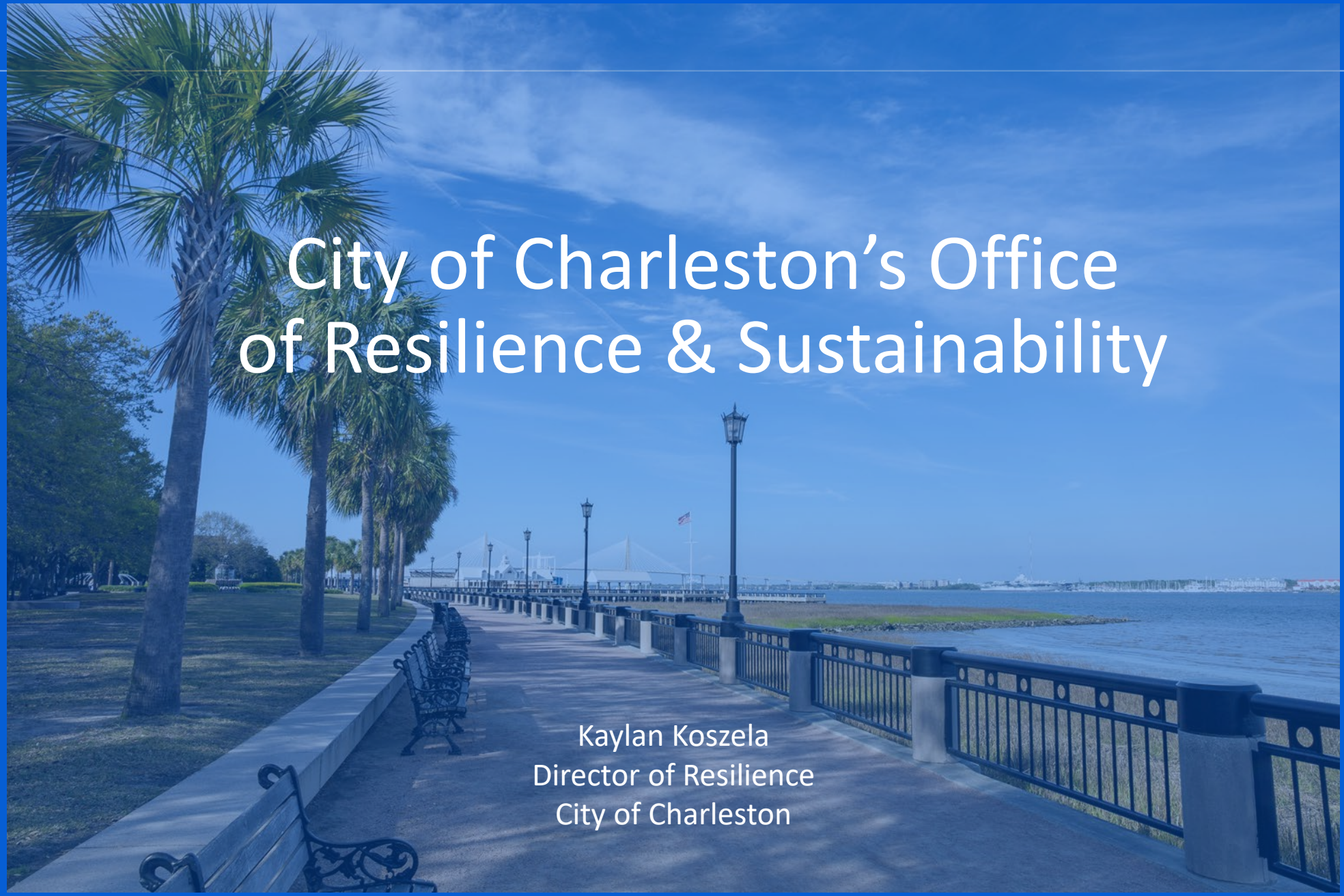


City of Charleston's Office of Resilience & Sustainability

Kaylan Koszela
Director of Resilience
City of Charleston

Mission:

Ensure our community can positively adapt to and thrive amidst changing climate conditions

ADAPT

Resilience

ensure high quality of life, reliable & protective infrastructure, and economic vitality

MITIGATE

Sustainability

conserve resources for present and future generations

All Hazard Vulnerability Analysis, 2019

Physical vulnerability: surge, tidal, rainfall, sea-level rise, earthquake, dam failure, heat, hazmat. Social vulnerability.

