



TYBEE ISLAND SEA LEVEL RISE ADAPTATION PLAN

Executive Summary June 2013

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MAREX

**Chatham County - Savannah Metropolitan Planning Commission
Georgia Department of Natural Resources Coastal Resources Commission**

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Executive Summary

As a low-lying barrier island, the City of Tybee Island faces unique challenges from hazards such as sea level rise, storm surges, and extreme rainfall. This plan presents suggestions for the management and protection of Tybee Island. Tybee Island is a coastal barrier island and a popular tourist destination. It faces a wide range of complex challenges including erosion, coastal flooding, and the looming challenges of climate-induced sea level rise.

This document provides a summary of an ongoing public process to identify and evaluate a series of adaptation actions that the City of Tybee Island might pursue to mitigate current and future hazards associated with sea level rise. The Tybee Island Sea Level Rise Adaptation Plan will be the result of a robust public process in which a wide range of stakeholders and the public will participate over a 2-year period.

Five Focus Areas

The complex issues facing Tybee Island are addressed through five Focus Areas, each of which will be described in some detail. In summary, they are as follows.

1 Infrastructure

Because Tybee Island is a low-lying barrier island, much of the property and infrastructure is vulnerable to tidal flooding. Sea level rise can be expected to exacerbate these vulnerabilities over time. Identifying these vulnerabilities, evaluating the relative costs and benefits of infrastructure, and developing funding mechanisms for implementing cost-effective environmentally suitable improvements are all key goals of the adaptation plan.

2 Access and Connectivity

Tybee Island's only road linkage to the mainland Savannah Metropolitan area is provided by US Highway 80. Sections of this highway are very low-lying and currently flood approximately 4-5 times each year during spring tide events. Over the next several decades the frequency of road flood events is expected to increase significantly due to sea level rise if the road is maintained at its current elevation grade.

3 Coastal Dynamics

Tybee Island is the visible portion of a much larger coastal sediment system. Erosion problems will worsen with climate related sea level rise, and will need to be managed through a variety of approaches, including retreat, nourishment and coastal armoring.

4 Image and Character

Tybee Island has a unique culture and history. Once home to American Indians, Spanish, and French inhabitants, today the island draws users from across the nation who find beauty and relaxation in the wind, waves, beaches, and marshes. Balancing sea level rise adaptation with the maintenance of the island's unique image and character will require careful planning and consideration.

5 Management and Stewardship

Though visitors experience a single place, a host of different federal, state and local agencies are responsible for different aspects of Tybee Island. This plan is intended to provide a vision that can facilitate coordination across jurisdictional boundaries for the sustained benefit of Tybee Island residents and visitors over the next several decades.

Executive Summary

Plan Outline: Potential Adaptation Actions

These six potential adaptation actions outline the Tybee Island Sea Level Rise Adaptation Plan's major suggestions. Each one will include many individual suggestions.

Assumptions that inform the plan suggestions include:

- > Analysis and modeling to 2060 horizon
- > Recommendations to 2060
- > Ongoing monitoring and adaptive management

Action 1: Stormwater Retrofit

Tybee Island has recently retrofitted a section of its stormwater drainage system with larger capacity pipes and tidal valve gates. These improvements lessen the risk of local flooding from extreme high tide and heavy rainfall events. Ongoing sea level rise will likely necessitate a series of other stormwater improvements over the next several decades. Prioritization of when to retrofit specific stormwater basin, evaluation of different retrofit options, and identification of sustainable funding mechanisms to fund improvements are major planning needs.



Action 2: Elevating Well Pumps

In light of the threat of sea level rise, Tybee Island is moving forward to elevate critical city infrastructure such as well infrastructure. In addition, raising and floodproofing wastewater lift stations may arise as a planning need of the City.



Action 3: Repetitive Loss Properties

To improve their Community Rating within the National Flood Insurance Program, Tybee Island should consider innovative methods to deal with the Repetitive Loss Properties located on the island.



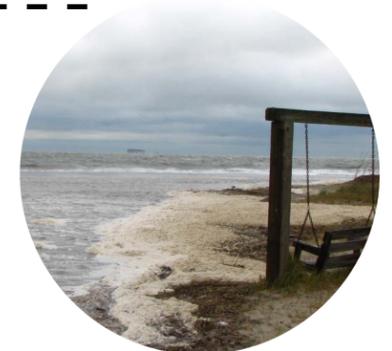
Action 4: US 80

The Georgia Department of Transportation is currently evaluating new plans for bridge replacements and other major improvements US80. This process provides the City of Tybee Island with an opportunity to work with GDOT and other partners on potential options for elevating US80 several feet above its current grade, thereby mitigating current and future hazards associated with tidal flooding of the road corridor.



