2	4	0	146

Shelter Requirements

Hazus-MH estimates the number of households evacuated from buildings with severe damage from high velocity winds as well as the number of people who will require short-term sheltering. The results are listed in Table 7 and mapped in Figure 5.

Table 7: Displaced Households and People

Classification	# of Displaced Households	# of People Needing Short-Term Shelter
Category 2	304	82

Figure 5 shows a distribution of shelter needs within each census tract. The number of dots in each census tract reflects the number of persons who are anticipated to need short term shelter supplied by the government. Dots are randomly distributed within each census tract. While the figure may be used to understand regional patterns of need, it does not specify the exact location of either the persons needing shelter or the recommended locations of shelters within a census tract.

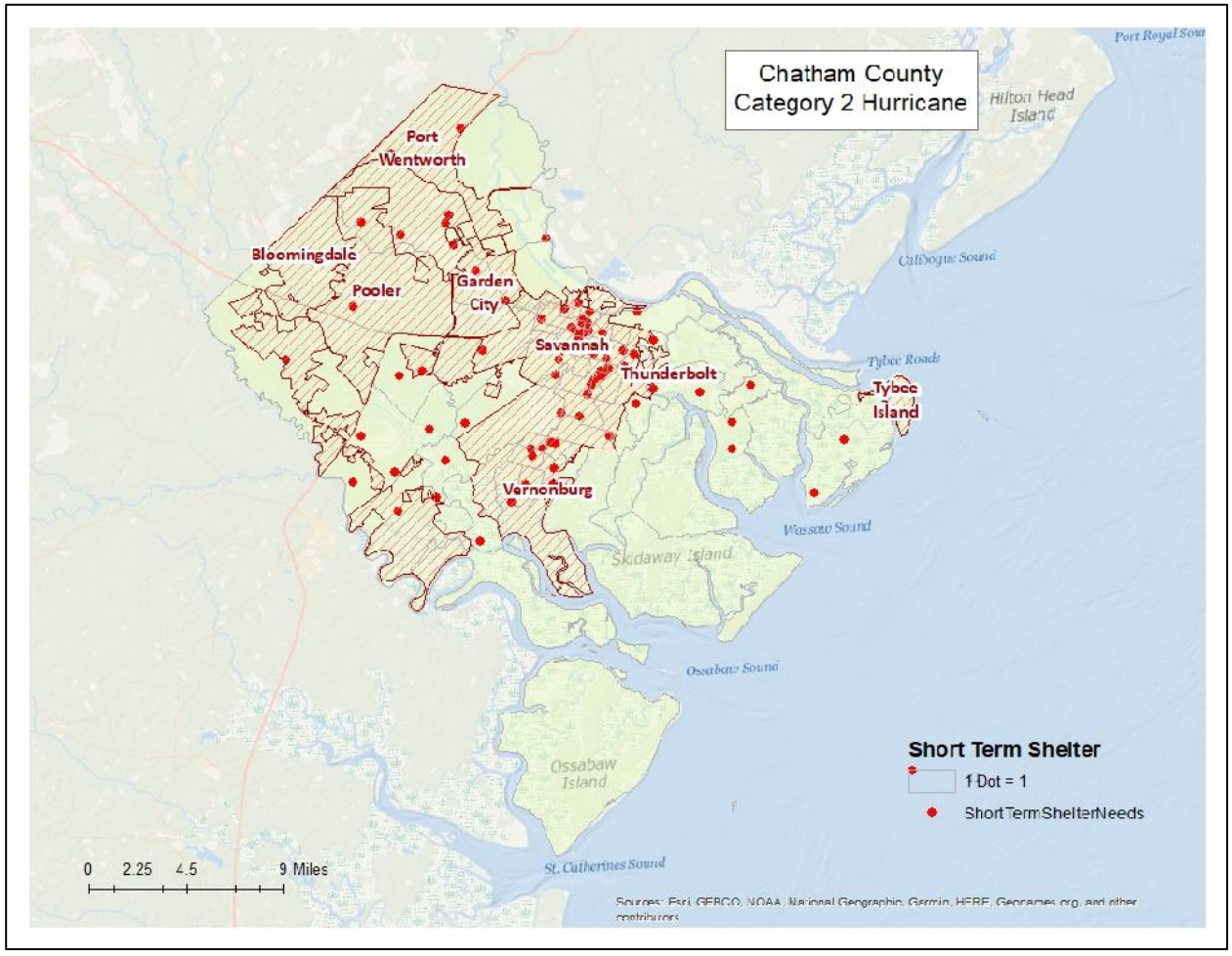

Figure 5: Hurricane Wind Shelter Requirements

Debris Generated from Hurricane Wind

Hazus-MH estimates the amount of debris that will be generated by high velocity hurricane winds and quantifies it into three broad categories to determine the material handling equipment needed:

- Reinforced Concrete and Steel Debris
- Brick and Wood and Other Building Debris
- Tree Debris

Different material handling equipment is required for each category of debris. The estimates of debris for this scenario are listed in Table 8. The amount of hurricane wind related tree debris that is estimated to require pick up at the public's expense is listed in the eligible tree debris column.

Table 8: Wind-Related Debris Weight (Tons)

Classification	Brick, Wood, and Other	Reinforced Concrete and Steel	Eligible Tree Debris	Other Tree Debris	Total
Category 2	47,373	52	48,411	189,978	285,814

Figure 6 shows the distribution of all wind related debris resulting from a Category 2 hurricane. Each dot represents 20 tons of debris within the census tract in which it is located. The dots are randomly distributed within each census tract and therefore do not represent the specific location of debris sites.

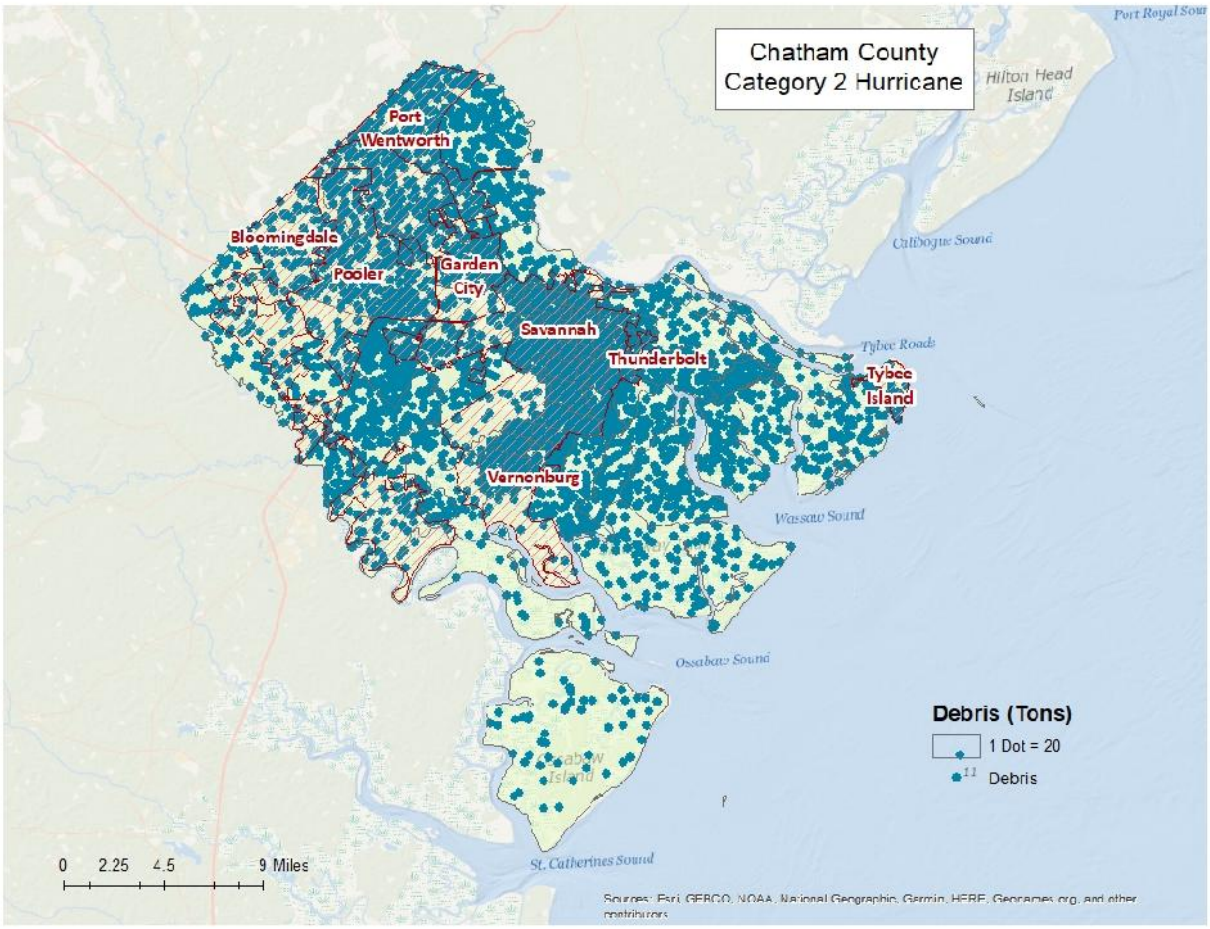

Figure 6: Wind-Related Debris Weight (Tons)

Storm Surge Damage Assessment

This section describes the storm surge-based losses that Chatham County could sustain in the event of a Category 2 hurricane.

The coastal losses were determined for Category 2 water depth grids derived from the National Hurricane Center's (NHC) Sea Lake and Overland Surge from Hurricanes (SLOSH) model Maximum of Maximums (MOMs) data. MOMs represent the worst-case scenario for a given category of storm – as opposed to a specific storm. The coastal surge depth grids were derived by subtracting digital elevation model (DEM) features at 30-meter resolution from a water surface elevation (WSE) raster created from the SLOSH MOMs. Figure 7 illustrates the resulting potential storm surge boundaries for a Category 2 storm event.

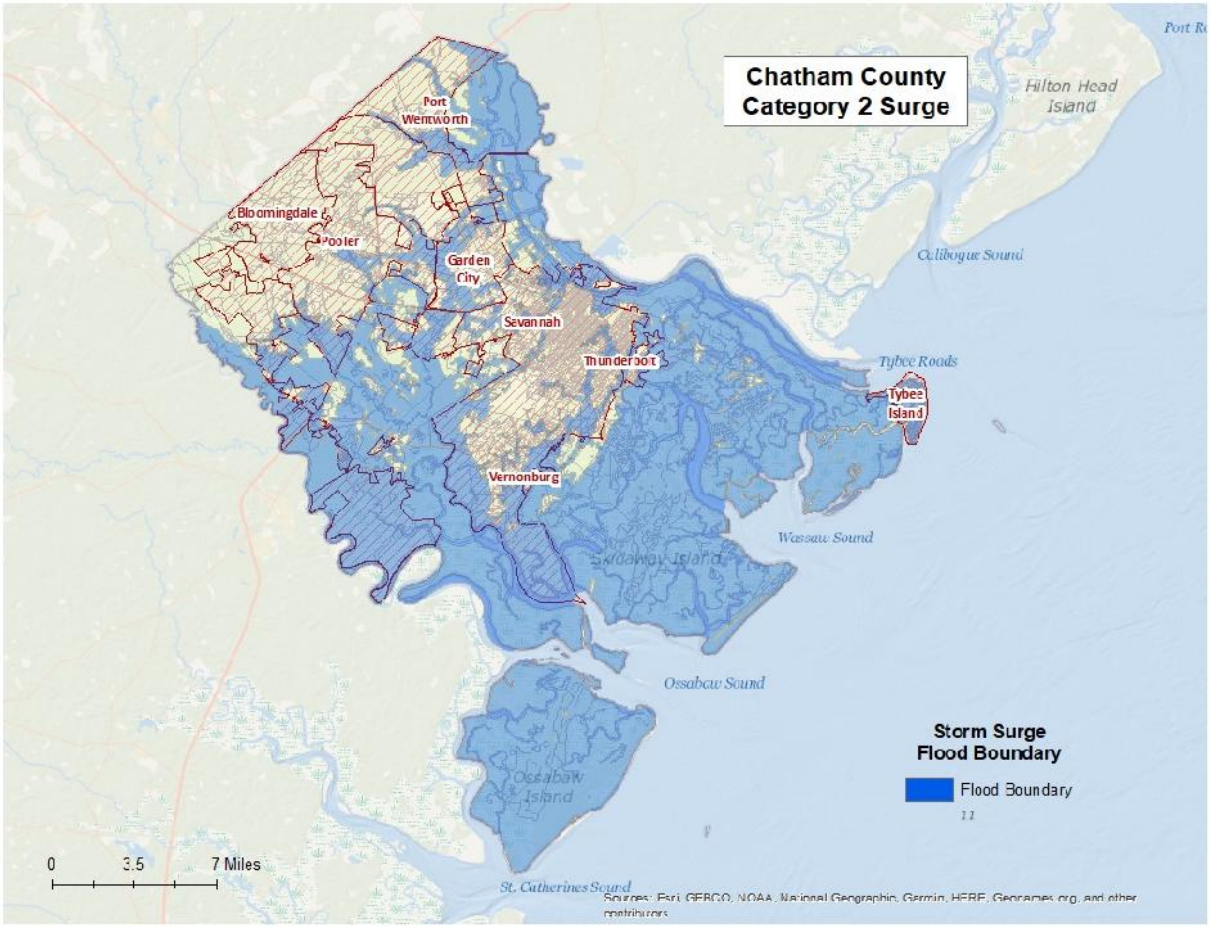

Figure 7: Storm Surge Inundation

Storm Surge Related Building Damages

Buildings in Chatham County are vulnerable to storm surge flooding and the cost to rebuild may have significant consequences to the community. Table 9 shows a summary of the results of flood-related building damage in Chatham County for the Category 2 (1% probability) storm. Figure 8 maps the loss ratio which expresses losses as a percentage of total building replacement cost. Figure 9 maps the buildings located in the storm surge inundation area.