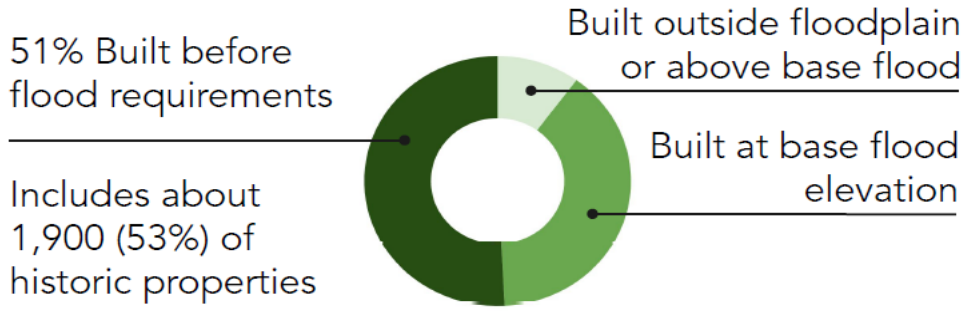
Key Finding 1

Flooding, storm surge, and earthquakes drive vulnerability citywide

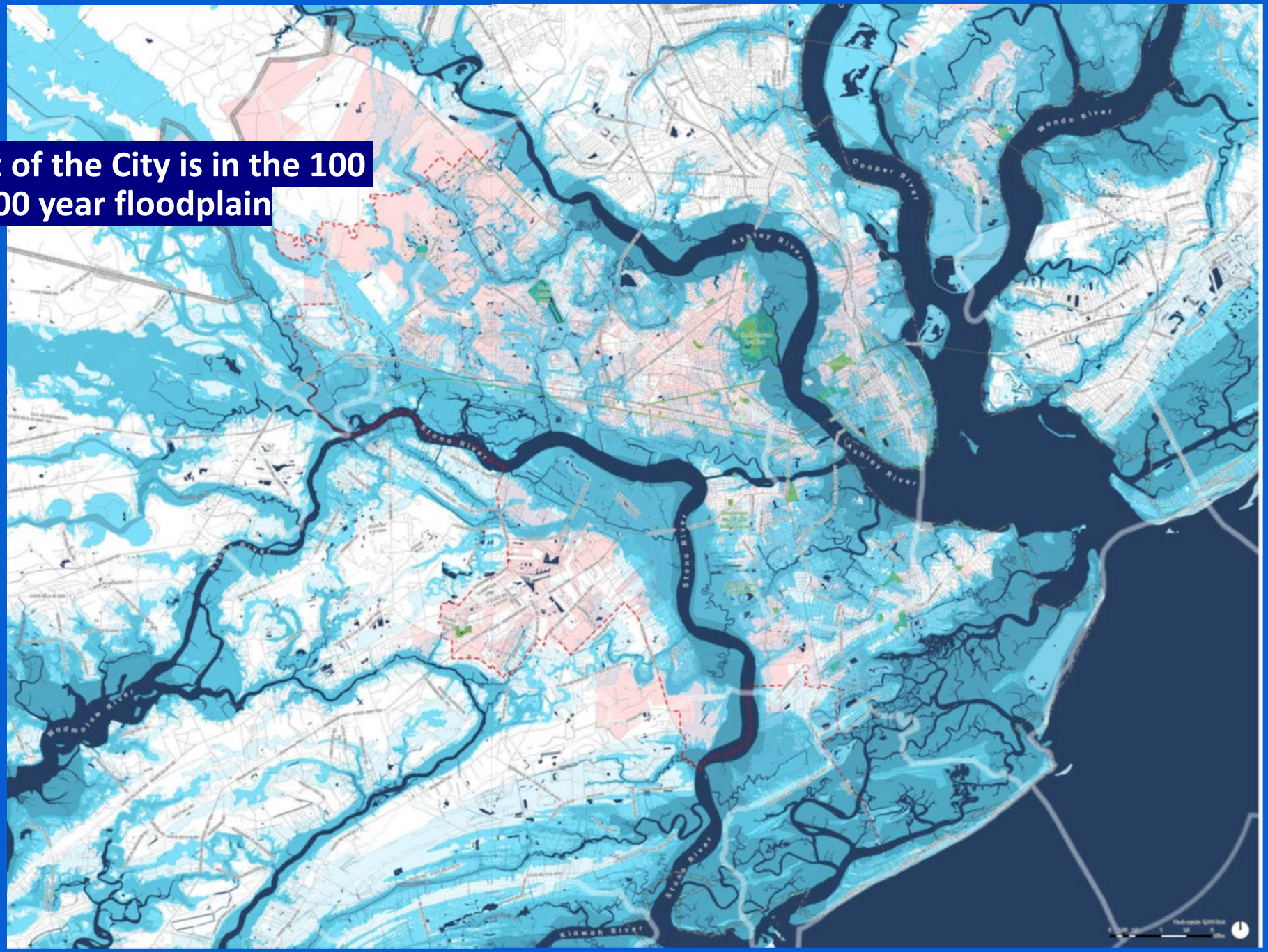
	Floodplain Inundation	Storm Surge	Earthquake
Businesses	71%	84%	46%
Homes	70%	87%	39%
Critical Facilities	59%	72%	88%

Key Finding 2

The ability to cope with flood inundation is a main driver of vulnerability



57 percent of the City is in the 100 or 500 year floodplain

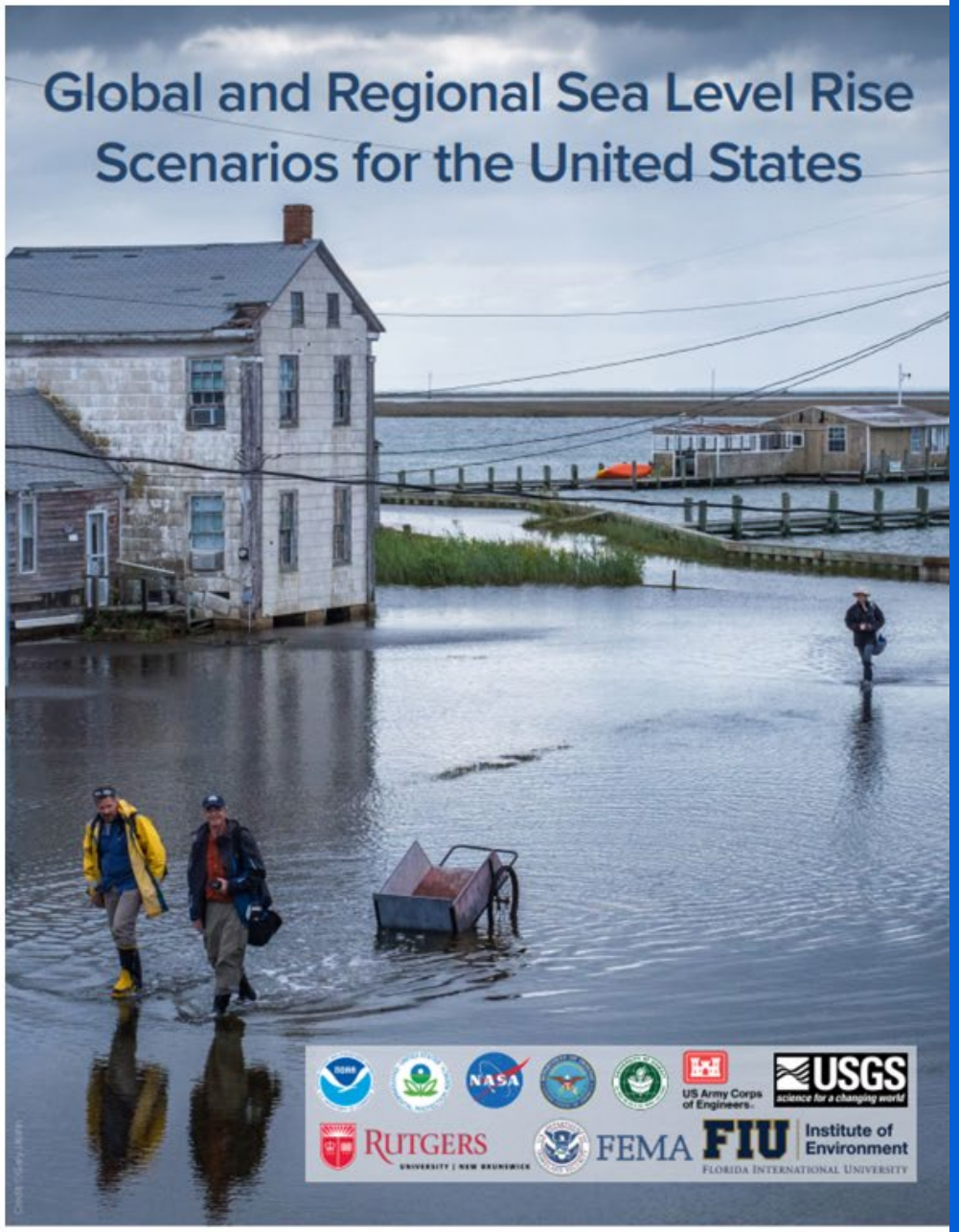


March 2022: NOAA Technical Report

Seas will rise as much over next 30 years as they have over last 100.

