BLACK & VEATCH

IN ASSOCIATION WITH

WAGGONNER & BALL
ARCHITECTURE / ENVIRONMENT

moffatt & nichol

Biohabitats

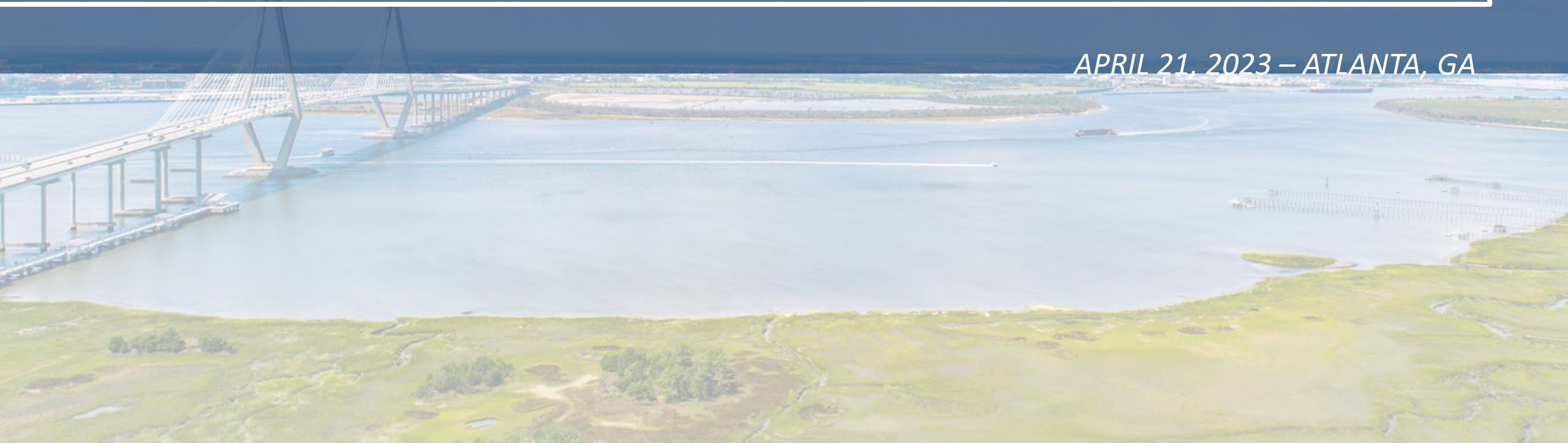
HIGH WATER IN THE HOLY CITY