Table 9: Category 2 Storm Surge Building Losses

Classification	Total Buildings in Jurisdiction	Number of Buildings Damaged	Total Building Exposure in the Jurisdiction	Total Building Loss ($)	Loss Ratio
Garden City					
Commercial	403	65	$253,325,415	$7,905,498	3.12%
Industrial	201	54	$372,034,929	$11,022,475	2.96%
Residential	1,816	313	$283,602,412	$7,728,974	2.73%
Religious	33	4	$33,558,898	$217,833	0.65%
Pooler					
Government	6	2	$3,684,861	$26,788	0.73%
Commercial	453	38	$547,613,433	$2,627,974	0.48%
Industrial	136	23	$555,148,283	$20,232,112	3.64%
Residential	7,639	396	$1,829,577,113	$9,883,613	0.54%
Religious	14	1	$14,634,319	$86,589	0.59%
Port Wentworth					
Religious	12	1	$7,943,952	$30,857	0.39%
Government	8	2	$2,739,984	$67,078	2.45%
Commercial	118	27	$72,154,147	$2,019,673	2.80%
Residential	3,534	367	$579,833,304	$9,974,346	1.72%
Industrial	60	27	$276,623,107	$12,715,558	4.60%
Savannah					
Government	96	21	$373,529,654	$10,651,165	2.85%
Religious	432	26	$334,232,955	$1,599,329	0.48%
Residential	43,785	8,647	$9,034,582,184	$284,360,222	3.15%
Education	206	19	$635,430,677	$2,337,007	0.37%
Commercial	3,345	332	$4,119,367,654	$56,173,270	1.36%
Industrial	562	137	$1,943,351,050	$25,340,718	1.30%
Thunderbolt					
Education	3	1	$10,282,599	$189,371	1.84%
Commercial	69	51	$70,648,383	$21,838,718	30.91%
Industrial	35	26	$9,886,566	$2,158,721	21.83%
Government	2	2	$671,397	$163,586	24.37%
Residential	878	337	$145,923,137	$17,548,472	12.03%
Tybee Island					
Industrial	4	4	$802,167	$143,604	17.90%
Education	5	5	$4,037,454	$493,963	12.23%
Religious	5	5	$3,537,854	$407,902	11.53%
Commercial	85	84	$33,998,035	$5,860,682	17.24%
Government	8	6	$8,187,419	$838,807	10.25%
Residential	3,228	3,188	$798,538,073	$203,469,526	25.48%

Classification	Total Buildings in Jurisdiction	Number of Buildings Damaged	Total Building Exposure in the Jurisdiction	Total Building Loss ($)	Loss Ratio
Unincorporated					
Residential	31,523	23,984	$7,003,860,023	$1,582,797,732	22.60%
Education	25	16	$89,214,879	$4,556,473	5.11%
Religious	84	50	$119,847,960	$10,891,909	9.09%
Industrial	269	163	$2,190,814,627	$193,183,695	8.82%
Government	28	20	$24,182,917	$1,158,698	4.79%
Commercial	515	363	$540,599,867	$62,276,589	11.52%
Vernonburg					
Residential	64	47	$17,016,987	$3,158,947	18.56%
County Total					
	99,689	38,854	$32,345,018,673	$2,576,138,474	

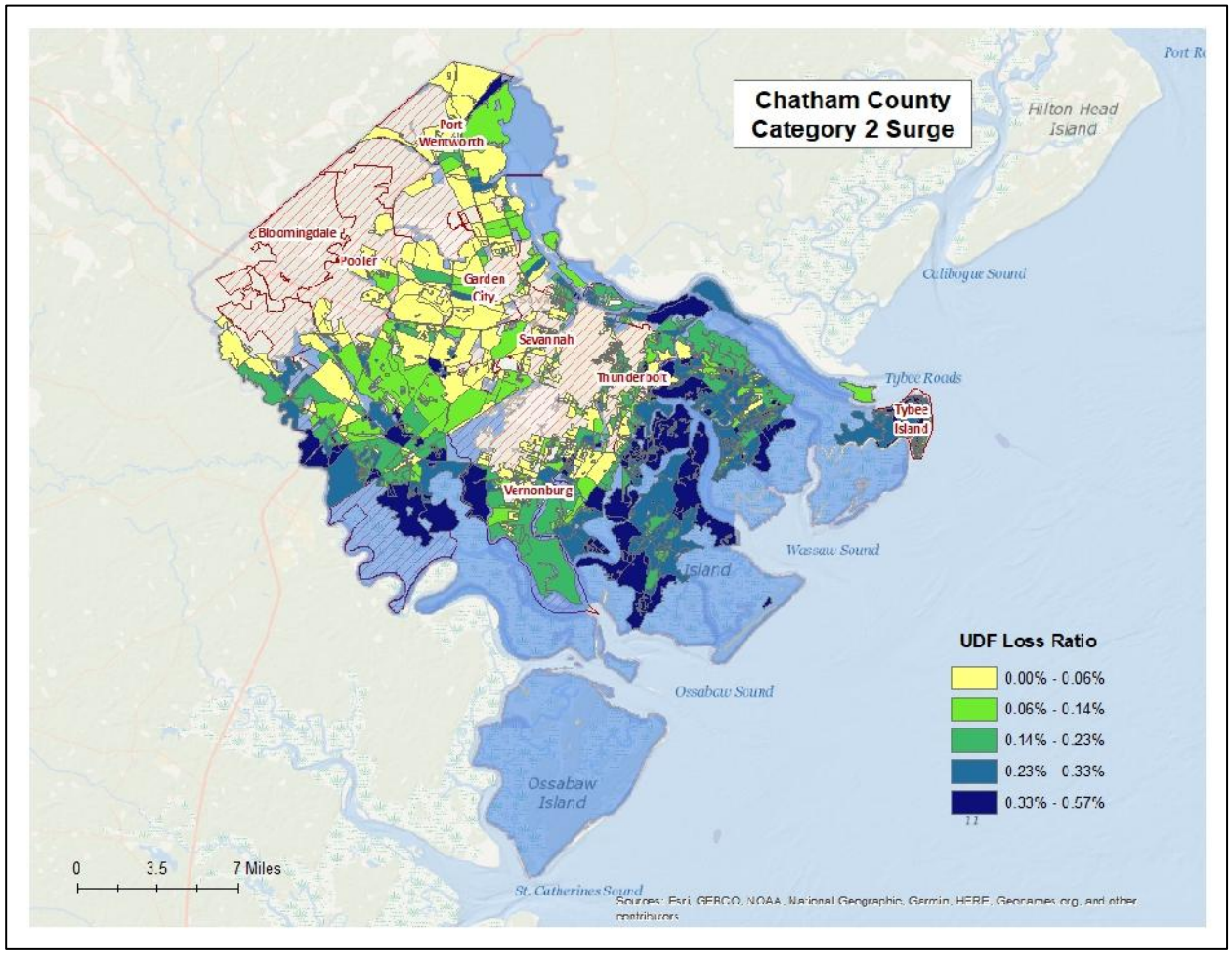

Figure 8: Chatham County Storm Surge-Related Losses

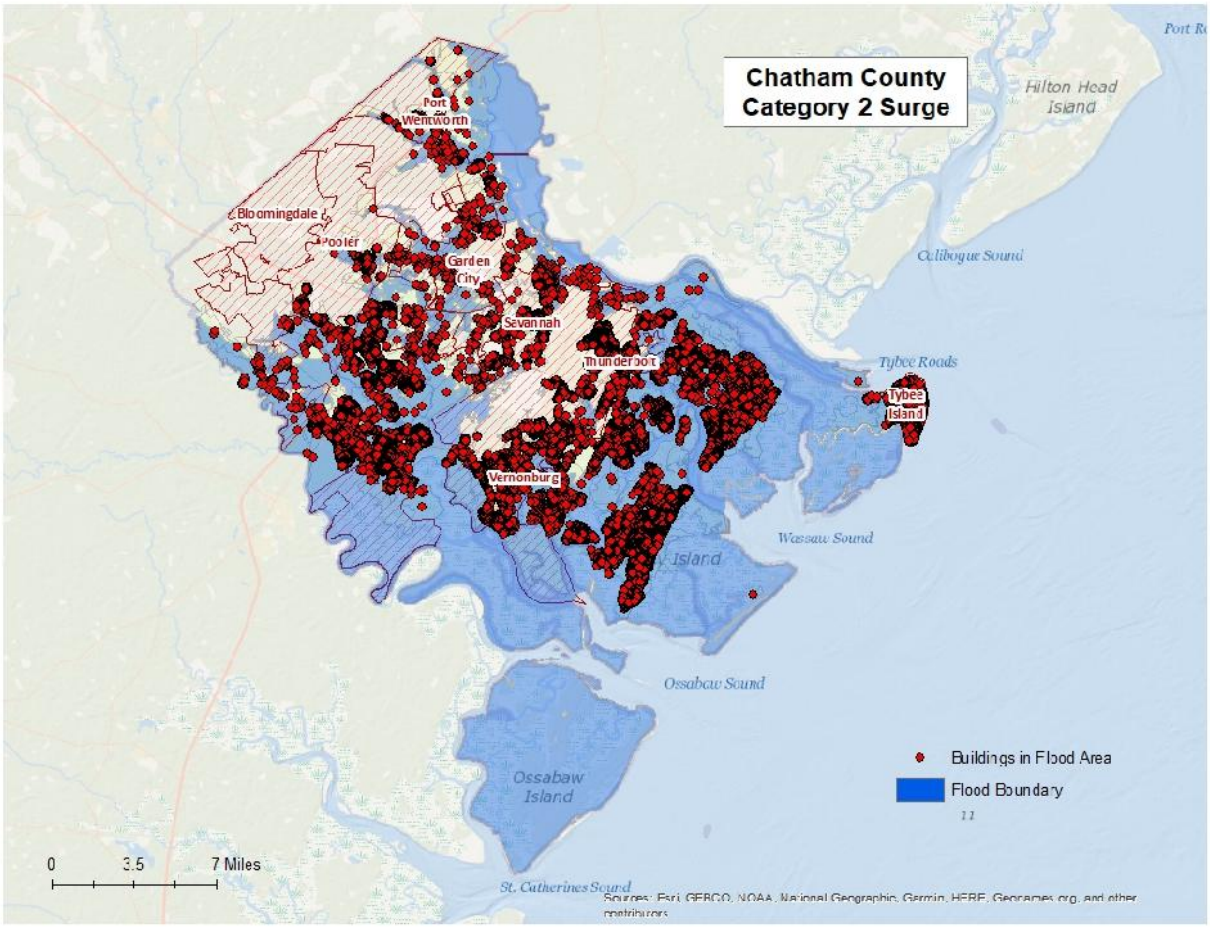

Figure 9: Damaged Buildings in the Category 2 Storm Surge Inundation Area

Essential Facility Losses

Essential facilities are also vulnerable to flood events, and the potential loss of functionality may have significant consequences to the community. Hazus identified the essential facilities that may be moderately or severely damaged by winds from the Category 2 storm. The results are compiled in Table 10.

There are 175 essential facilities in Chatham County.

Classification	Number
EOCs	2
Fire Stations	42
Care Facilities	11
Police Stations	15
Schools	105

Table 10: Damaged Essential Facilities

Category	Name	City
Chatham County Health Department	Medical Care	Savannah
Chatham County Health Department 2	Medical Care	Savannah
Georgia Regional Hospital	Medical Care	Savannah
Oceanside Nursing Home	Medical Care	Tybee Island
Tara Nursing Home	Medical Care	Thunderbolt
Chatham Emergency Services Station #2	Fire Station	Savannah
Chatham Emergency Services Station #5	Fire Station	Savannah
Chatham Emergency Services Station #6	Fire Station	Savannah
Chatham Emergency Services Station #7	Fire Station	Savannah
Chatham Emergency Services Station #8	Fire Station	Savannah
Chatham Emergency Services Station #9	Fire Station	Savannah
Chatham Fire Station #14	Fire Station	Savannah
City of Tybee Island Fire Department	Fire Station	Tybee Island
Pooler Fire Department Station 3	Fire Station	Pooler
Port Wentworth Fire Department #2	Fire Station	Port Wentworth
Savannah Fire Station #07	Fire Station	Savannah
Savannah Fire Station #10	Fire Station	Savannah
Savannah Fire Station #12	Fire Station	Savannah
City of Tybee Island Police Department	Police Station	Tybee Island
Police Precinct 1	Police Station	Savannah
Police Precinct 2	Police Station	Savannah
Police Precinct Eastside	Police Station	Savannah
Police Precinct Northwest	Police Station	Savannah
Police Professional Standards	Police Station	Savannah
SCCPSS A. B. Williams Elementary School	School	Savannah
SCCPSS Coastal Middle School	School	Savannah
SCCPSS Beach High School	School	Savannah
SCCPSS Howard Elementary School	School	Savannah
SCCPSS Isle of Hope Elementary School	School	Savannah
SCCPSS Jenkins High School	School	Savannah
SCCPSS Johnson High School	School	Thunderbolt
SCCPSS Marshpoint Elementary School	School	Savannah
SCCPSS Southwest Elementary School	School	Savannah
SCCPSS Southwest Middle School	School	Savannah
Tybee Island Maritime Academy	School	Tybee Island
SCCPSS Windsor Forest High School	School	Savannah
5707 Greenhouse 1	School	Savannah
5708 Greenhouse 2	School	Savannah
5709 Greenhouse 3	School	Savannah
5710 Office Building No. 15	School	Savannah

Category	Name	City
5711 Auditorium No. 16	School	Savannah
5712 Laundry No. 19	School	Savannah
5714 Shop No. 20	School	Savannah
5715 Storage No. 25	School	Savannah
5718 Storage No. 28	School	Savannah
5719 Storage No. 29	School	Savannah
5723 Power House	School	Savannah
7012 Skidaway Marine Extension	School	Savannah
7013 Skidaway Dormitory	School	Savannah
7014 Skidaway Dining Hall	School	Savannah
7015 Skidaway Shellfish	School	Savannah
7017 Algae Growth House	School	Savannah
7018 Skidaway Storage	School	Savannah
Bamboo Farm & Coastal Gardens	School	Savannah
Skidaway Inst. of Oceanography Library	School	Savannah
SSU Cottage #9	School	Savannah
SSU Evers Physical Plant	School	Savannah
SSU Howard Jordan College of Business	School	Savannah
SSU Lift Station	School	Savannah

Shelter Requirements

Floods can cause loss of function or habitability of buildings that contain housing units, resulting in approximately predictable numbers of displaced households. These households may need alternative short-term shelter, provided by family, friends, renting apartments or houses, or public shelters provided by relief organizations such as the Red Cross, Salvation Army, and others. For units where repair takes longer than a few weeks, long-term alternative housing can be accommodated by importing mobile homes, occupancy of vacant units, net emigration from the impacted area, and, eventually, by the repair or reconstruction of new public and private housing. While the number of people seeking short-term public shelter is of great concern to emergency response organizations, the longer-term impacts on the housing stock are of great concern to local governments, such as cities and counties.