Gulf Coast: 14”-18”
Southeast Atlantic: 10”-14”

Charleston Flooding & SLR Strategy:
14” by 2050



Types of Flooding:

Tidal Flooding: tides reach elevations that begin to inundate the built environment

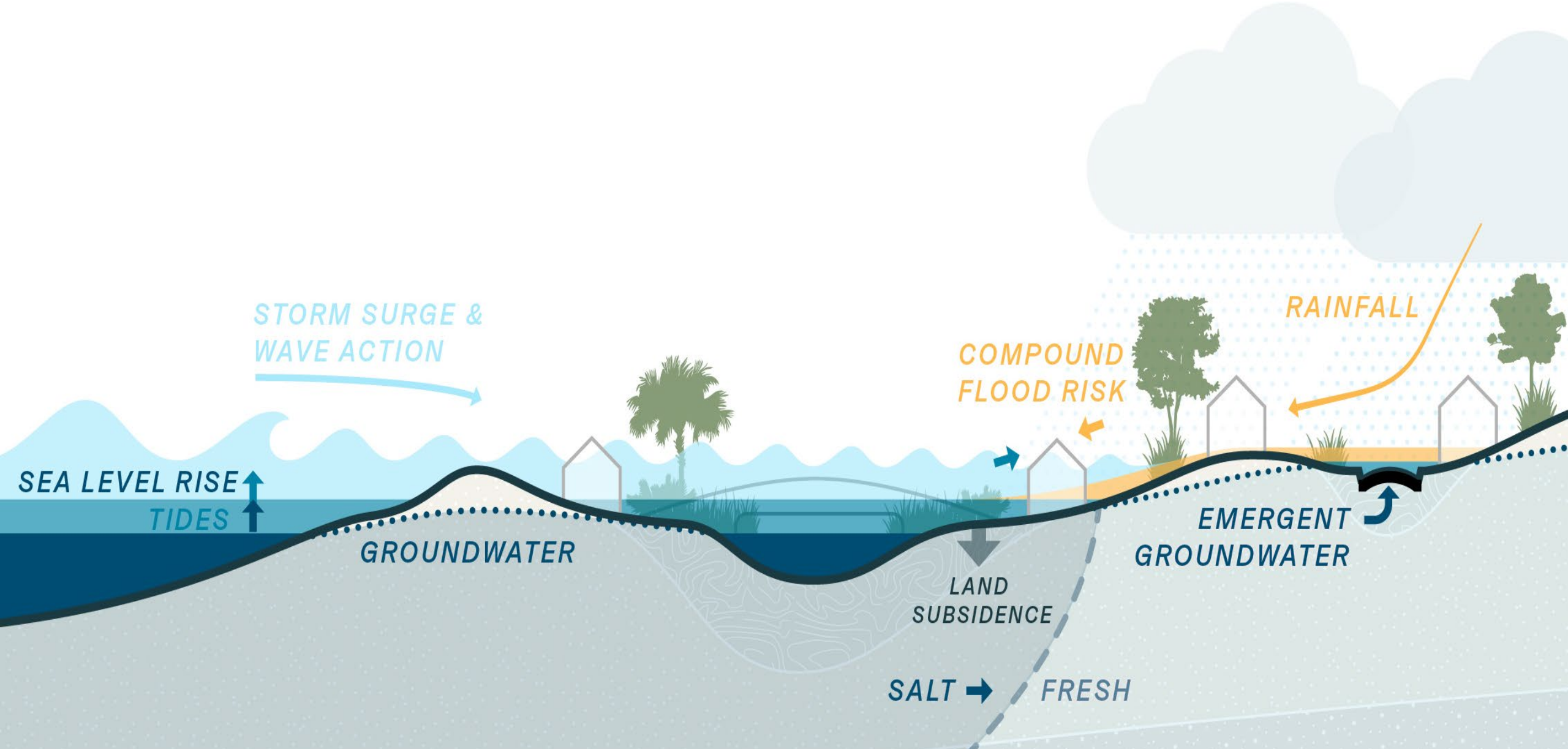
Storm Surge: storms push water inland, flooding land that is normally dry and worsened by wind-driven waves

Stormwater: when rains fall at rates that exceed the capacity of the drainage system to convey and natural systems to absorb

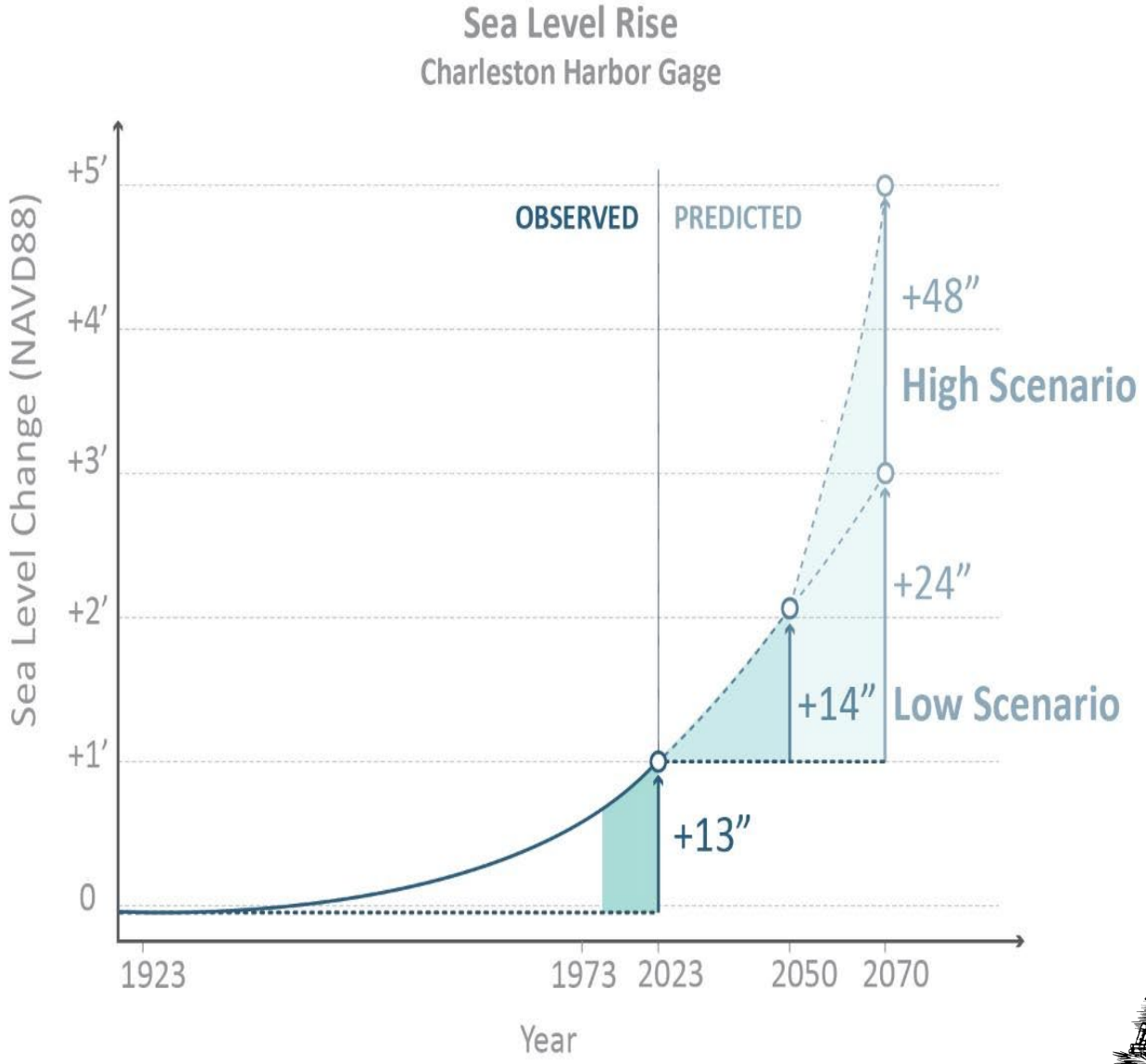
Groundwater: risking sea levels push groundwater elevations higher, resulting in ground flooding of low-lying areas