Action 5: Beach Nourishment

The beaches of Tybee Island are currently renourished on a 7-year schedule. Although the sand-sharing and erosion system along Tybee Island is influenced by many variables, sea level rise may result in the need for more frequent and/or higher volumes of sand renourishment. Pro-active research and planning is required to ensure that future renourishment projects are appropriately scaled and that adequate funding is identified.



Action 6: Shoreline Stabilization

A number of developed areas on Tybee Island are vulnerable to increased flooding risk associated with sea level rise. Traditional approaches for stabilizing shorelines and holding back high water events include bulkheads and sea walls. While generally quite effective in holding back tidewaters, such structures are expensive to construct and are known to have a variety of impacts on coastal hydrology that can adversely effect natural resources. Balancing the site-specific benefits and costs of armoring is likely one of the most difficult issues that Tybee Island faces in relation to sea level rise. For this reason, a key goal of the adaptation plan is to discuss and suggest comprehensive policy options and novel methods for the City to consider regarding coastal armoring.



The purpose of the Sea Level Rise Adaptation Plan is to provide Tybee Island with detailed options and suggestions for local adaptation to sea level rise threats.

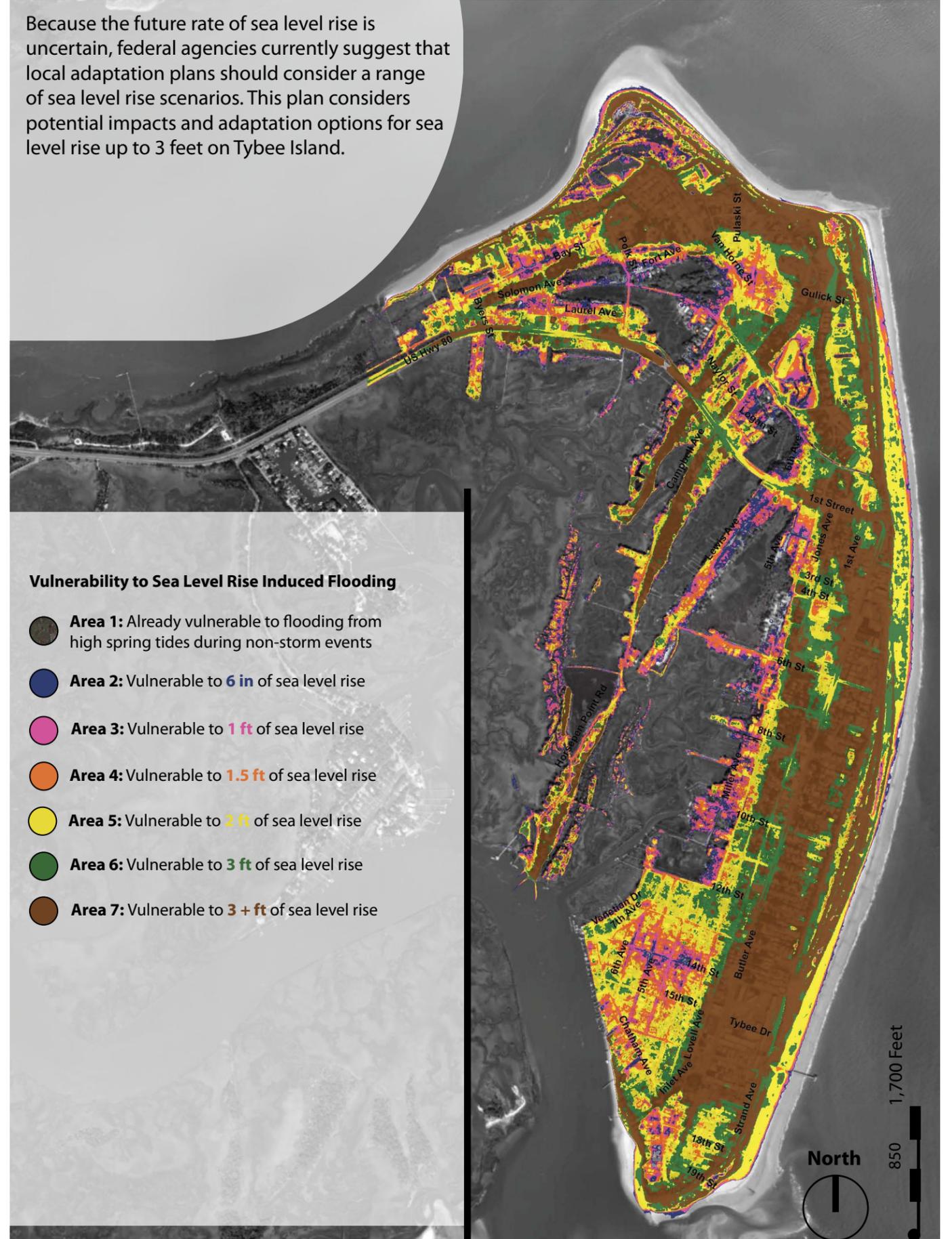


Map Visualization of Primary Adaptation Actions Currently under Consideration

- 1 **Action 1:** Stormwater Retrofit
- 2 **Action 2:** Elevating Well Pumps
- 3 **Action 3:** Repetitive Loss Properties
- 4 **Action 4:** US 80
- 5 **Action 5:** Beach Nourishment
- 6 **Action 6:** Ecological Armoring of Shore

Figure 0-1. Tybee Sea Level Rise Adaptation Plan Illustrative

Because the future rate of sea level rise is uncertain, federal agencies currently suggest that local adaptation plans should consider a range of sea level rise scenarios. This plan considers potential impacts and adaptation options for sea level rise up to 3 feet on Tybee Island.



Vulnerability to Sea Level Rise Induced Flooding

- Area 1: Already vulnerable to flooding from high spring tides during non-storm events
- Area 2: Vulnerable to 6 in of sea level rise
- Area 3: Vulnerable to 1 ft of sea level rise
- Area 4: Vulnerable to 1.5 ft of sea level rise
- Area 5: Vulnerable to 2 ft of sea level rise
- Area 6: Vulnerable to 3 ft of sea level rise
- Area 7: Vulnerable to 3+ ft of sea level rise

Figure 0-2. Tybee Sea Level Rise Adaptation Plan Flooding

Sections of Tybee Island are located on area that once was tidal marsh. Because portions of these fill areas are low-lying and composed of poorly-drained soils, flood risks in these fill areas can be quite high. Much of this developed tidal marsh area is located in the southwest sector of the island. Ongoing sea level rise can be expected to only further increase these risks. Lessening current and future flood risks in these areas will require the implementation of innovative stormwater management strategies.

Flooding during a spring tide November 2012 that occurred simultaneously with a rain storm