Hazus estimates the number of people evacuated from buildings with severe damage from storm surge as well as the number of people who will require short-term sheltering in public shelters. The results are listed in Table 11 and mapped in Figure 10. The points on the map reflect the number of people estimated to require public shelter in a given census tract as opposed to either the location of those people or the locations of shelters that might serve those individuals.

Table 11: Displaced Households and People

Classification	# of Displaced People	# of People Needing Short-Term Shelter
Category 2	105,966	99,305

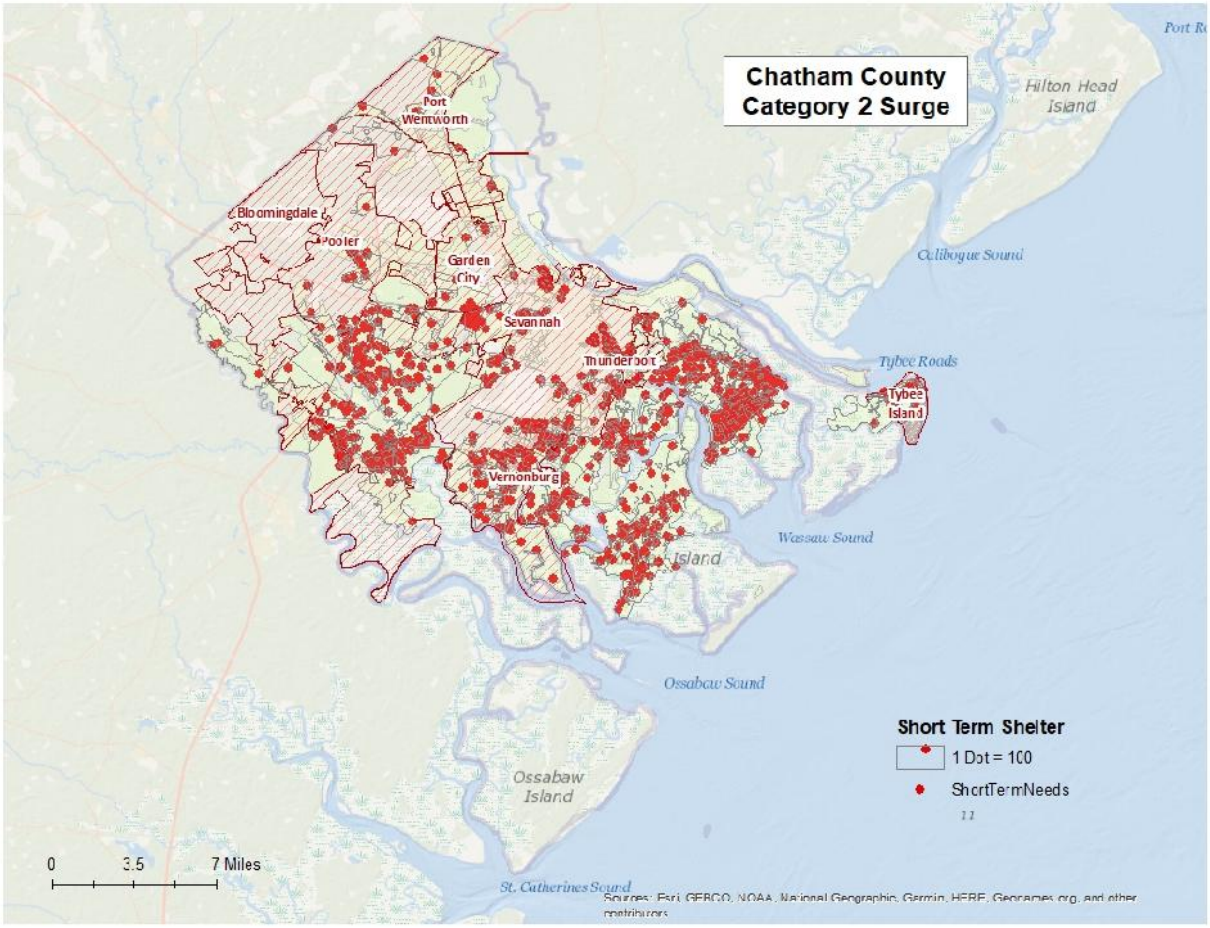

Figure 10: Storm Surge Shelter Requirements

Storm Surge Generated Debris

Hazus estimates the amount of debris that will be generated by flooding and quantifies it into three general debris categories: 1) finishes (dry wall, insulation, etc.), 2) structural (wood, brick, etc.), and 3) foundations (concrete slab, concrete block, rebar, etc.). Different types of material handling equipment will be required for each category. The results are listed in Table 12 and mapped in Figure 11. Debris definitions applied in Hazus are unique to the Hazus model and so do not necessarily conform to other definitions that may be employed in other models or guidelines.

Table 12: Storm Surge Generated Debris Weight (Tons)

Classification	Finishes	Structures	Foundations	Total
Category 2	141,070	111,514	101,133	353,717

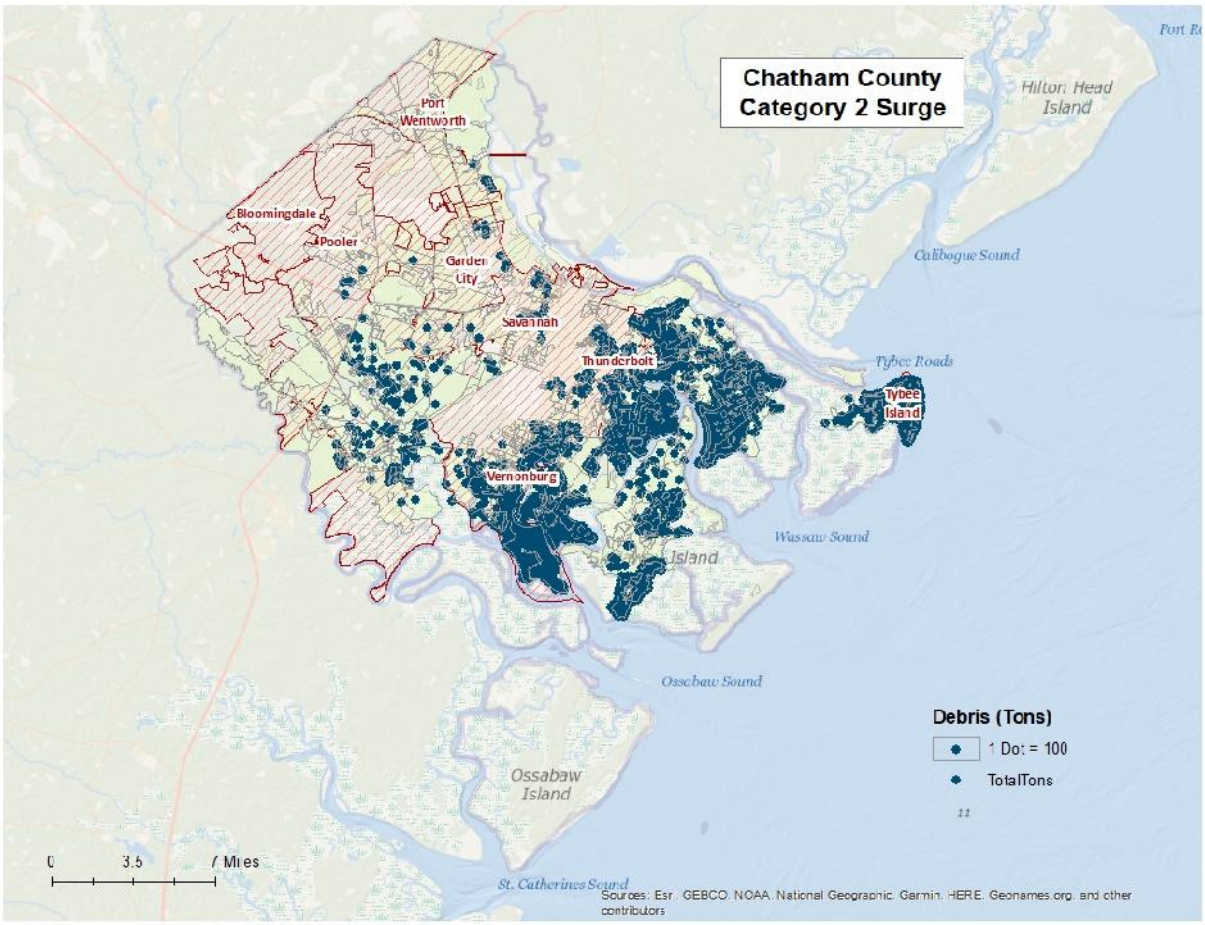

Figure 11: Storm Surge Generated Debris (Tons)

Flood Risk Assessment

Hazard Definition

Flooding is a significant natural hazard throughout the United States. The type, magnitude, and severity of flooding are functions of the amount and distribution of precipitation over a given area, the rate at which precipitation infiltrates the ground, the geometry and hydrology of the catchment, and flow dynamics and conditions in and along the river channel. Floods can be classified as one of three types: upstream floods, downstream floods, or coastal floods.

Upstream floods, also called flash floods, occur in the upper parts of drainage basins and are generally characterized by periods of intense rainfall over a short duration. These floods arise with very little warning and often result in locally intense damage, and sometimes loss of life, due to the high energy of the flowing water. Flood waters can snap trees, topple buildings, and easily move large boulders or other structures. Six inches of rushing water can upend a person; another 18 inches might carry off a car. Generally, upstream floods cause damage over relatively localized areas, but they can be quite severe in the local areas in which they occur. Urban flooding is a type of upstream flood. Urban flooding involves the overflow of storm drain systems and can be the result of inadequate drainage combined with heavy rainfall or rapid snowmelt. Upstream or flash floods can occur at any time of the year in Georgia, but they are most common in the spring and summer months.

Downstream floods, also called riverine floods, refer to floods on large rivers at locations with large upstream catchments. Downstream floods are typically associated with precipitation events that are of relatively long duration and occur over large areas. Flooding on small tributary streams may be limited, but the contribution of increased runoff may result in a large flood downstream. The lag time between precipitation and time of the flood peak is much longer for downstream floods than for upstream floods, generally providing ample warning for people to move to safe locations and, to some extent, secure some property against damage.

Coastal floods occurring on the Atlantic and Gulf coasts may be related to hurricanes or other combined offshore, nearshore, and shoreline processes. The effects of these complex interrelationships vary significantly across coastal settings, leading to challenges in the determination of the base (1-percent-annual-chance) flood for hazard mapping purposes. Land area covered by floodwaters of the base flood is identified as a Special Flood Hazard Area (SFHA). The Chatham County flood risk assessment analyzed at risk structures in the SFHA.

> The SFHA is the area where the National Flood Insurance Program's (NFIP) floodplain management regulations must be enforced and the area where the mandatory purchase of flood insurance applies. The owner of a structure in a high-risk area must carry flood insurance, if the owner carries a mortgage from a federally regulated or insured lender or servicer.

The following probabilistic risk assessment involves an analysis of a 1% annual chance riverine flood event (100-Year Flood) and a 1% annual chance coastal flood.

Riverine 1% Flood Scenario

Riverine losses were determined from the 1% flood boundaries downloaded from the FEMA Flood Map Service Center in July 2020. The flood boundaries were overlaid with the USGS 10 meter DEM using the

Hazus-MH Enhanced Quick Look tool to generate riverine depth grids. The riverine flood depth grid was then imported into Hazus-MH to calculate the riverine flood loss estimates. Figure 12 illustrates the riverine inundation boundary associated with the 1% annual chance.