Compound: Combo of all of the above

Forces of Water



- Sea level rise increases risk from all types of flooding that affects Charleston's landscape
- 70 % of major tidal floods have occurred since 2015
- Tidal flood events will likely more than triple by 2050 (170/yr)
- 2024 Charleston Harbor hit flood stage 54 times



December 17, 2023 Nor’Easter
Photos: Post & Courier

Sunny day tidal flooding, Lockwood Drive

What are we doing to mitigate drivers of Sea Level Rise?

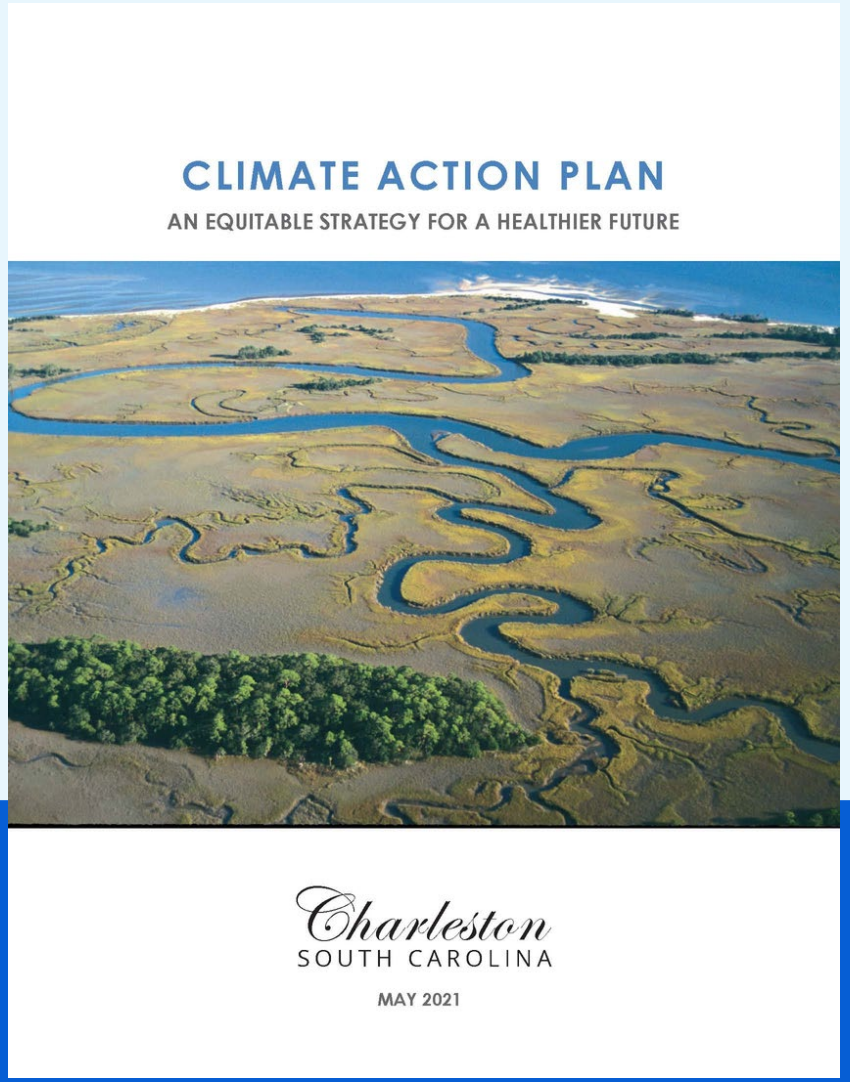
Reduce carbon emissions to net zero by 2050

BUILDINGS

TRANSPORTATION

WASTE

CARBON SINKS



Prevent flooding by monitoring, clearing and reporting on your neighborhood drain!

Adopt-a-Drain

TAKE CLIMATE ACTION TODAY!

- ✓ SUSTAIN YOUR LIFESTYLE
- ✓ MAKE YOUR HOME MORE RESILIENT
- ✓ PROTECT YOUR AIR, WATER, AND CARBON SINKS
- ✓ REDUCE YOUR WASTE
- ✓ LIGHTEN YOUR TRANSPORTATION FOOTPRINT
- ✓ USE ENERGY EFFICIENTLY & RENEWABLY

What are we doing to adapt?

resilience

Collection

Flooding and Sea Level Rise Strategy Update

City of Charleston

Get started

This collection collates and explains the City's work to address flooding and sea level rise, now and in the future. Numerous City departments are involved; we rely also on the support of key outside agencies and partners.