THE CHARLESTON COMPREHENSIVE INTEGRATED WATER PLAN

SESWA REGIONAL STORMWATER SEMINAR

STORMWATER MANAGEMENT FOR RESILIENT COMMUNITIES

APRIL 21, 2023 – ATLANTA, GA



AGENDA

Forces of Water in Charleston

Charleston Comprehensive Integrated Water Plan Introduction

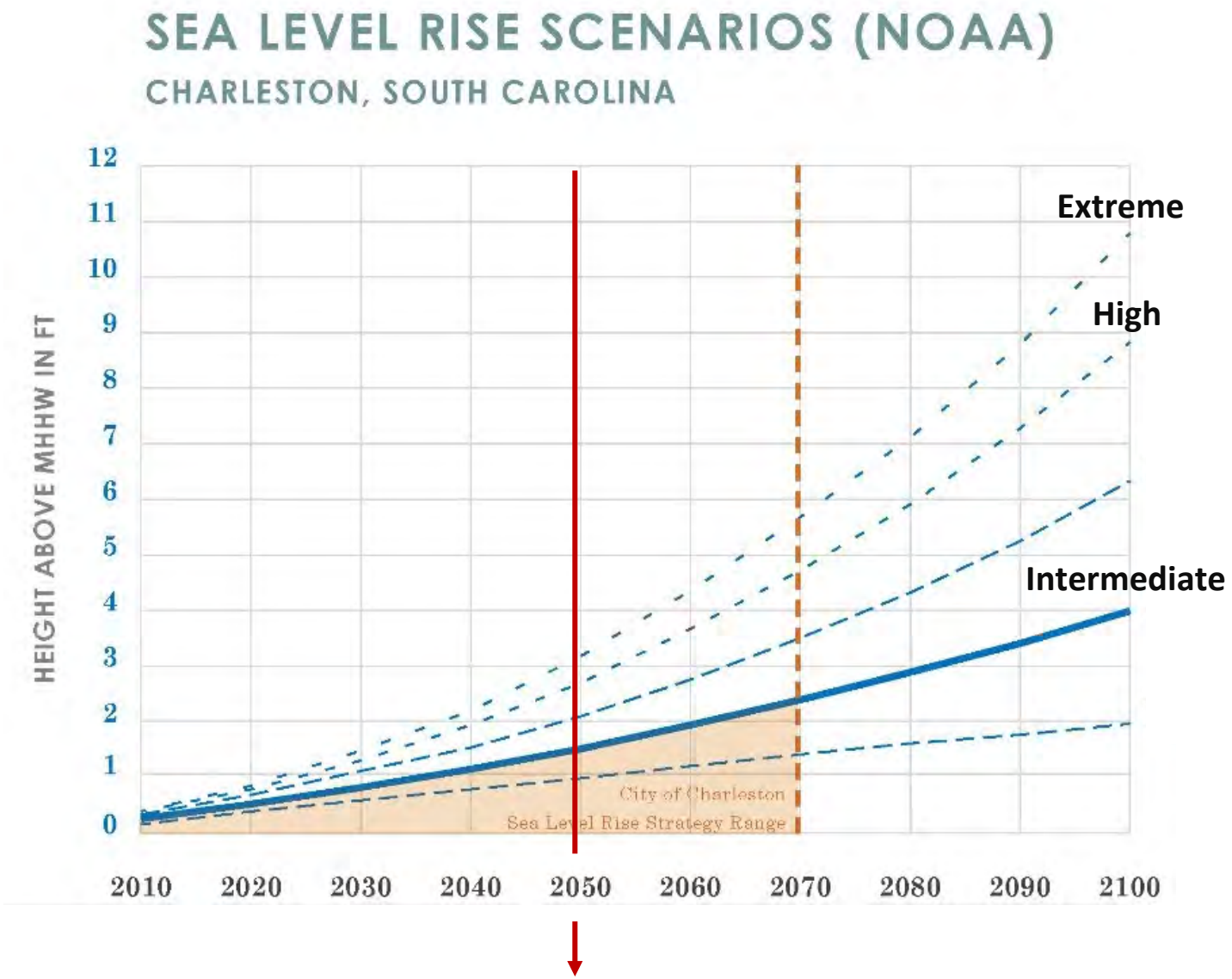
Planning in Charleston

Working Together for Resilience

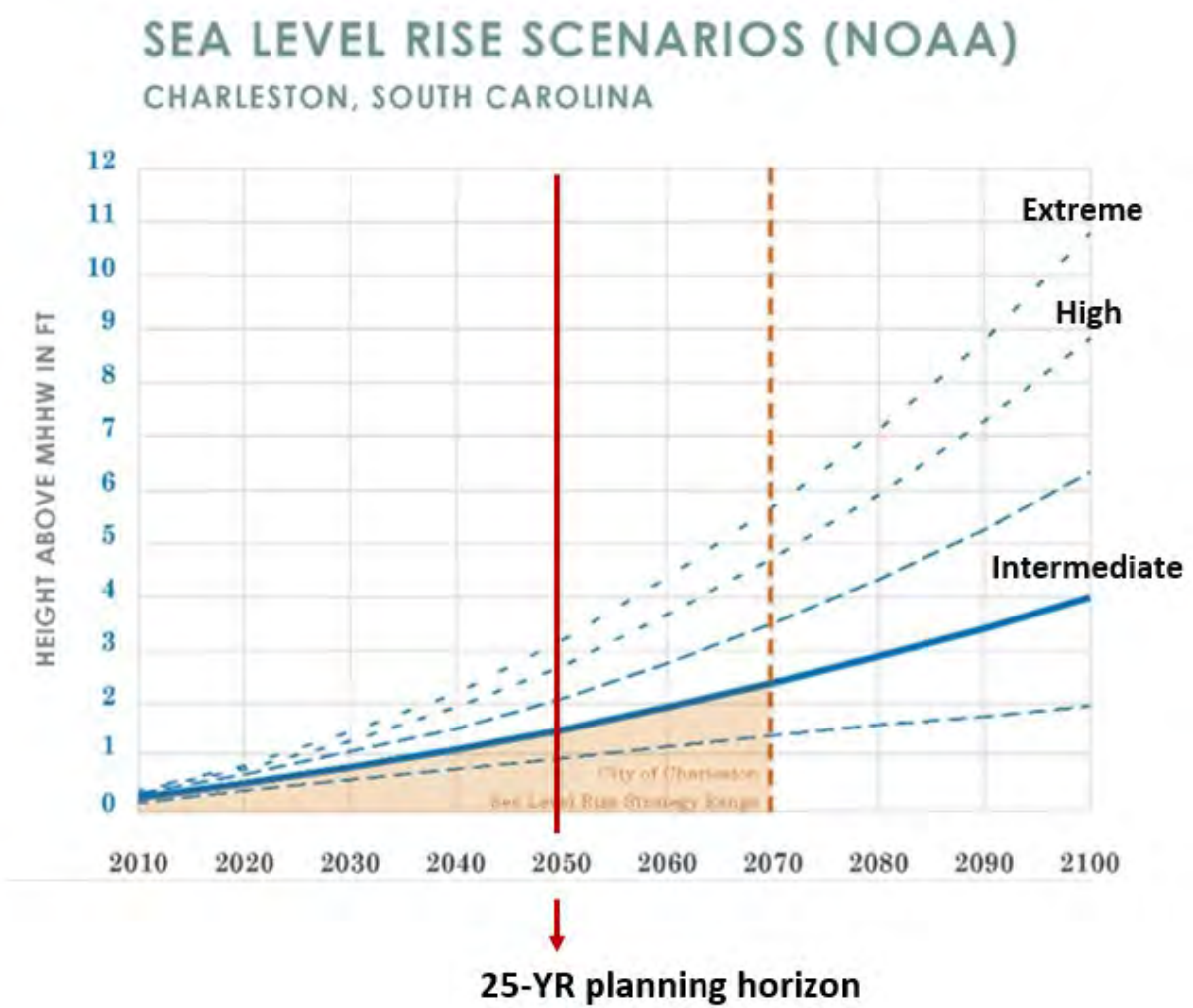
Future Risk & Investment