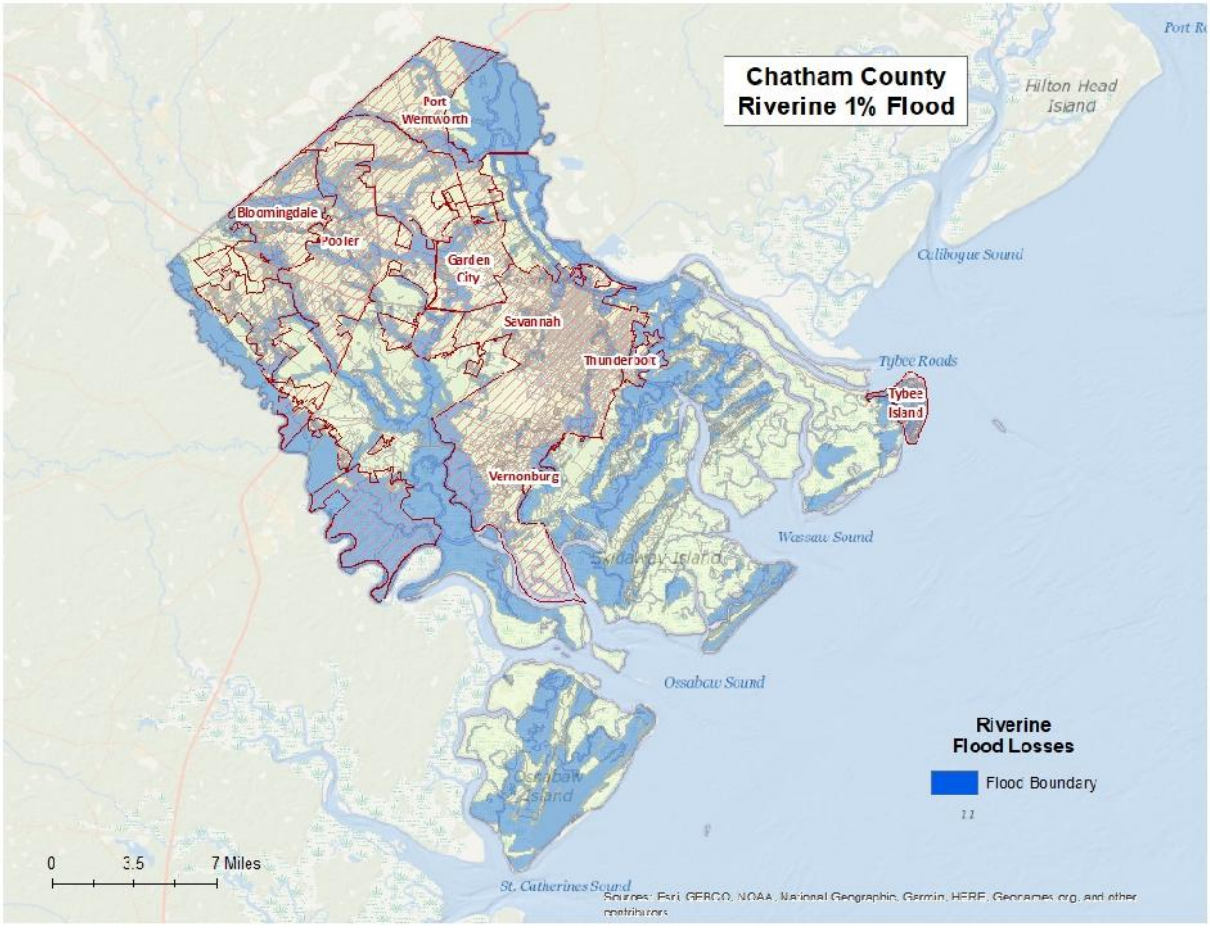

Figure 12: Riverine 1% Flood Inundation

Riverine 1% Flood Building Damages

Buildings in Chatham County are vulnerable to flooding from events equivalent to the 1% riverine flood. The economic and social impacts from a flood of this magnitude can be significant. Table 13 provides a summary of the potential flood-related building damage in Chatham County by jurisdiction that might be experienced from the 1% flood. Figure 13 maps the potential loss ratios of total building exposure to losses sustained to buildings from the 1% flood by 2010 census block and Figure 14 illustrates the relationship of building locations to the 1% flood inundation boundary.

Table 13: Chatham County Riverine 1% Building Losses

Occupancy	Total Buildings in the Jurisdiction	Total Buildings Damaged in the Jurisdiction	Total Building Exposure in the Jurisdiction	Total Losses to Buildings in the Jurisdiction	Loss Ratio of Exposed Buildings to Damaged Buildings in the Jurisdiction
Bloomingdale					
Commercial	37	2	$17,008,933	$364	0.00%
Residential	878	138	$106,413,934	$203,353	0.19%
Industrial	16	4	$134,778,021	$3,687	0.00%
Garden City					
Residential	1,816	182	$283,602,412	$3,187,280	1.12%
Religious	33	1	$33,558,898	$90,616	0.27%
Industrial	201	20	$372,034,929	$2,175,199	0.58%
Commercial	403	14	$253,325,415	$3,055,305	1.21%
Pooler					
Commercial	453	30	$547,613,433	$1,561,181	0.29%
Industrial	136	26	$555,148,283	$10,192,663	1.84%
Education	6	1	$15,134,377	$1,698	0.01%
Religious	14	1	$14,634,319	$74,660	0.51%
Residential	7,639	677	$1,829,577,113	$16,760,149	0.92%
Port Wentworth					
Industrial	60	9	$276,623,107	$1,243,530	0.45%
Government	8	1	$2,739,984	$15,366	0.56%
Commercial	118	20	$72,154,147	$1,070,754	1.48%
Residential	3,534	139	$579,833,304	$3,813,810	0.66%

Occupancy	Total Buildings in the Jurisdiction	Total Buildings Damaged in the Jurisdiction	Total Building Exposure in the Jurisdiction	Total Losses to Buildings in the Jurisdiction	Loss Ratio of Exposed Buildings to Damaged Buildings in the Jurisdiction
Savannah					
Government	96	9	$373,529,654	$3,610,492	0.97%
Residential	43,785	2,465	$9,034,582,184	$74,891,103	0.83%
Religious	432	13	$334,232,955	$531,256	0.16%
Education	206	9	$635,430,677	$1,081,844	0.17%
Commercial	3,345	160	$4,119,367,654	$10,701,508	0.26%
Industrial	562	81	$1,943,351,050	$10,734,226	0.55%
Thunderbolt					
Residential	878	149	$145,923,137	$9,047,397	6.20%
Commercial	69	35	$70,648,383	$3,109,406	4.40%
Industrial	35	5	$9,886,566	$480,126	4.86%
Government	2	1	$671,397	$2,438	0.36%
Tybee Island					
Education	5	4	$4,037,454	$92,995	2.30%
Religious	5	4	$3,537,854	$348,611	9.85%
Commercial	85	50	$33,998,035	$1,720,963	5.06%
Government	8	3	$8,187,419	$118,624	1.45%
Industrial	4	3	$802,167	$78,674	9.81%
Residential	3,228	2,358	$798,538,073	$90,779,220	11.37%
Unincorporated					
Education	25	3	$89,214,879	$403,322	0.45%
Residential	31,523	7,071	$7,003,860,023	$275,189,425	3.93%
Religious	84	5	$119,847,960	$323,600	0.27%
Industrial	269	78	$2,190,814,627	$22,206,960	1.01%
Government	28	5	$24,182,917	$127,538	0.53%
Commercial	515	59	$540,599,867	$4,224,698	0.78%
Vernonburg					
Residential	64	7	$17,016,987	$223,989	1.32%
County Total					
	100,605	**13,842**	**$32,596,442,527**	**$553,478,030**	

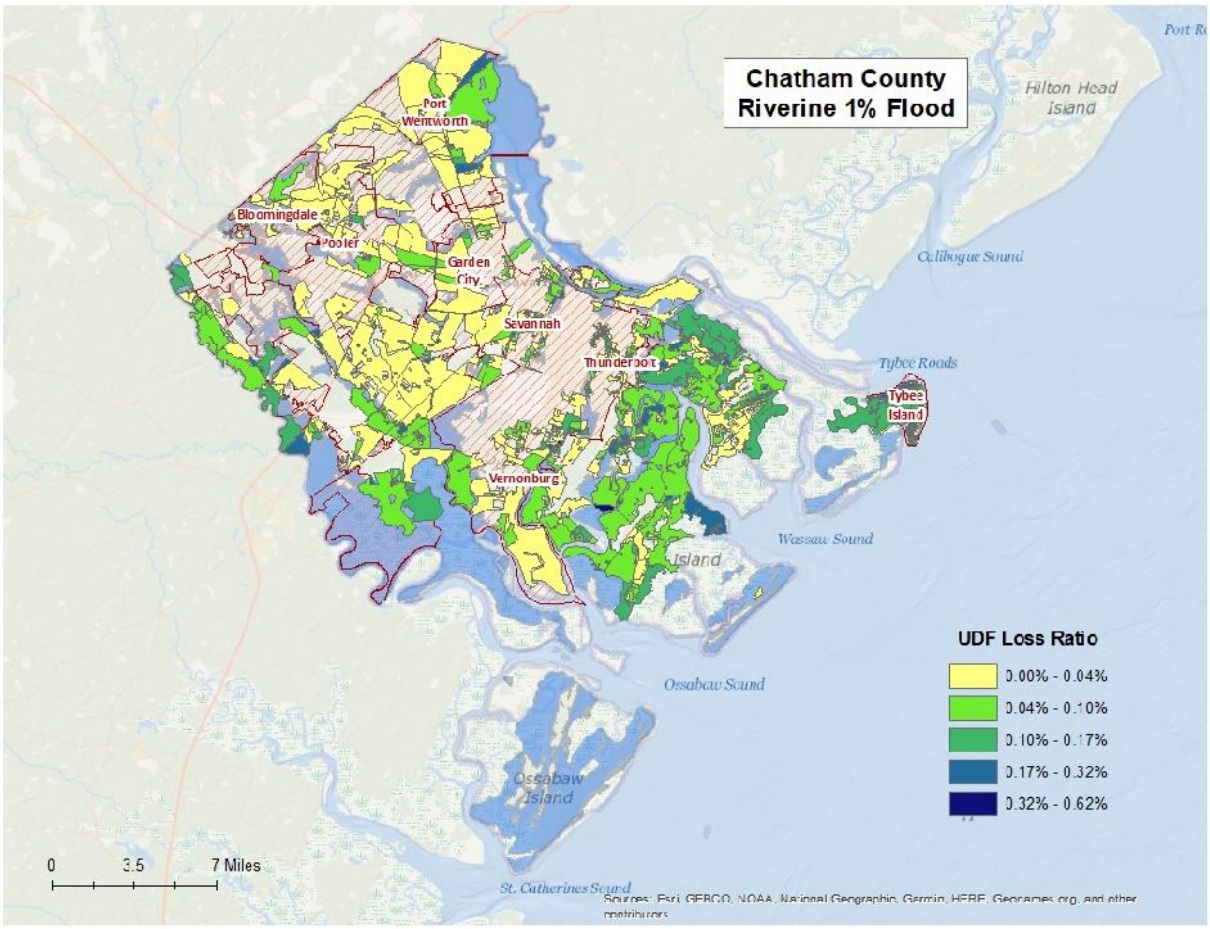

Figure 13: Chatham County Potential Loss Ratios of Total Building Exposure to Losses Sustained to Buildings from the 1% Riverine Flood by 2010 Census Block

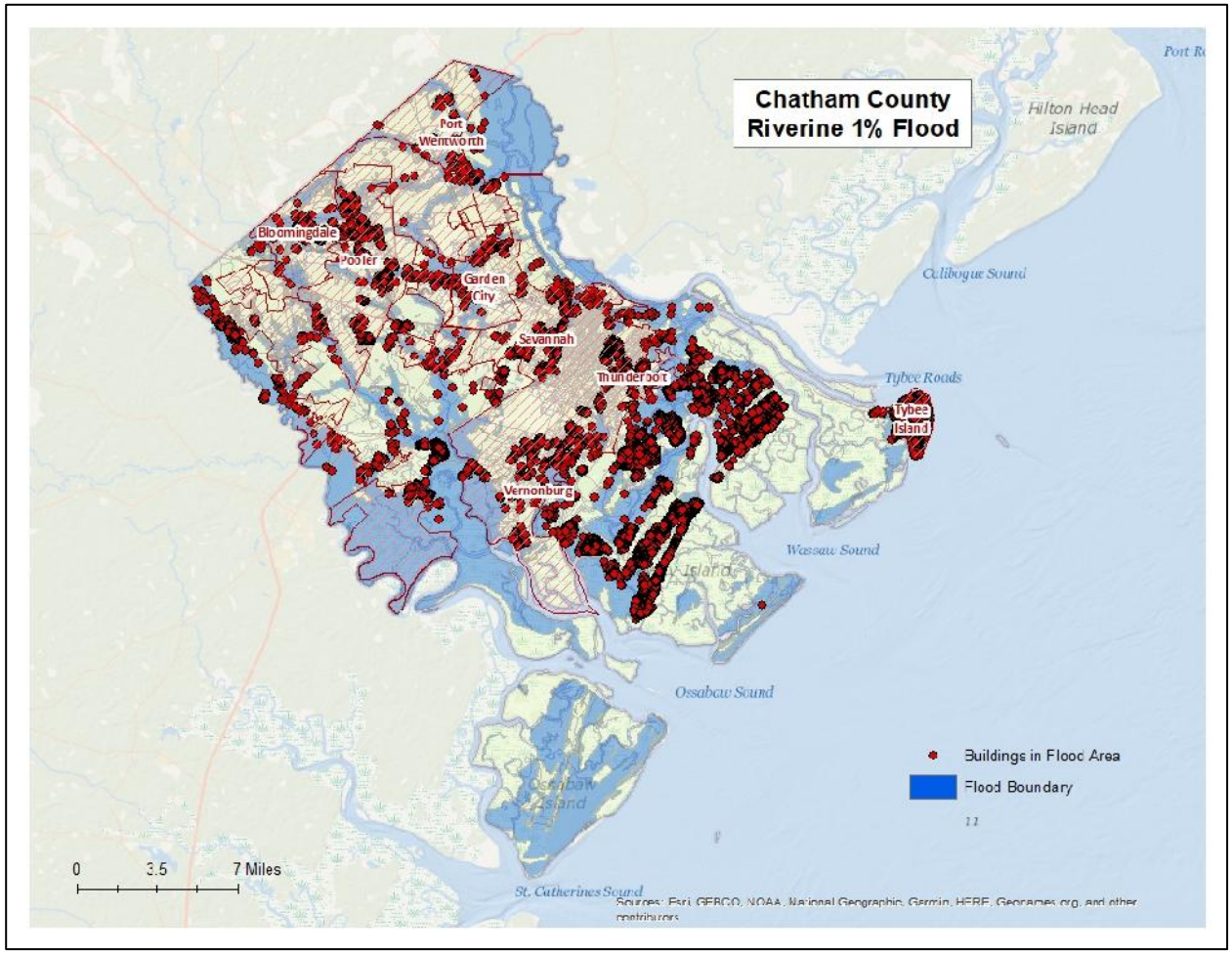

Figure 14: Chatham County Damaged Buildings in Riverine Floodplain (1% Flood)

Riverine 1% Flood Essential Facility Losses

An essential facility may encounter many of the same impacts as other buildings within the flood boundary. These impacts can include structural failure, extensive water damage to the facility and loss of facility functionality (e.g. a damaged police station will no longer be able to serve the community). The analysis identified 10 essential facilities that were subject to damage in the Chatham County riverine 1% probability floodplain.