1 How to Navigate this Site


2 Executive Summary


3 Strategic Plan


4 Sea Level Rise and Flooding: an Introduction


5 Infrastructure Projects


6 Land Use


7 Governance


8 Resources and Information


9 Outreach and Partnerships

5 Critical Components

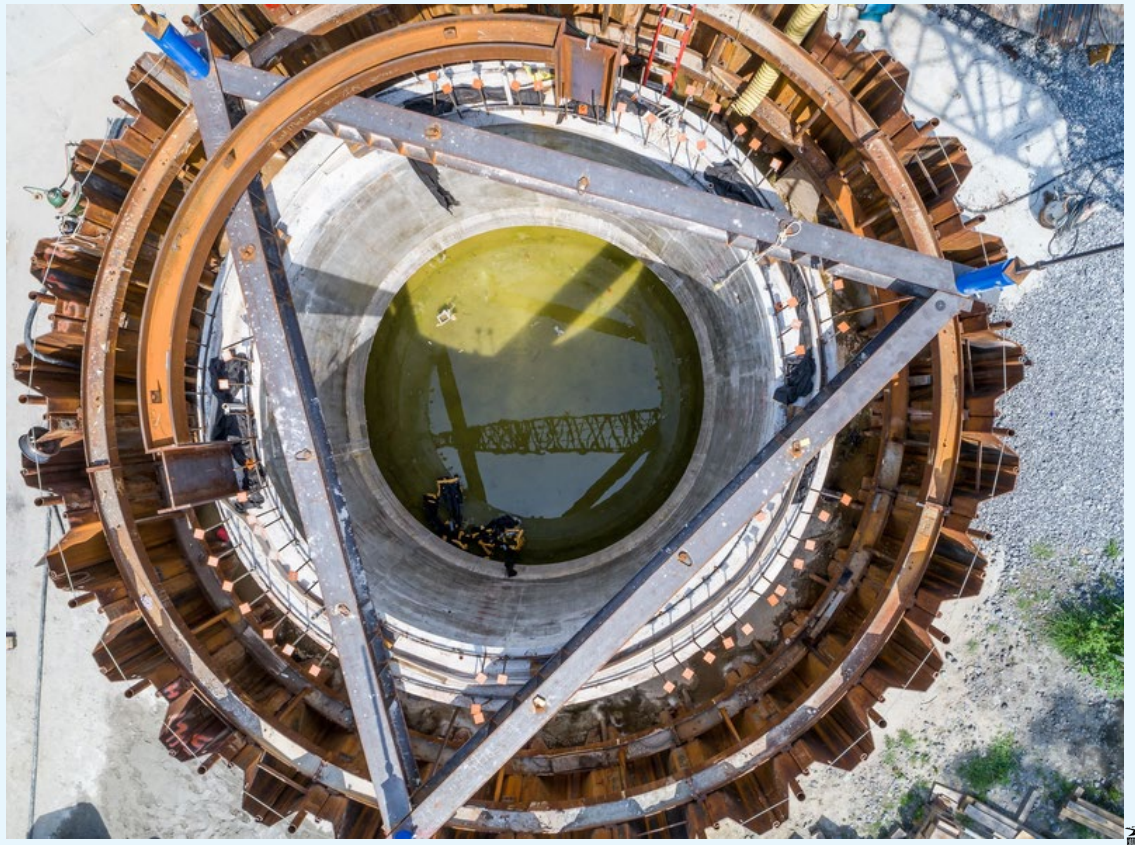
- Infrastructure: pumps, seawalls, green solutions
- Land Use: Planning Efforts like the City Comprehensive Plan, Water Plan, & Zoning Updates
- Governance: Policies like banning slab on grade in the 100 year floodplain & Stormwater Design Standards Manual
- Resources: Capacity, Funding & Data
- Outreach and Partnerships: Citizens, community stakeholders, including business, academic, and scientific

Infrastructure Examples:

- Restoration of the Low Battery

Once complete: 2.5 ft extra protection, new promenade, new parklets, new outfall!

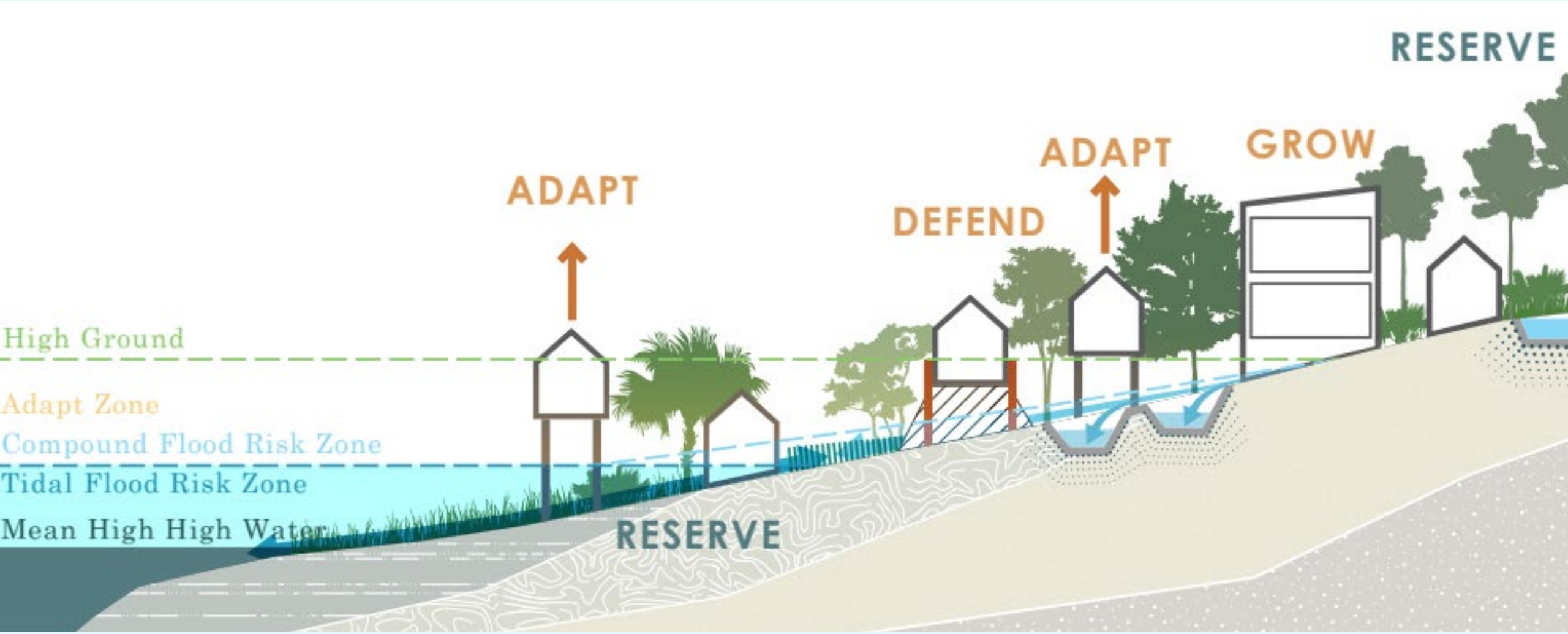
- Spring Fishburne Drainage Improvements



Once complete: draining 360,000 gallons/minute into Ashley River!

Land Use: Water First!

Reducing current & future flood risk, enabling adaptation, and strengthening community resilience



Key Resilience Projects:

Corps Partnership:

- Battery Extension (Peninsula CSRM/Perimeter Protection): Preconstruction, Engineering, & Design to Extend the Battery for Charleston Peninsula
- Tidal & Inland Flooding Study for the entire City
- 65% federal cost share for expansive and expensive projects

Charleston Water Plan

- A proactive and achievable vision for Charleston to embrace its current and future relationship with water
- Using a 25 year planning horizon, the plan will aid city staff, Council, stakeholders, & citizens to understand, prioritize, manage and adapt to current and future compound flood risks

Basin Flood Action Program

- Guided by the Water Plan, utilizes 16 water basins in the City for future water planning & project efforts
- Focus on immediate steps to tackle flooding and planned actions

Rosemont and Bridgeview Resilience Plan

- Equity in future water management and planning

How do we stay here?