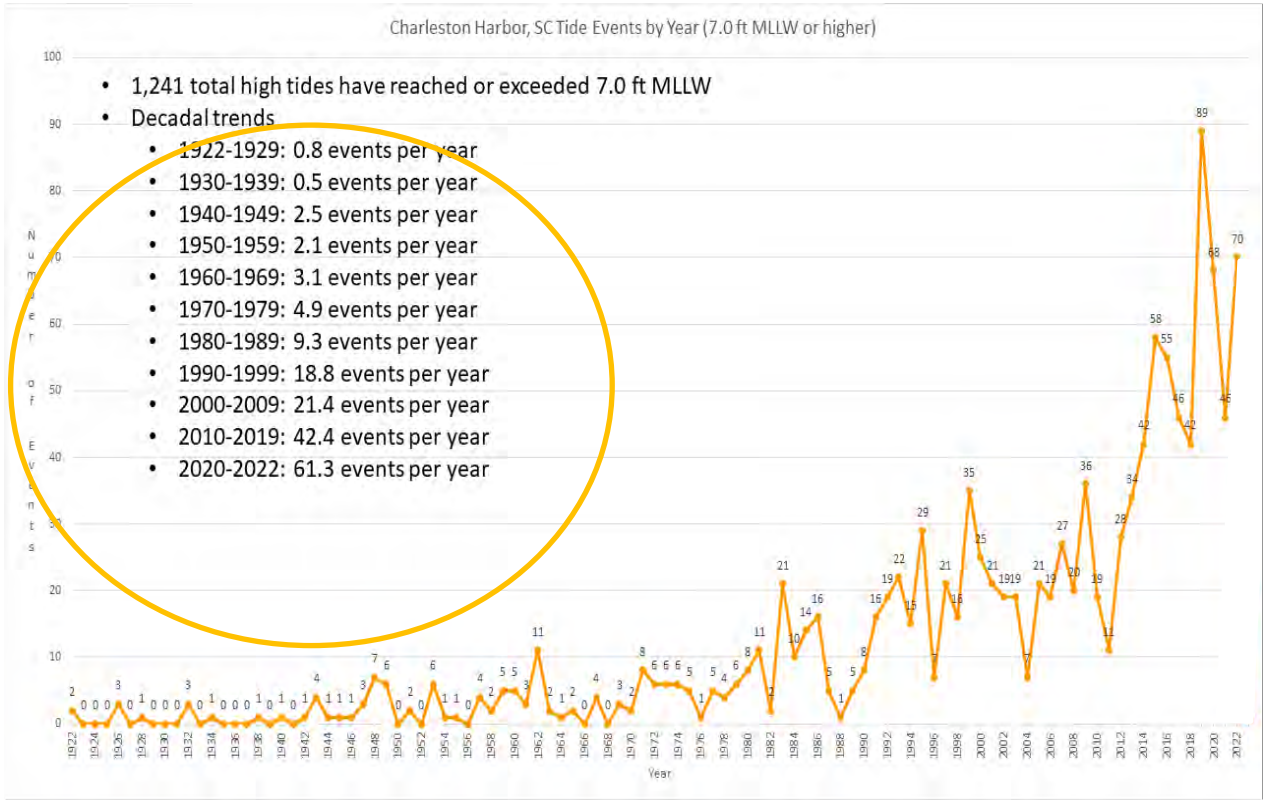
Example Projects

FORCES OF WATER IN CHARLESTON: SEA LEVEL RISE

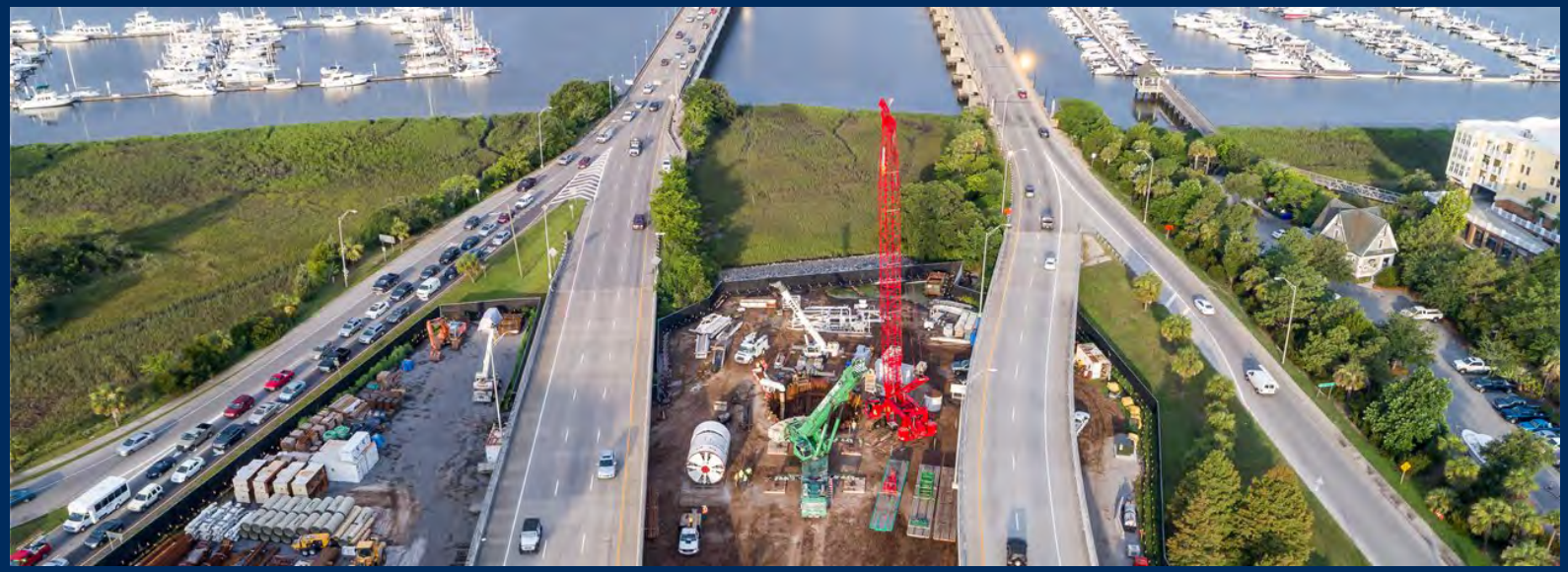


FORCES OF WATER IN CHARLESTON: NUISANCE TIDAL FLOODING?