Area once tidal marsh that is at present developed

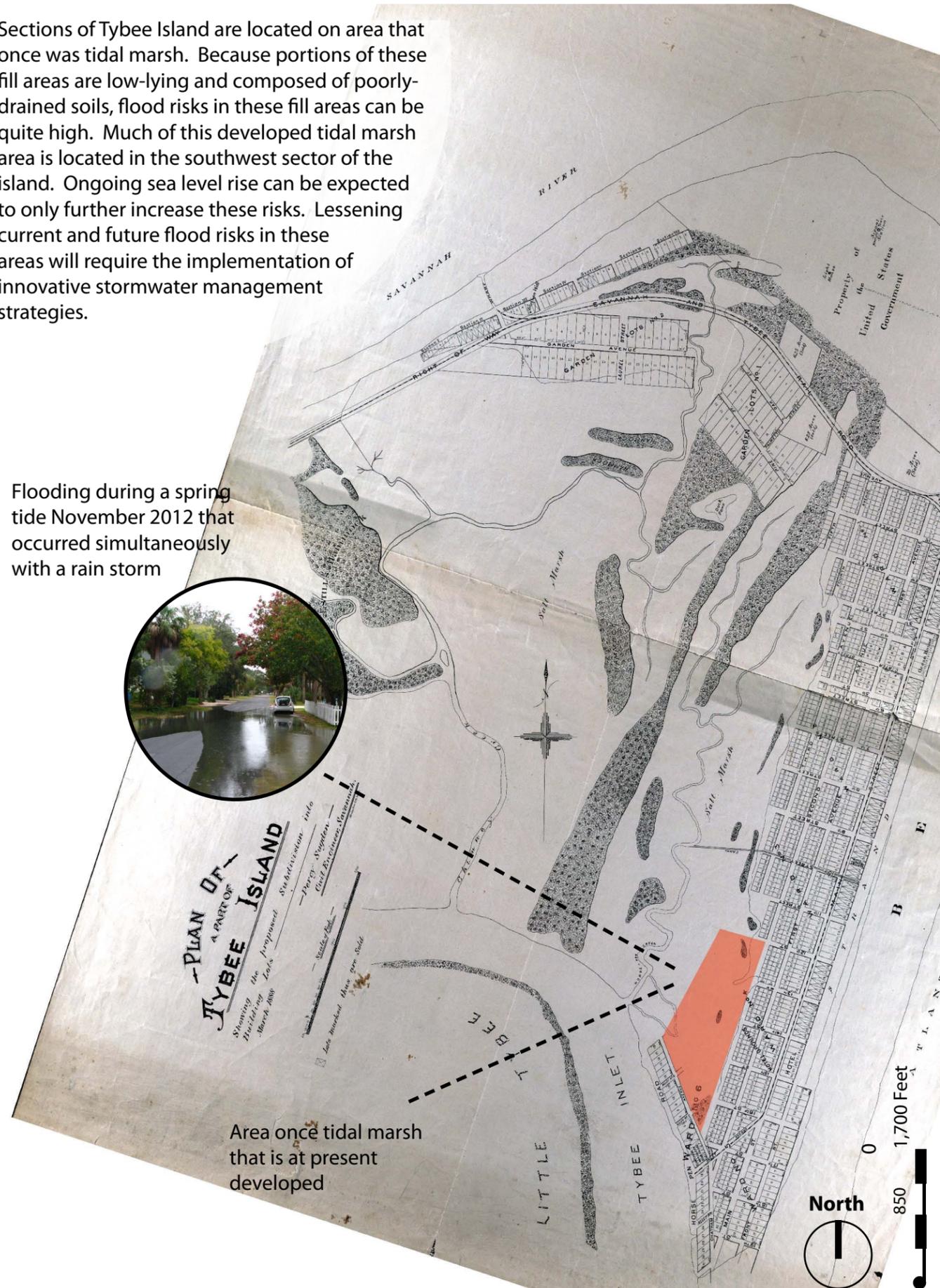


Figure 0-3. Tybee Sea Level Rise Adaptation Plan 1888 Conditions

Annual flood risk damages by City block were modeled under a scenario assuming 1 foot of sea level rise. Expected flood frequencies, flood heights, and expected damages were determined using several sets of data: 1) tide gage data from Ft. Pulaski over the period of 2009-2011; 2) high resolution coastal LiDAR elevation data; and 3) dollar values determined from property tax assessments and economic activity generated from hotel night stays.