Utilizing Partnerships & Innovation

Battery Extension (Charleston Peninsula CSRM):

- **Why?** Without an 'elevated edge,' flooding and SLR on the peninsula will become challenging to manage, continuing to impact residents, businesses, roads, tourism, Medical District, colleges, & public safety
- **8 mile storm surge structure** @ 12' NAVD 88
- Includes, **10 pumps** (permanent and temporary to account for impoundment and overtopping) & **nature based-features** (living shorelines)
- **Four phases:** West side (Coast Guard Station to the Joe) & nonstructural (Rosemont & Bridgeview communities); East side (Morrison drive to Historic Charleston); refinement of existing Batteries; & Wagener Terrace (combo wall)
- **Design goal-** extension of existing Batteries: **protection PLUS public amenity** w/ increased public access to Charleston waterfront and perimeter connectivity for bike/ped; integration with Ashley River Crossing and Lockwood knee wall ($50 million included for aesthetic migitation)
- **Improved stormwater & tidal flooding management** by integrating the Tidal & Inland FRM to utilize project to address interior drainage & tidal flooding (upsize pumps, outfalls, O&M of gates)
- **Alignment refinement-** close to land/water edge, reduction of gates and public disruption
- **$1.3 billion ;** cost shared 65%-35%
- City net cost- $300 million; USACE cost: $845 million
- **10.8-1 benefit-cost ratio-** top in the nation!

Battery Extension (Charleston Peninsula CSRM):

Timeline:

- **2018:** Kick off of Coastal Storm Risk Management Feasibility Study for the Peninsula
- **2022**: Chief's Report & Water Resources Development Act (WRDA) Authorization
- **2023**: Design Agreement Negotiations
- **2024-** City kicked off preliminary work on preferred design and alignment for Phase 1 to bring to the Preconstruction, Engineering, & Design (PED) phase (6 months of work)
- **2025**- est. kick off of PED with USACE Charleston District
- **2028**- est. kick off of construction Phase 1 IF City and USACE can design a structure that works for Charleston

Can we adapt and still be historic & beautiful Charleston?

SOUTHERN END OF WATERFRONT PARK - *Ideas for a Storm Surge Protection System for the Charleston Peninsula*

Tidal & Inland Flood Risk Management Study

- Authorized by Congress in WRDA 2020 to develop **plan to address flood damage reduction across the City of Charleston**
- **50% cost share-** city/USACE
- **2024 Kick off, 6-year timeline**
- Scope of initial study area, guided by Water Plan- **James Island, West Ashley, & Peninsula** (integrate w/CSRM)
- Examples of solutions to explore; **nature based** (living shorelines, marsh restoration): **improved drainage conveyance** (surface & subsurface); nonstructural interventions
- **Next steps-** public input in 2025

City of Charleston **Water Plan**

Charleston 2050

- **Manage flood risks from tides, sea level rise, stormwater, storm surge & groundwater**
- **Guide safe, resilient growth**
- **Protect, conserve, and restore ecologically sensitive areas**
- **Accentuate the City's sense of place and historic character around water**

How We Got Here

Continuity of approach to water & integration with past plans

1998 Concord Street Drainage Improvements

Market Street Drainage Improvements (Tunnel & Shaft CM)

2006 Spring/ Fishburne US 17 Drainage Improvements

2014 Calhoun West Drainage Improvement & Sea Level Rise Mitigation

2019 Calhoun West Medical District Drainage Erhardt

2020 Church Creek Flood Storage & Resiliency Action Plan

2021 Johns Island Restoration & Resiliency Plan

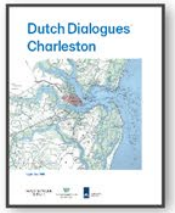
2022 Concord Street Pump Station Rehabilitation (CMAR Procurement)

1980 | 1985 | 1990 | 1995 | 2000 | 2005 | 2010 | 2015 | 2020 | 2025

1984 Drainage Plan

2019 Dutch Dialogues Charleston

Flooding & Sea-Level Rise Strategy



2021 Perimeter Protection Analysis Discovery Report

City Comprehensive Plan

Principles & Key Recommendations

Safety First: Protect & Connect

Work from the Ground Up: Build with Nature

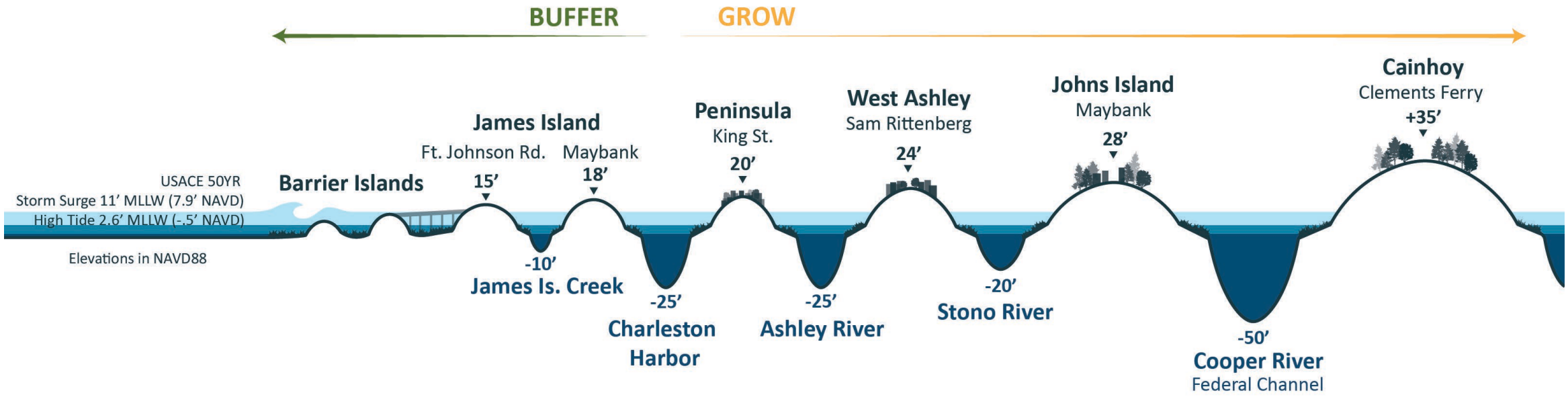
Change for Good: Provide Resources & Access