Table 14: Riverine 1% Flood Damaged Essential Facilities

Name	Category	City
Chatham County Health Department	Medical Care	Savannah
Chatham County Health Department 2	Medical Care	Savannah
Georgia Regional Hospital	Medical Care	Savannah
Chatham Emergency Services Station #2	Fire Station	Savannah
Chatham Fire Station #11	Fire Station	Savannah
City of Tybee Island Fire Department	Fire Station	Tybee Island

Fire Training Center	Fire Station	Savannah
Name	Category	City
Bloomingdale Police Department	Police Station	Bloomingdale
Tybee Island Maritime Academy	School	Tybee Island
7015 Skidaway Shellfish	School	Savannah

Riverine 1% Flood Shelter Requirements

Hazus-MH estimates that the number of households that are expected to be displaced from their homes due to riverine flooding and the associated potential evacuation. The model estimates 17,720 households might be displaced due to the flood. Displacement includes households evacuated within or very near to the inundated area. Displaced households represent 53,159 individuals, of which 48,005 may require short term publicly provided shelter. The results are mapped in Figure 15.

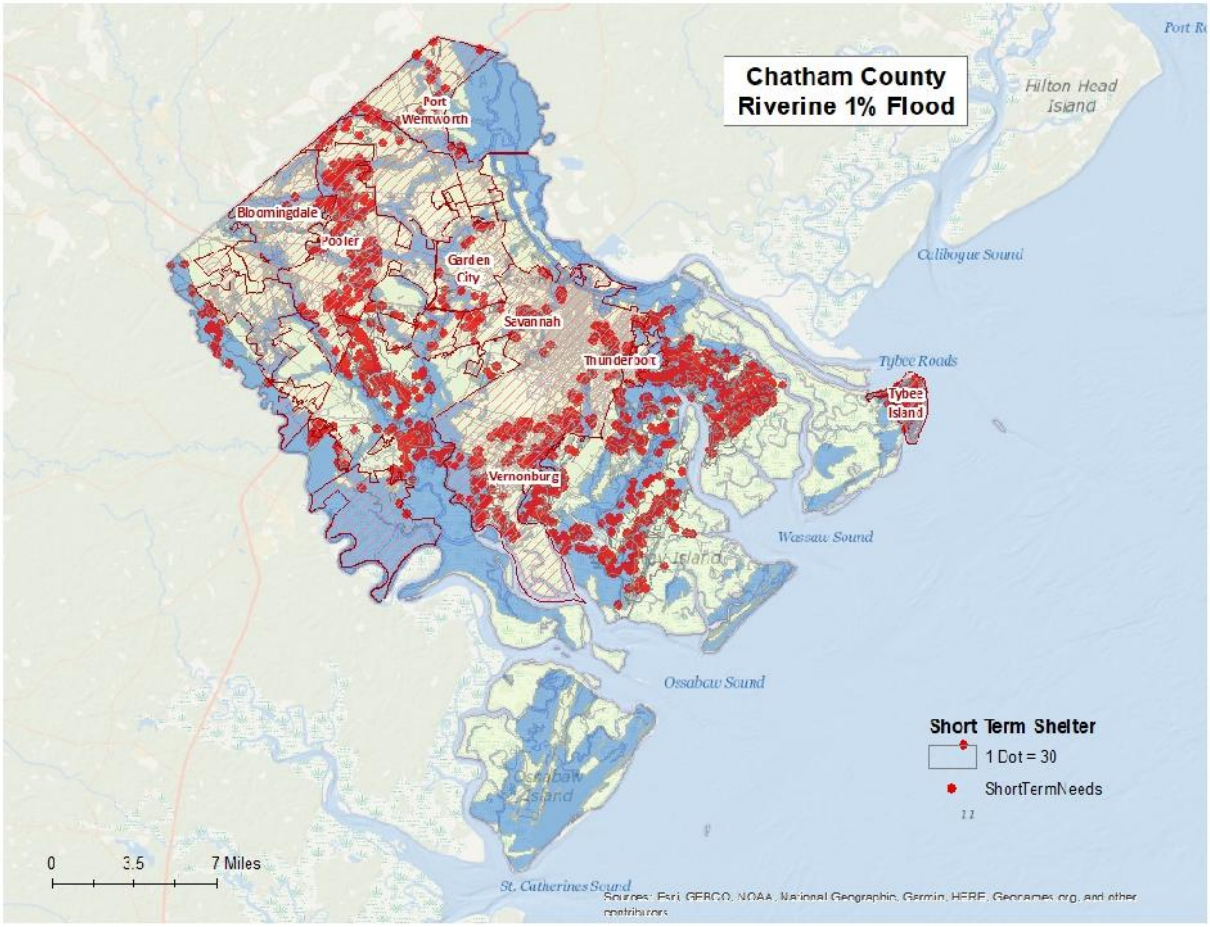

Figure 15: Riverine 1% Estimated Flood Shelter Requirements

Riverine 1% Flood Debris

Hazus-MH estimates the amount of debris that will be generated by the flood. The model breaks debris into three general categories:

- Finishes (dry wall, insulation, etc.)
- Structural (wood, brick, etc.)
- Foundations (concrete slab, concrete block, rebar, etc.)

Different types of material handling equipment will be required for each category. Debris definitions applied in Hazus-MH are unique to the Hazus-MH model and so do not necessarily conform to other definitions that may be employed in other models or guidelines.

The analysis estimates that an approximate total of 32,016 tons of debris might be generated: 1) Finishes- 26,262 tons; 2) Structural – 3,239 tons; and 3) Foundations- 2,515 tons. The results are mapped in Figure 16.

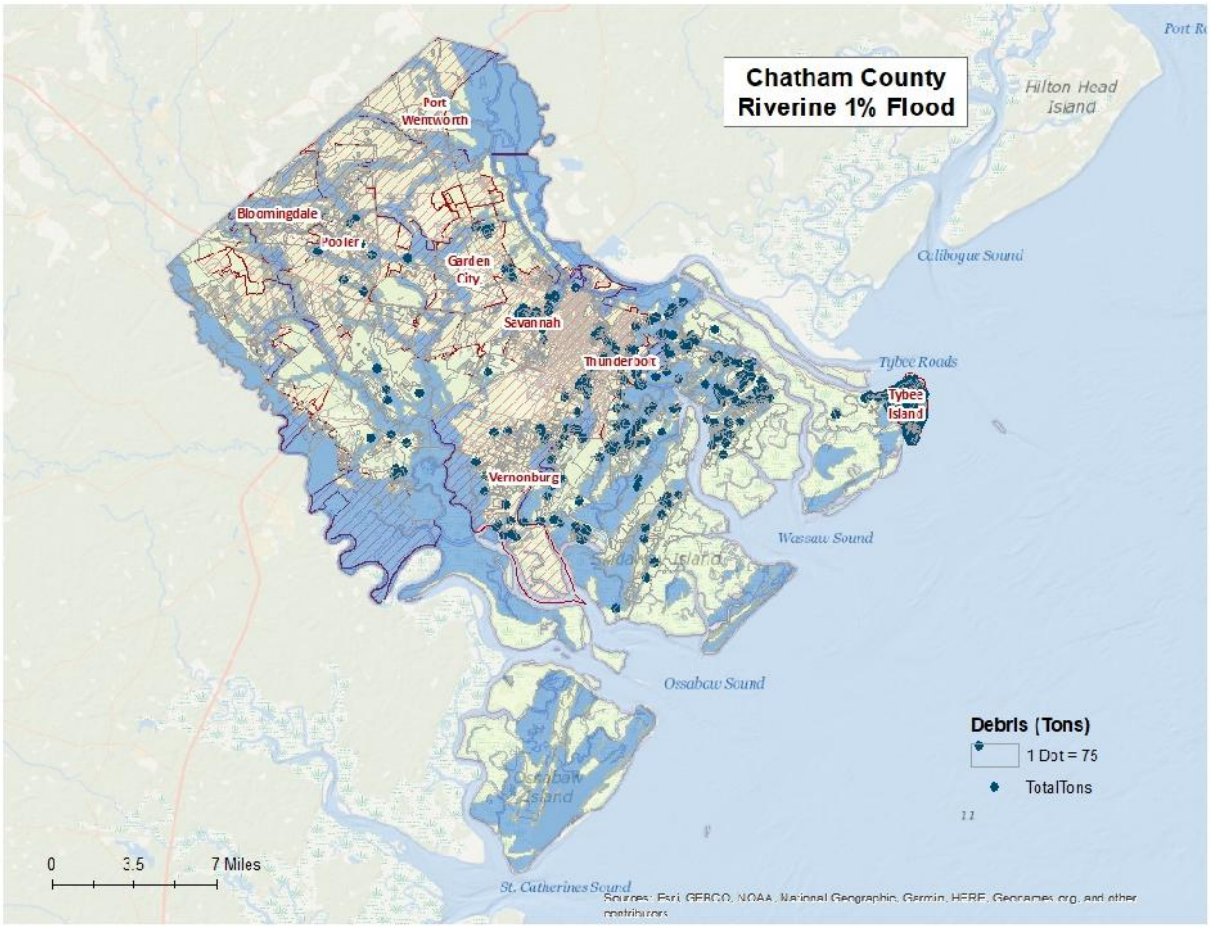

Figure 16: Riverine 1% Flood Debris Weight (Tons)

Coastal 1% Flood Scenario

Coastal losses are determined from the 1% flood boundaries downloaded from the FEMA Flood Map Service Center from July 2020. The flood boundaries are overlaid with the USGS DEM to generate riverine depth grids. The coastal flood depth grids are imported into Hazus-MH to calculate the coastal flood loss estimates. Figure 17 illustrates the coastal boundary associated with the one-percent-annual-chance.

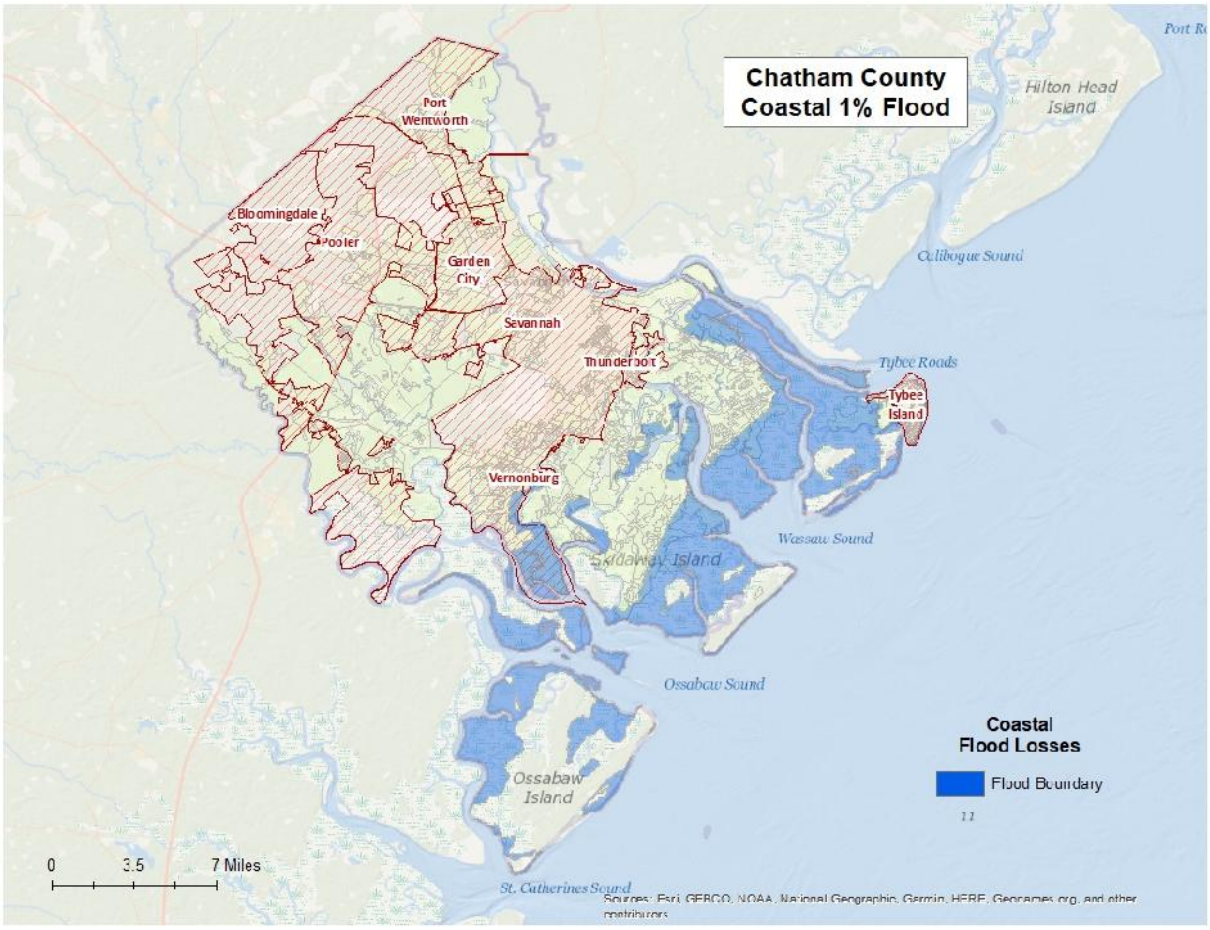

Figure 17: Coastal 1% Flood Inundation

Coastal 1% Flood Building Damages

Buildings in Chatham County are vulnerable to flooding from the 1% Coastal Flood and the cost to rebuild may have significant consequences to the community. Table 15 shows a summary of the results of flood-related building damage in Chatham County for the Coastal 1% probability storm. Figure 18 shows the building related loss ratio and Figure 19 maps the damaged buildings located in the inundation area.