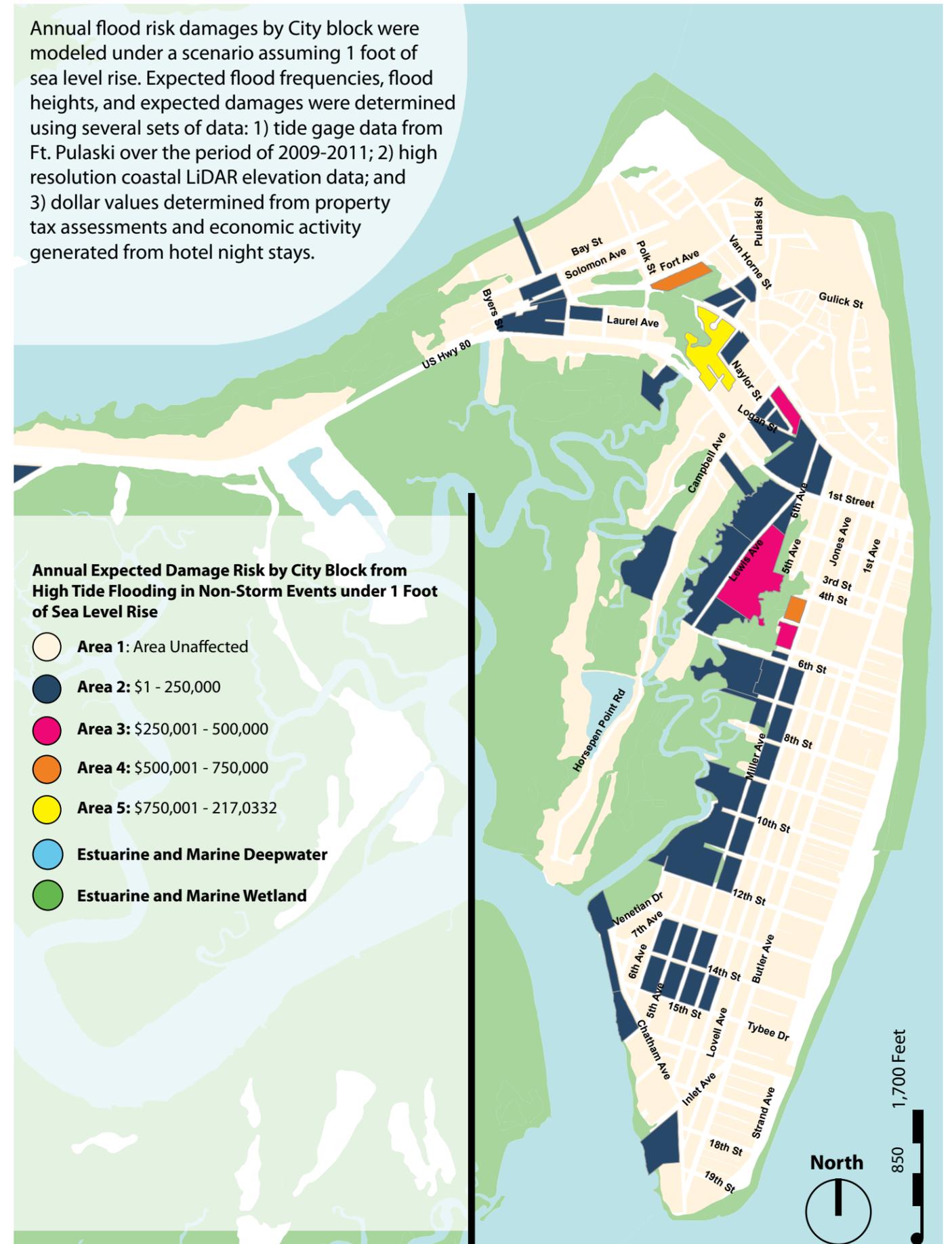


Figure 0-4. Tybee Sea Level Rise Adaptation Plan Flood Damage

Public Outreach Process

A comprehensive effort has been devoted to synthesizing an array of complex conditions and tradeoffs into accessible and compelling materials to facilitate participation in planning for sea level rise. The outreach process is fundamental to the development of this plan and has included stakeholder interviews, three public meetings, a University of Georgia Graduate Class, and multiple online media resources.

Tybee Island Advisors

The Plan enlisted the advice of the Tybee Island City Council to weigh in as needed on the scientific and engineering aspects of the project.

Tybee Island Mayor

Jason Buelterman

Tybee Island City Council

Wanda Doyle
Barry Brown
Paul Wolff
Bill Garbett
Tom Groover
Jan Fox

City Officials

Dianne Schleicher
City Manager
Jimmy Brown
Emergency Management Coordinator
Joe Wilson
Director of Department of Pubic Works
Diane Otto
Community Development Specialist
George Reese
Manager of Water Department

Public Meetings

The public process has included three sets of town hall meetings at Tybee Island City Hall. These meetings have featured expert presentations on sea level rise science and adaptation, and have also solicited public input for considering adaptation options appropriate to the unique conditions faced by Tybee Island.



Public Meeting Series 1

May 2012

Tybee Island is a complex, multifaceted environment, with a host of overlapping issues and challenges. To kick off the public outreach process, the Tybee Island Coastal Hazards Adaptation Plan's first public meeting focused on presenting the threats of sea level rise to the island as well as adaptation options for Tybee Island to consider. Speakers included Jackie Jackson-Teel of the Chatham-Savannah Metropolitan Planning Commission and Jennifer Kline of the Coastal Hazards Specialist for Georgia DNR Coastal Resources Division.