Work Together: Coordinate & Communicate

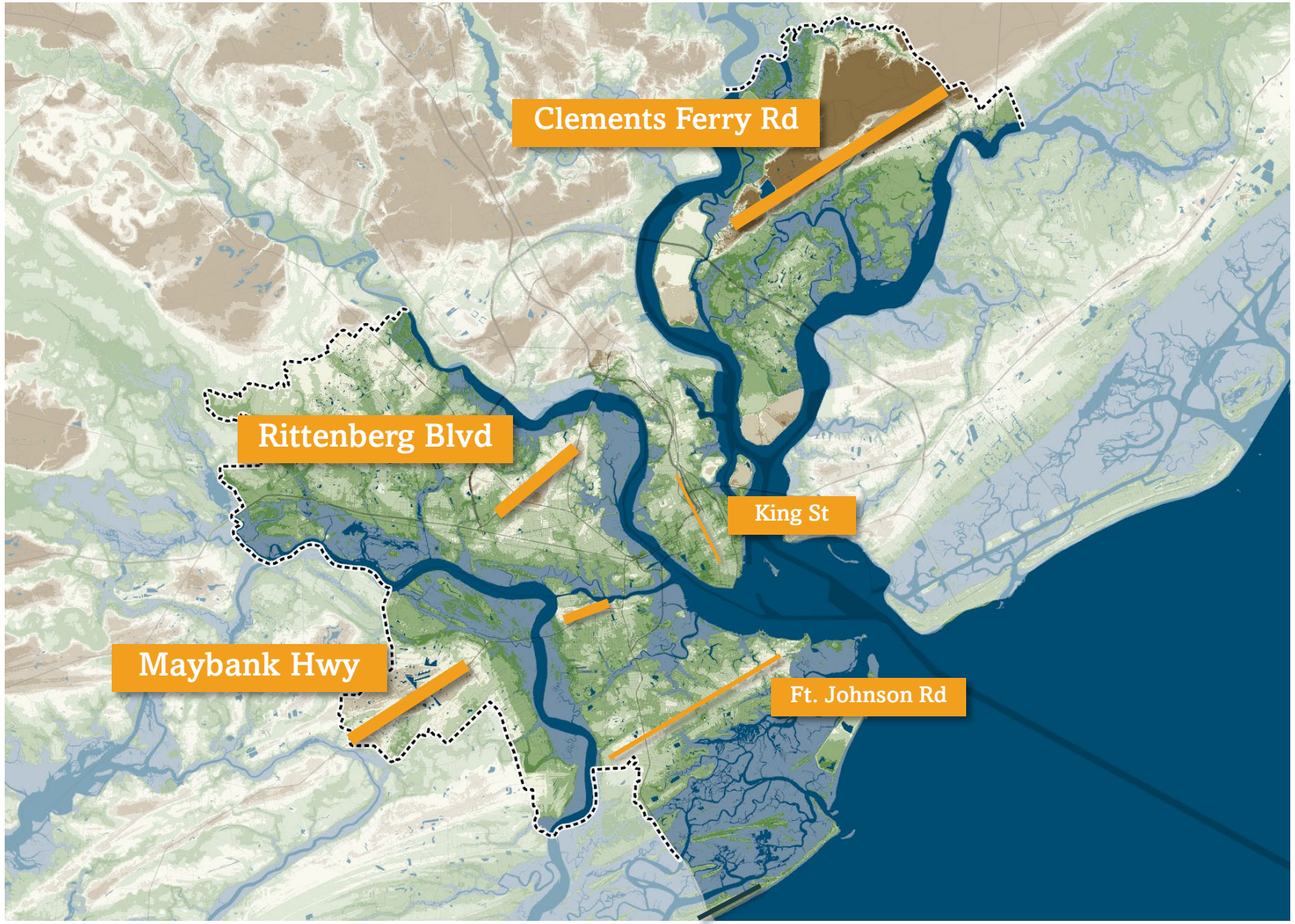
Build Value: Invest & Adapt

Principles & Key Recommendations

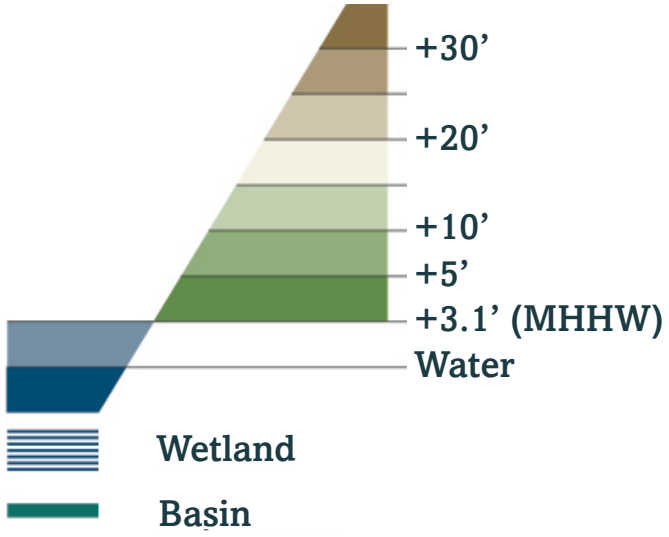
Safety First: Protect & Connect



Elevation Matters

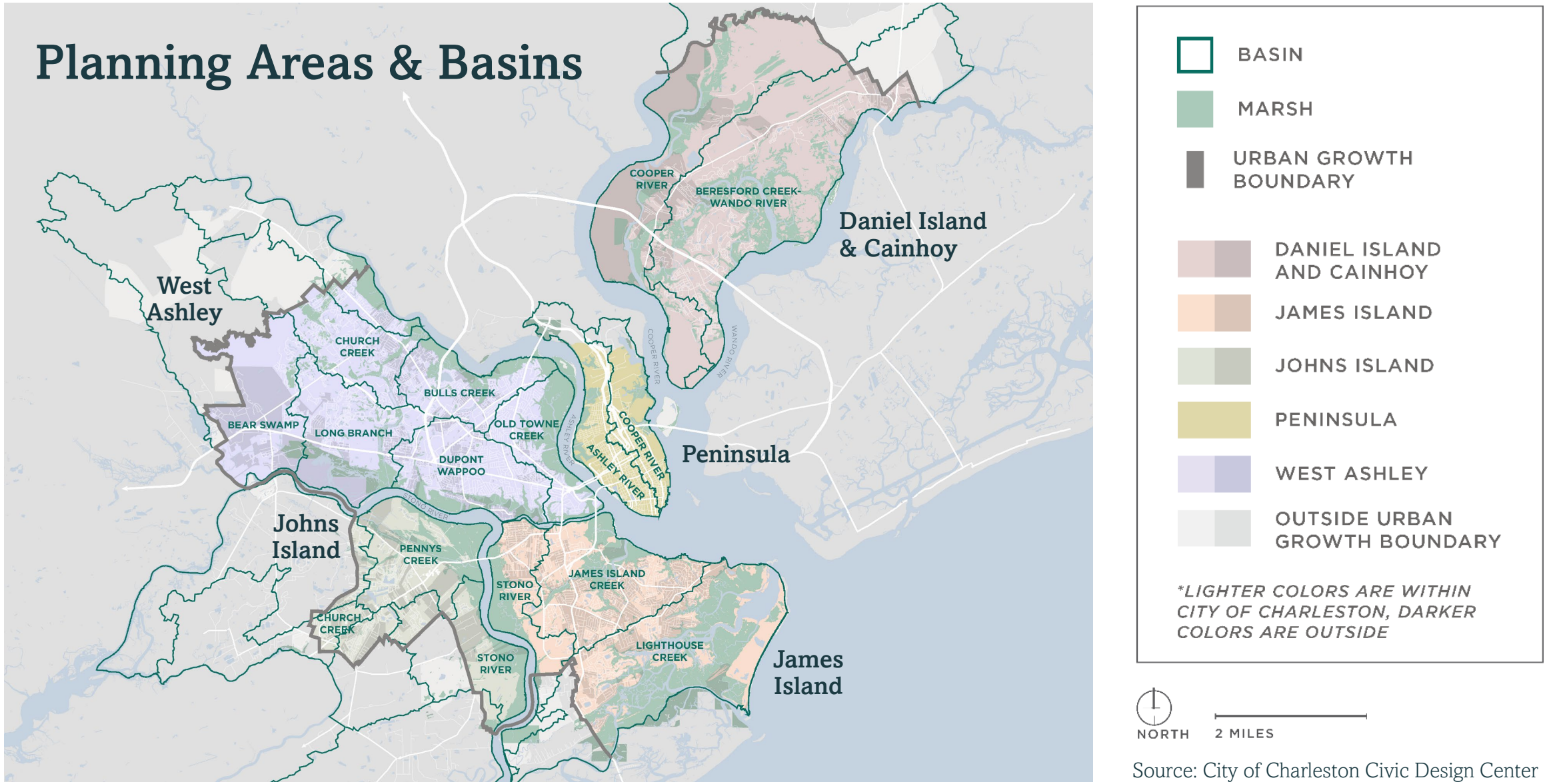


Land Surface Elevation



Source: NOAA 2017

Integrating Scales



Source: City of Charleston Civic Design Center

Project Concepts

Feature Projects (8)

"More-than-the-sum-of-their-parts" high-impact & incremental.