Table 15: Chatham County Coastal 1% Building Losses

Occupancy	Total Buildings in the Jurisdiction	Total Buildings Damaged in the Jurisdiction	Total Building Exposure in the Jurisdiction	Total Losses to Buildings in the Jurisdiction	Loss Ratio of Exposed Buildings to Damaged Buildings in the Jurisdiction
Savannah					
Commercial	3,345	1	$4,119,367,654	$31,456	0.00%
Residential	43,785	8	$9,034,582,184	$354,456	0.00%
Tybee Island					
Government	8	2	$8,187,419	$203,689	2.49%
Residential	3,228	33	$798,538,073	$553,781	0.07%
Commercial	85	1	$33,998,035	$19,439	0.06%
Unincorporated					
Residential	31,523	89	$7,003,860,023	$4,007,471	0.06%
Commercial	515	2	$540,599,867	$158,250	0.03%
County Total					
	82,489	**136**	**$21,539,133,254**	**$5,328,542**	

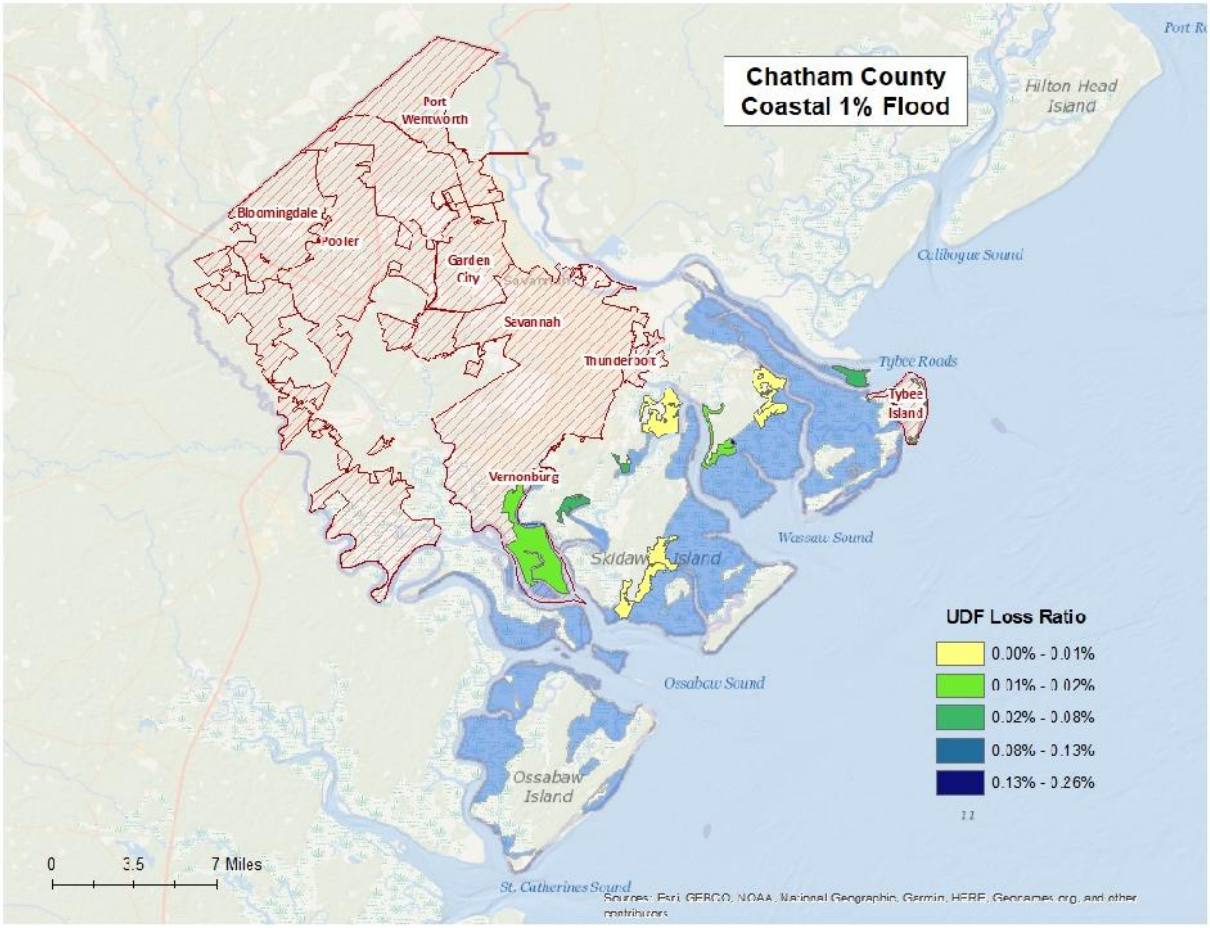

Figure 18: Chatham County Coastal Floodplain (1% Flood) Related Losses

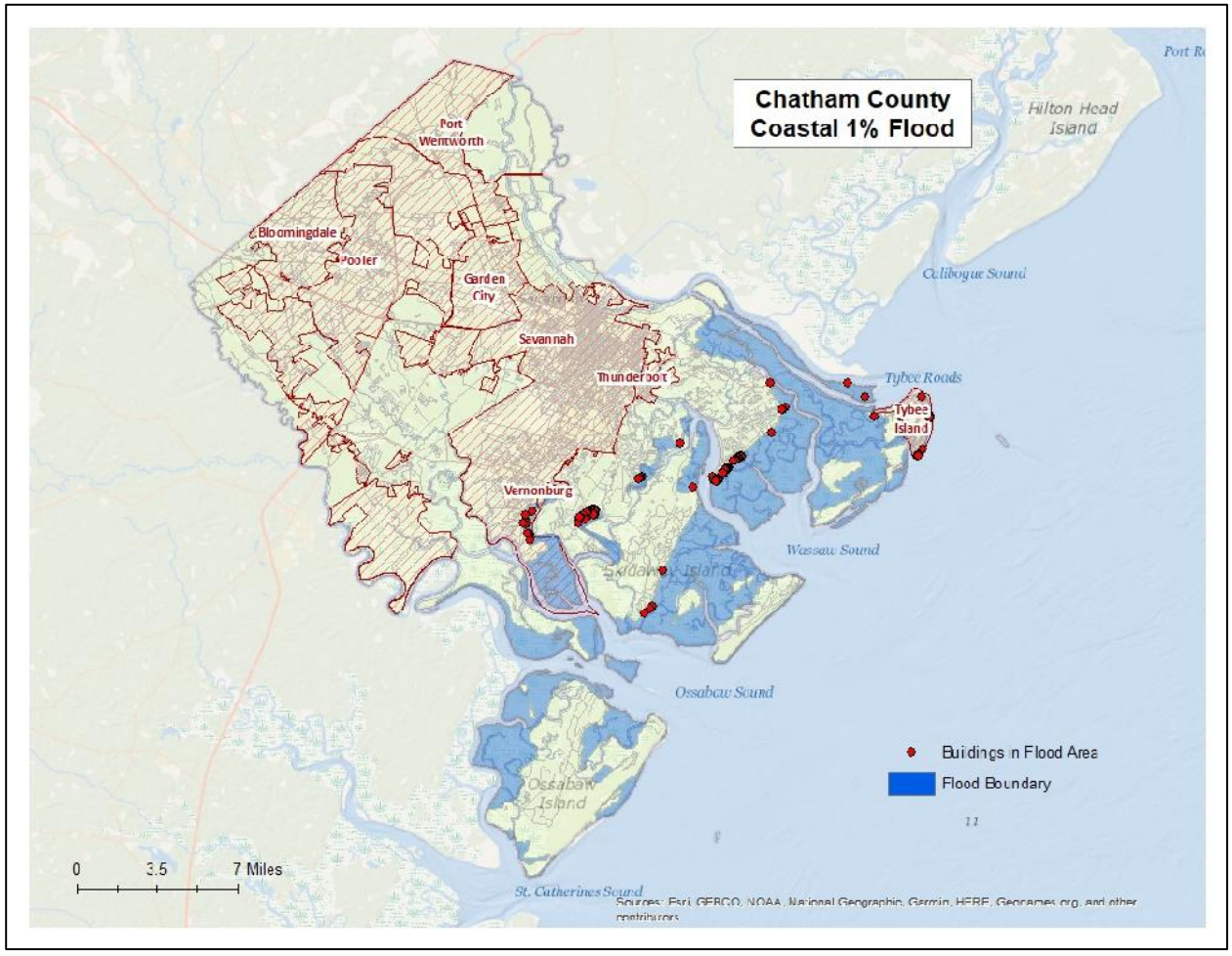

Figure 19: Damaged Buildings in Coastal Floodplain (1% Flood)

Coastal 1% Flood Essential Facility Losses

An essential facility may encounter many of the same impacts as other buildings within the flood boundary. These impacts can include structural failure, extensive water damage to the facility and loss of facility functionality (e.g. a damaged police station will no longer be able to serve the community). The analysis identified no essential facility that was subject to damage in the Chatham County 1% coastal floodplain.

Coastal 1% Flood Shelter Requirements

Hazus estimates that the number of households that are expected to be displaced from their homes due to the coastal flooding and the associated potential evacuation. The model estimates 1,318 households will be displaced due to the flood. Displacement includes households evacuated within or very near to the inundated area. Displaced households represent 3,955 individuals, of which 3,819 will require short-term publicly provided shelter. The results are mapped in Figure 20.

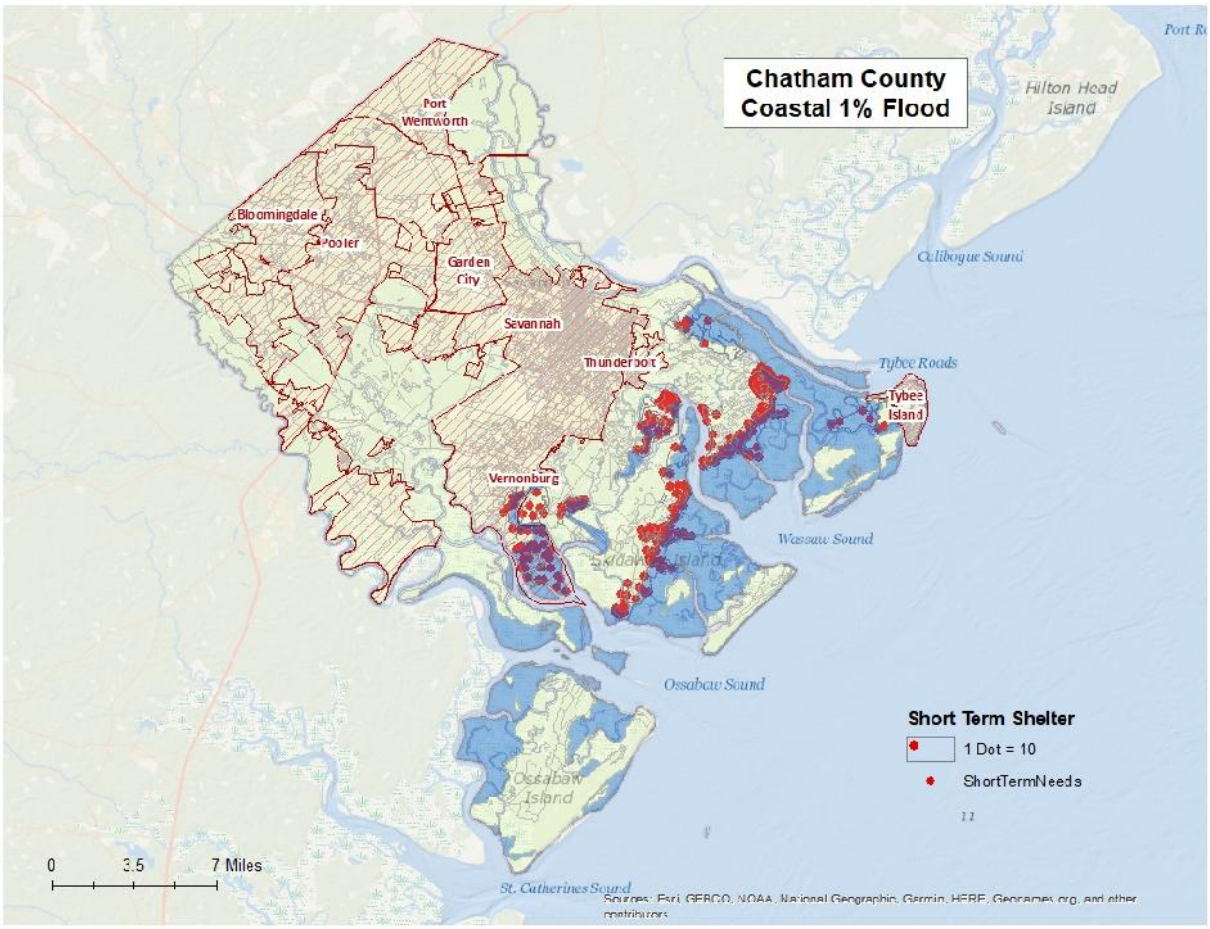

Figure 20: Coastal 1% Flood Shelter Requirements

Coastal 1% Flood Debris

Hazus estimates the amount of debris that will be generated by the flood. The model breaks debris into three general categories: 1) Finishes (dry wall, insulation, etc.), 2) Structural (wood, brick, etc.) and 3) Foundations (concrete slab, concrete block, rebar, etc.). Different types of material handling equipment will be required for each category. Debris definitions applied in Hazus are unique to the Hazus model and so not necessarily conform to other definitions that may be employed in other models or guidelines.

The analysis estimates that an approximate total of 3,473 tons of debris will be generated: 1) Finishes- 2,423 tons; 2) Structures- 643 tons; and 3) Foundations- 407 tons. The results are mapped in Figure 21.