Public Meeting Series 2

August 6-7, 2012`

A key element of the plan's strategy is to test a wide range of adaptation options and explore their tradeoffs over a long time period. Dr. Sam Merrill, Director of the New England Environmental Finance Center, worked participants through sea level rise adaptation options for Tybee Island. Dr. Merrill also presented examples of sea level rise planning currently being practiced in other communities.

Sea level rise adaptation options depend heavily on a projected height of sea level rise. Through facilitated discussion and straw poll votes, meeting participants decided to consider a range of sea level rise scenarios for Tybee Island. These included a low scenario of 7 inches, an intermediate scenario of 1.3 feet, and a high scenario of 2.3 feet by the year 2060. These scenarios closely match recommendations made by NOAA and other federal agencies for sea level rise adaptation planning.

Local adaptation options identified for further evaluation included raising the city's well pump houses, making local stormwater improvements, marsh-side armoring of the shoreline, increasing the height of future beach renourishment to accommodate sea level rise, and elevating US 80 four feet above current grade.

Public Meeting Series 3

March 4-5, 2013`

Dr. Jason Evans presented a series of benefit-cost evaluations for identified adaptation actions. Several actions such as beach renourishment, elevation of well pumps, and construction of tide valve gates on stormwater outlets that drain low-lying areas of the island showed clear net economic benefits for all scenarios. Elevation of US80 requires further analysis, but was judged to have high benefits with consideration of increased evacuation times before hurricanes and continuous access to the island during future high tide events.