Rough Order-of-Magnitude Cost Estimates

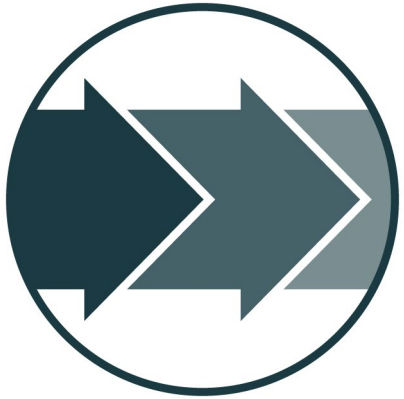
$	<$10 million
$$	$10-25 million
$$$	$25-50 million
$$$$	$50-100 million
$$$$$	>$100 million

Prototypical Projects (100+)

Identified from conceptual modeling for areas of potential flooding.

- **(Re)development Opportunities**
- **Critical Connections**
- **Green Infrastructure**
- **Stormwater Storage / Parks**
- **Drainage Improvements**
- **Defend / Elevate**
- **Reserve** (incl. marsh migration & terracing)
- **Community Adaptation Areas**

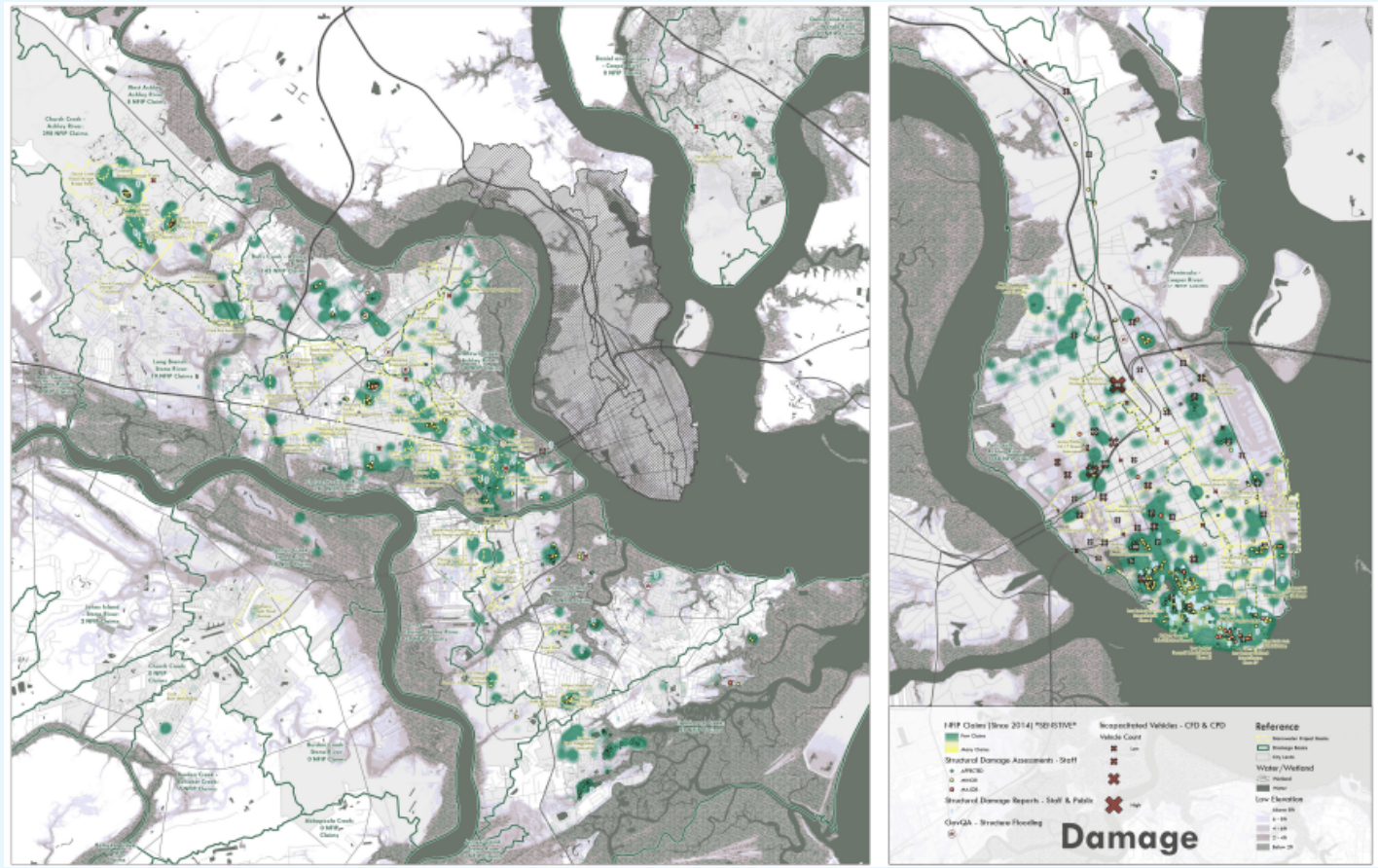
Next Steps for the Water Plan:



- **Track Progress** & assign responsibilities
  - comprehensive City projects & initiatives per basin
  - Adaptive Management program
- Proceed with **Partnerships**
- **Collect & Monitor** data
  - City-wide stormwater modeling
  - Water data collection & monitoring (tide, groundwater, rainfall)
- **Advance Projects** through scoping, design & engineering

Basin Flood Action Program

- 16 Detailed Basin Maps for each area of the City derived from Water Plan
- BFAP focus is on immediate steps to tackle flooding and planned actions
- PDF exists today with goal of interactive GIS map in the near future
- Revised citizens Advisory Committee to oversee City flood adaption efforts, Apply online!



GET INVOLVED!

- ✓ STAY INFORMED: BE FLOOD, TIDE AND WEATHER AWARE
- ✓ ADOPT A DRAIN
- ✓ PLANT & CONSERVE TREES
- ✓ REPORT FLOODING
- ✓ MAKE A PLAN

TIDEeye

QUESTIONS?

Kaylan Koszela
koszelak@charleston-sc.gov