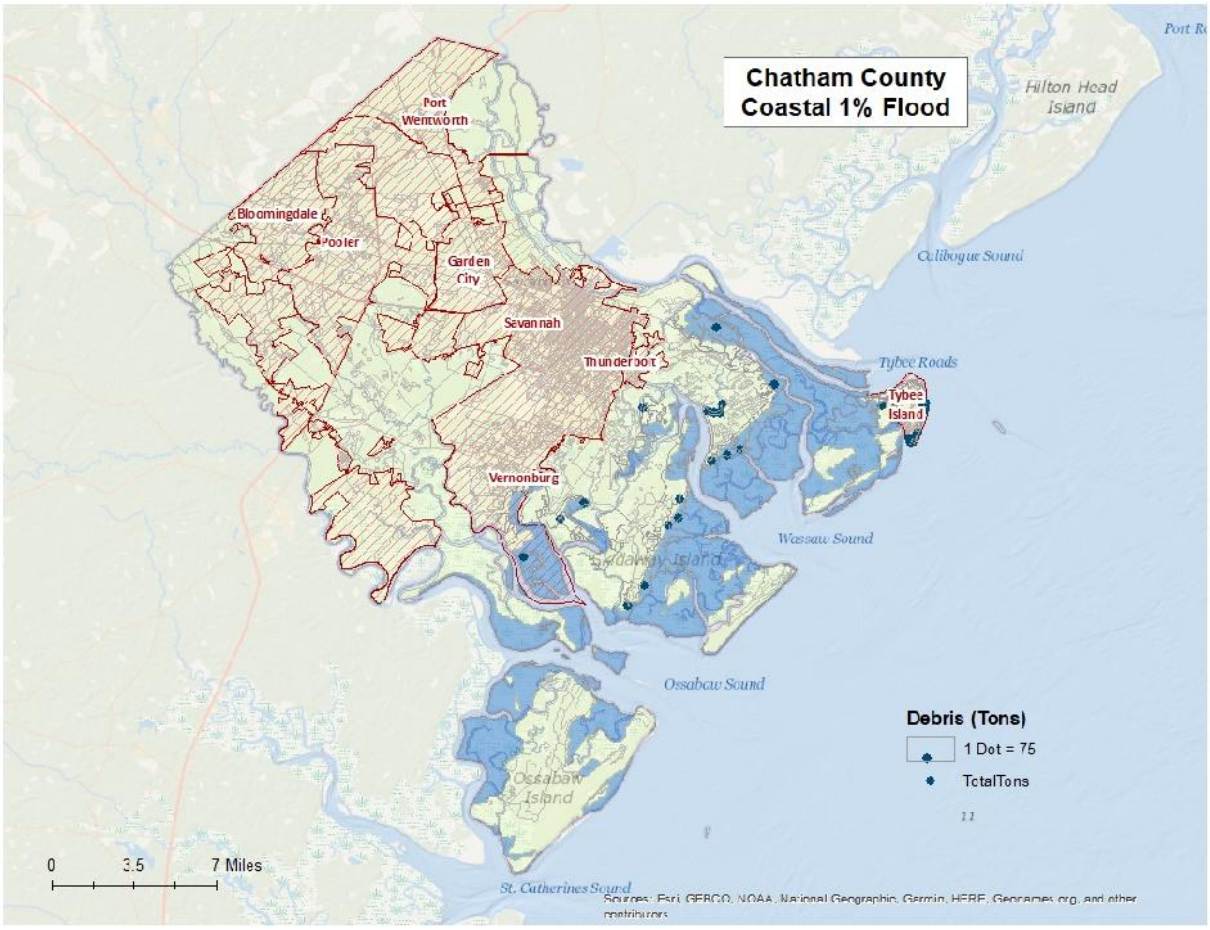

Figure 21: Coastal 1% Flood Debris Weight (Tons)

Tornado Risk Assessment

Hazard Definition

Tornadoes pose a great risk to the state of Georgia and its citizens. Tornadoes can occur at any time during the day or night. They can also happen during any month of the year. The unpredictability of tornadoes makes them one of Georgia's most dangerous hazards. Their extreme winds are violently destructive when they touch down in the region's developed and populated areas. Current estimates place the maximum velocity at about 300 miles per hour, but higher and lower values can occur. A wind velocity of 200 miles per hour will result in a wind pressure of 102.4 pounds per square foot of surface area—a load that exceeds the tolerance limits of most buildings. Considering these factors, it is easy to understand why tornadoes can be so devastating for the communities they hit.

Tornadoes are defined as violently-rotating columns of air extending from thunderstorms and cyclonic events. Funnel clouds are rotating columns of air not in contact with the ground; however, the violently-rotating column of air can reach the ground very quickly and become a tornado. If the funnel cloud picks up and blows debris, it has reached the ground and is a tornado.

Tornadoes are classified according to the Fujita tornado intensity scale. Originally introduced in 1971, the scale was modified in 2006 to better define the damage and estimated wind scale. The Enhanced Fujita Scale ranges from low intensity EF0 with effective wind speeds of 65 to 85 miles per hour, to EF5 tornadoes with effective wind speeds of over 200 miles per hour. The Enhanced Fujita intensity scale is included in Table 16.

Table 16: Enhanced Fujita Tornado Rating

Fujita Number	Estimated Wind Speed	Path Width	Path Length	Description of Destruction
EF0 *Gale*	65-85 mph	6-17 yards	0.3-0.9 miles	Light damage, some damage to chimneys, branches broken, sign boards damaged, shallow-rooted trees blown over.
EF1 Moderate	86-110 mph	18-55 yards	1.0-3.1 miles	Moderate damage, roof surfaces peeled off, mobile homes pushed off foundations, attached garages damaged.
EF2 Significant	111-135 mph	56-175 yards	3.2-9.9 miles	Considerable damage, entire roofs torn from frame houses, mobile homes demolished, boxcars pushed over, large trees snapped or uprooted.
EF3 Severe	136-165 mph	176-566 yards	10-31 miles	Severe damage, walls torn from well-constructed houses, trains overturned, most trees in forests uprooted, heavy cars thrown about.
EF4 Devastating	166-200 mph	0.3-0.9 miles	32-99 miles	Complete damage, well-constructed houses leveled, structures with weak foundations blown off for some distance, large missiles generated.
EF5 Incredible	> 200 mph	1.0-3.1 miles	100-315 miles	Foundations swept clean, automobiles become missiles and thrown for 100 yards or more, steel-reinforced concrete structures badly damaged.

Source: http://www.srh.noaa.gov

Hypothetical Tornado Scenario

For this report, an EF3 tornado was modeled to illustrate the potential impacts of tornadoes of this magnitude in the county. The analysis used a hypothetical path based upon an EF3 tornado event running along the predominant direction of historical tornados (southeast to northwest). The tornado path was placed to travel through Savannah. The selected widths were modeled after a re-creation of the Fujita-Scale guidelines based on conceptual wind speeds, path widths, and path lengths. There is no guarantee that every tornado will fit exactly into one of these categories. Table 18 depicts tornado path widths and expected damage.

Table 17: Tornado Path Widths and Damage Curves

Fujita Scale	Path Width (feet)	Maximum Expected Damage
EF-5	2,400	100%
EF-4	1,800	100%
EF-3	1,200	80%
EF-2	600	50%
EF-1	300	10%
EF-0	300	0%

Within any given tornado path there are degrees of damage. The most intense damage occurs within the center of the damage path, with decreasing amounts of damage away from the center. After the hypothetical path is digitized on a map, the process is modeled in GIS by adding buffers (damage zones) around the tornado path. Figure 22 describes the zone analysis.

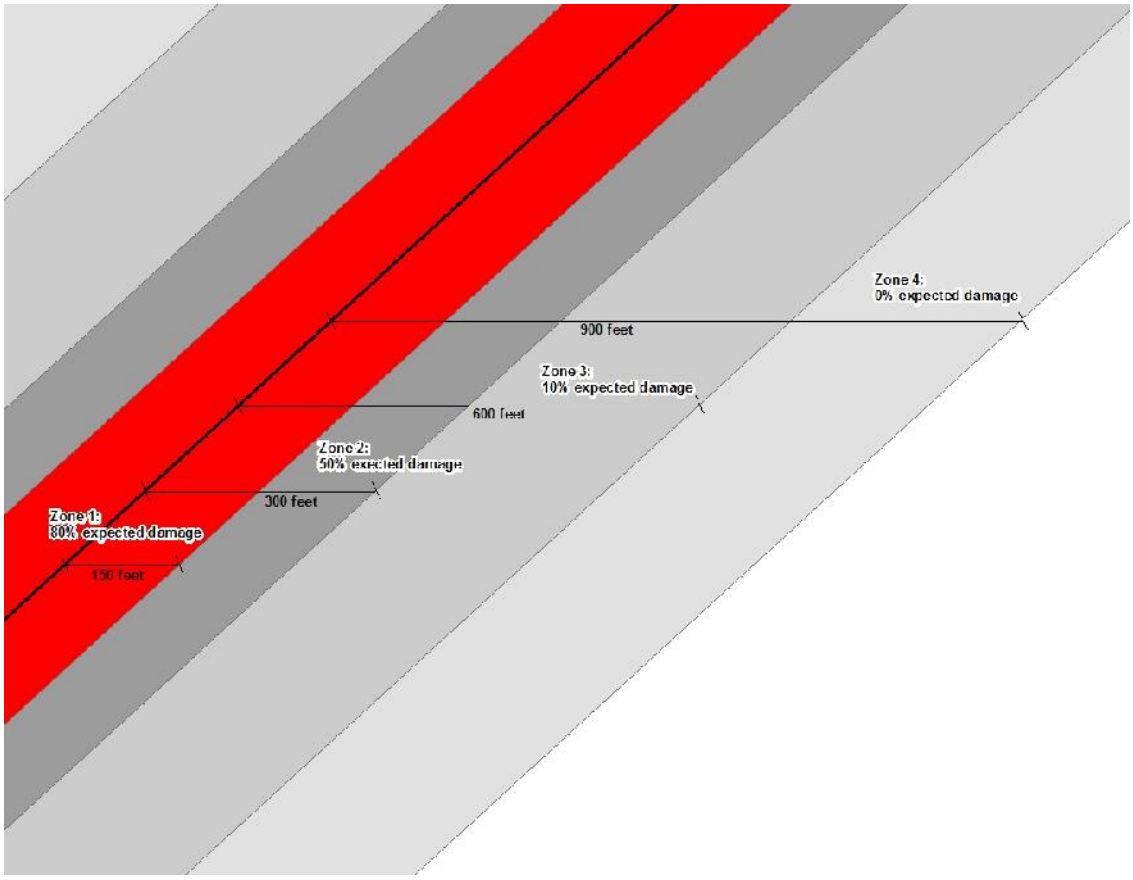

Figure 22: EF Scale Tornado Zones

An EF3 tornado has four damage zones, depicted in Table 19. Major damage is estimated within 150 feet of the tornado path. The outer buffer is 900 feet from the tornado path, within which buildings will not experience any damage. The selected hypothetical tornado path is depicted in Figure 23 and the damage curve buffer zones are shown in Figure 24.

Table 18: EF3 Tornado Zones and Damage Curves

Zone	Buffer (feet)	Damage Curve
1	0-150	80%
2	150-300	50%
3	300-600	10%
4	600-900	0%

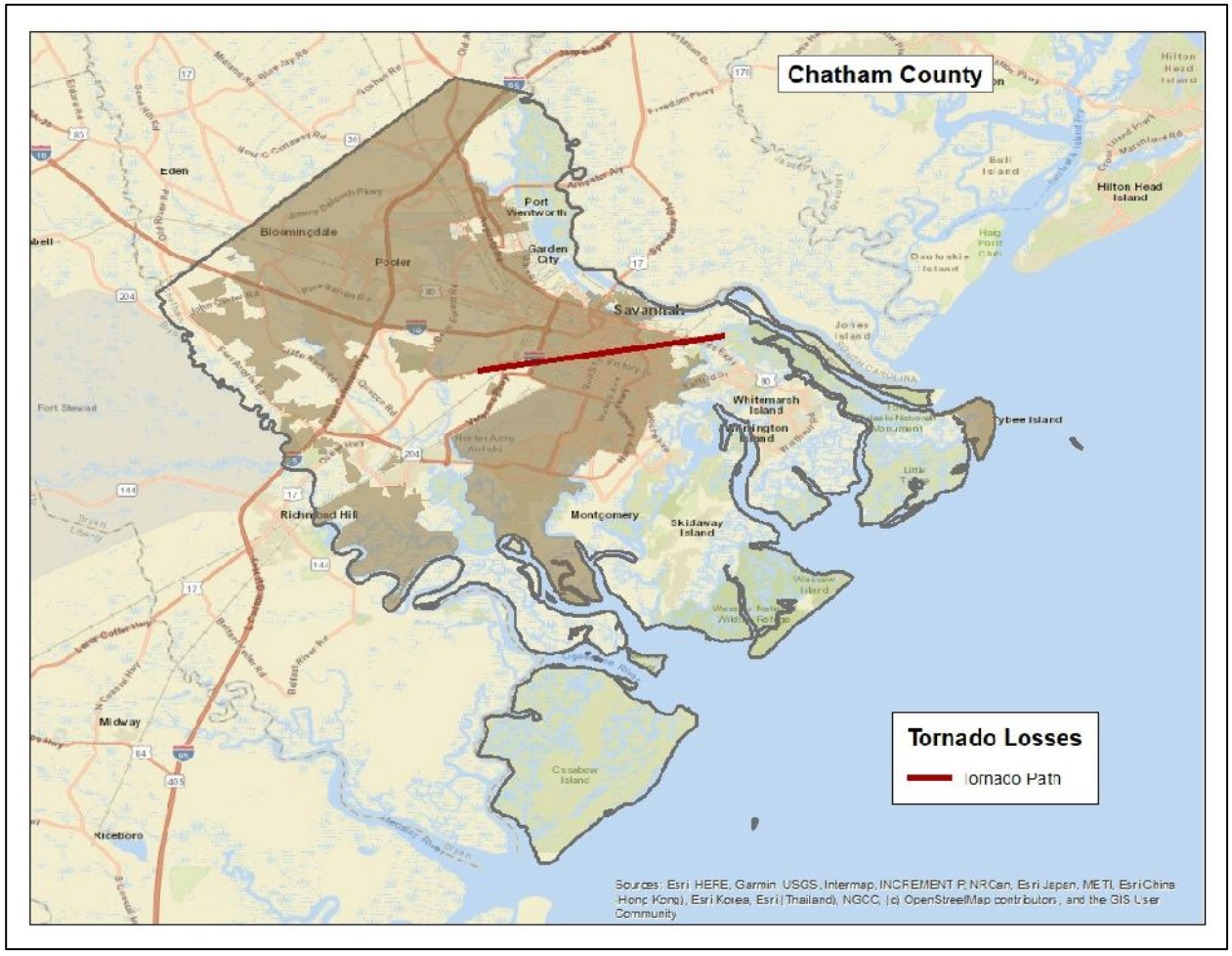

Figure 23: Hypothetical EF3 Tornado Path in Chatham County

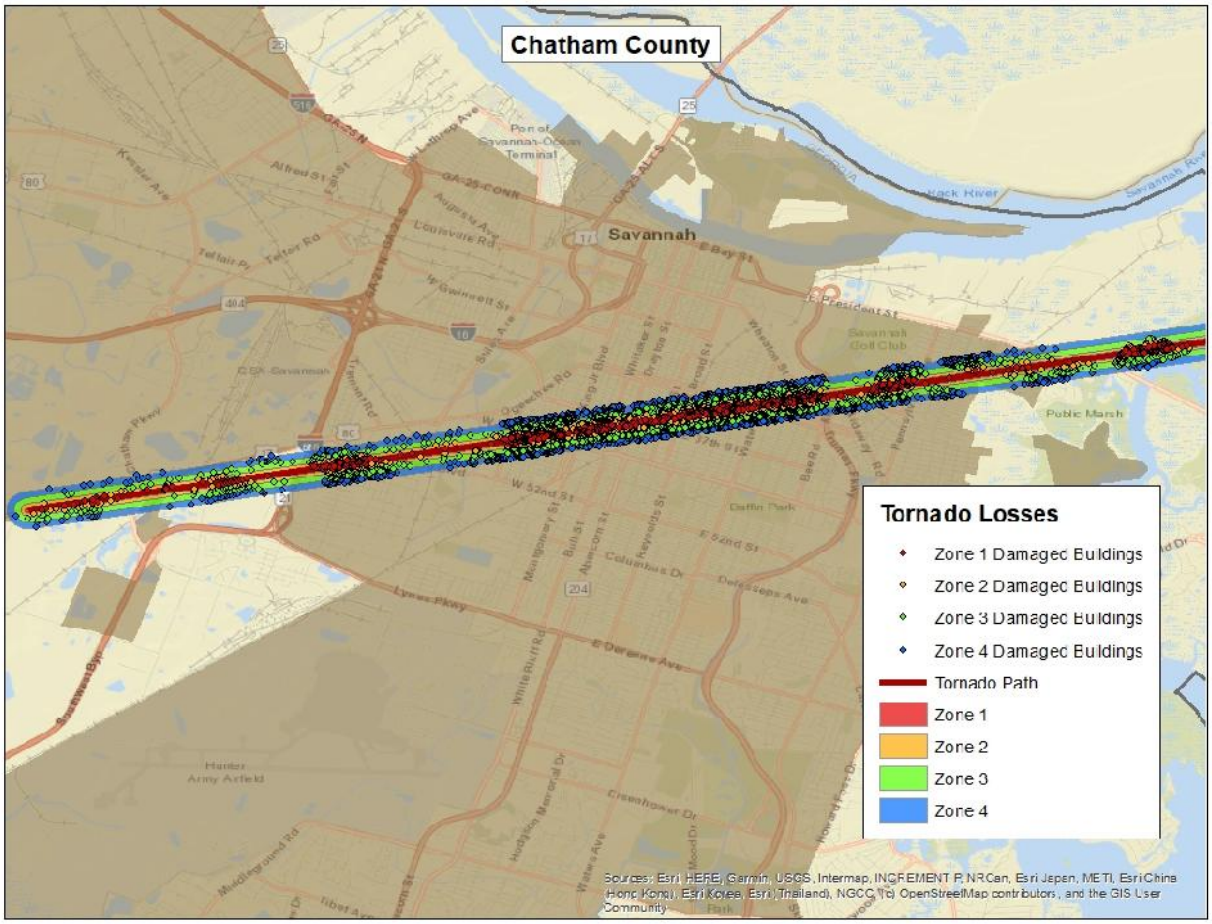

Figure 24: Modeled EF3 Tornado Damage Buffers in Chatham County

EF3 Tornado Building Damages

The analysis estimated that approximately 4,237 buildings could be damaged, with estimated building losses of $222 million. The building losses are an estimate of building replacement costs multiplied by the percentages of damage. The overlay was performed against parcels provided by Chatham County that were joined with Assessor records showing estimated property replacement costs. The Assessor records often do not distinguish parcels by occupancy class if the parcels are not taxable and thus the number of buildings and replacement costs may be underestimated. The results of the analysis are depicted in Table 20.

Table 19: Estimated Building Losses by Occupancy Type

Occupancy	Buildings Damaged	Building Losses
Residential	3,829	$140,782,544
Commercial	234	$30,979,218
Industrial	90	$24,898,083
Government	9	$3,012,877
Religious	55	$16,407,990
Education	20	$6,115,840
Total	**4,237**	**$222,196,552**

EF3 Tornado Essential Facility Damage

There were seven essential facilities located in the tornado path – four schools and three fire stations. Table 21 outlines the specific facilities and the amount of damage under the scenario.

Table 20: Estimated Essential Facilities Damaged

Facility	Amount of Damage
SCCPSS Beach High School	Major Damage
SCCPSS Savannah Early Coll. High School	Major Damage
SCCPSS Shuman Elementary School	Major Damage
Chatham Fire Station #10	Major Damage
Savannah Fire Station #09	Major Damage
Savannah Classical Acad. Charter High	Minor Damage
Chatham Fire Station #14	Minor Damage

According to the Georgia Department of Education, Beach High School's enrollment was approximately 926 students, Shuman Elementary School's enrollment was approximately 609 students, Savannah Early Coll. High School's enrollment was approximately 209 students, and Savannah Classical Acad. Charter High School's enrollment was approximately 263 students as of March, 2020. Depending on the time of day, a tornado strike, as depicted in this scenario, could result in significant injury and loss of life. In addition, arrangements would have to be made for the continued education of the students in another location.

The location of the damaged Essential Facilities is mapped in Figure 25.

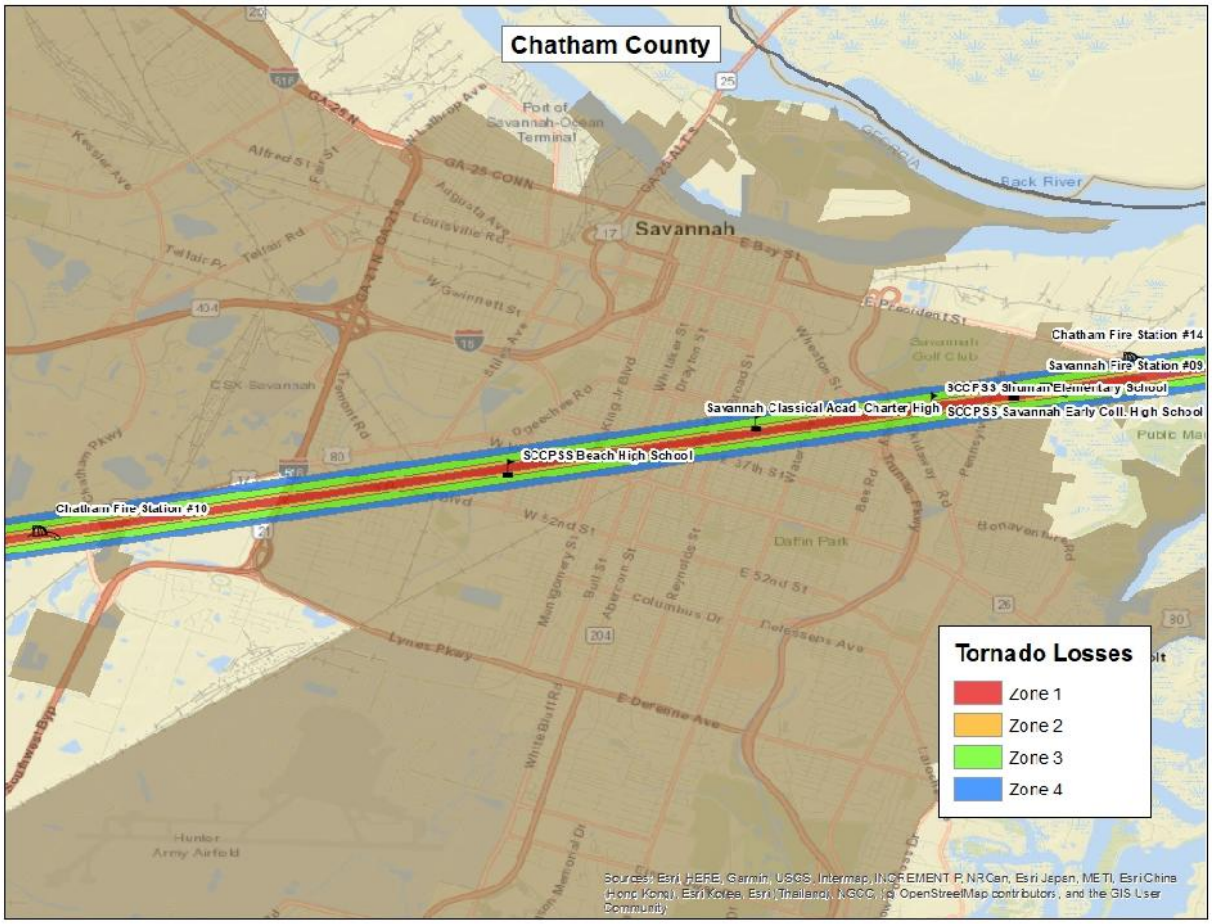

Figure 25: Modeled Essential Facility Damage in Chatham County

Exceptions Report

Hazus Version 2.2 SP1 was used to perform the loss estimates for Chatham County, Georgia. Changes made to the default Hazus-MH inventory and the modeling parameters used to setup the hazard scenarios are described within this document.

Reported losses reflect the updated data sets. Steps, algorithms and assumptions used during the data update process are documented in the project workflow named PDM_GA_Workflow.doc.

Statewide Inventory Changes

The default Hazus-MH Essential Facility inventory was updated for the entire state prior to running the hazard scenarios for Chatham County.

Statewide facility data were supplied by GEMA through the GMIS in June 2020. These updates were applied by The Carl Vinson Institute of Government at the University of Georgia. Table 21 summarizes the difference between the original Hazus-MH default data and the updated data for Chatham County.

Table 21: Essential Facility Updates

Site Class	Feature Class	Default Replacement Cost	Default Count	Updated Replacement Cost	Updated Count
EF	Care	$245,016,000	14	$221,811,000	11
EF	EOC	$880,000	1	$6,604,000	2
EF	Fire	$471,175,000	40	$522,695,000	42
EF	Police	$148,651,000	19	$97,664,000	15
EF	School	$754,671,000	157	$544,568,000	105

County Inventory Changes

The GBS records for Chatham County were replaced with data derived from parcel and property assessment data obtained from Chatham County. The county provided property assessment data was current as of June 2020 and the parcel data current as of December 2019.

General Building Stock Updates

The parcel boundaries and assessor records were obtained from Chatham County. Records without improvements were deleted. The parcel boundaries were converted to parcel points located in the centroids of each parcel boundary. Each parcel point was linked to an assessor record based upon matching parcel numbers. The generated Building Inventory represents the approximate locations (within a parcel) of building exposure. The Building Inventory was aggregated by Census Block and imported into Hazus-MH using the Hazus-MH Comprehensive Data Management System (CDMS). Both the 2010 Census Tract and Census Block tables were updated.

The match between parcel records and assessor records was based upon a common Parcel ID. For this type of project, unless the hit rate is better than 85%, the records are not used to update the default aggregate inventory in Hazus-MH. The Parcel-Assessor hit rate for Chatham County was 96.0%.

Adjustments were made to records when primary fields did not have a value. In these cases, default values were applied to the fields. Table 23 outlines the adjustments made to Chatham County records.

Table 22: Building Inventory Default Adjustment Rates

Type of Adjustment	Building Count	Percentage
Area Unknown	204	1%
Construction Unknown	1,315	8%
Condition Unknown	181	1%
Foundation Unknown	1,313	8%
Year Built Unknown	80	1%
Total Buildings	**15,848**	**4%**

Approximately 4% of the CAMA values were either missing (<Null> or '0'), did not match CAMA domains or were unusable ('Unknown', 'Other', 'Pending'). These were replaced with 'best available' values. Missing YearBuilt values were populated from average values per Census Block. Missing Condition, Construction and Foundation values were populated with the highest-frequency CAMA values per Occupancy Class. Missing Area values were populated with the average CAMA values per Occupancy Class.

The resulting Building Inventory was used to populate the Hazus-MH General Building Stock and User Defined Facility tables. The updated General Building Stock was used to calculate flood and tornado losses. Changes to the building counts and exposure that were modeled in Chatham County are sorted by General Occupancy in Table 1 at the beginning of this report. If replacements cost or building value were not present for a given record in the Assessor data, replacement costs were calculated from the Building Area (sqft) multiplied by the Hazus-MH RS Means ($/sqft) values for each Occupancy Class.

Differences between the default and updated data are due to various factors. The Assessor records often do not distinguish parcels by occupancy class when the parcels are not taxable; therefore, the total number of buildings and the building replacement costs for government, religious/non-profit, and education may be underestimated.

User Defined Facilities

Building Inventory was used to create Hazus-MH User Defined Facility (UDF) inventory for flood modeling. Hazus-MH flood loss estimates are based upon the UDF point data. Buildings within the flood boundary were imported into Hazus-MH as User Defined Facilities and modeled as points.

Table 23: User Defined Facility Exposure

Class	Hazus-MH Feature	Counts	Exposure
BI	Building Exposure	100,678	$32,729,862,399
Riverine UDF	Structures Inside 1% Annual Chance Riverine Flood Area	14,494	$4,664,118,118
Coastal UDF	Structures Inside 1% Annual Chance Riverine Flood Area	144	$35,818,687
Hurricane Surge UDF	Structures Inside Storm Surge Flood Area	38,966	$11,459,107,432

Assumptions

- Flood analysis was performed on Building Inventory. Building Inventory within the flood boundary was imported as User Defined Facilities. The point locations are parcel centroid accuracy.
- The analysis is restricted to the county boundary. Events that occur near the county boundary do not contain loss estimates from adjacent counties.
- The following attributes were defaulted or calculated:
  First Floor Height was set from Foundation Type
  Content Cost was calculated from Building Cost

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