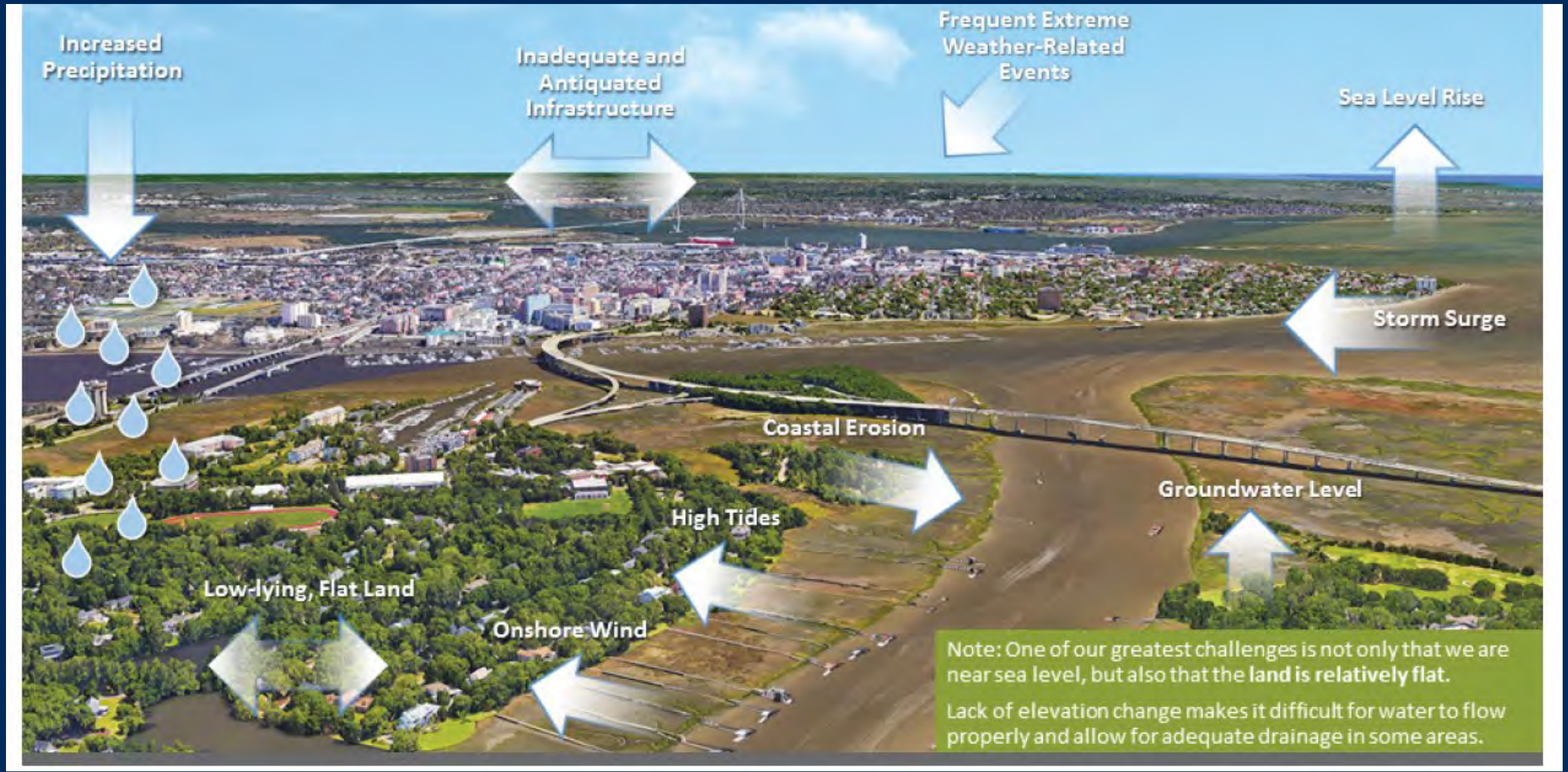




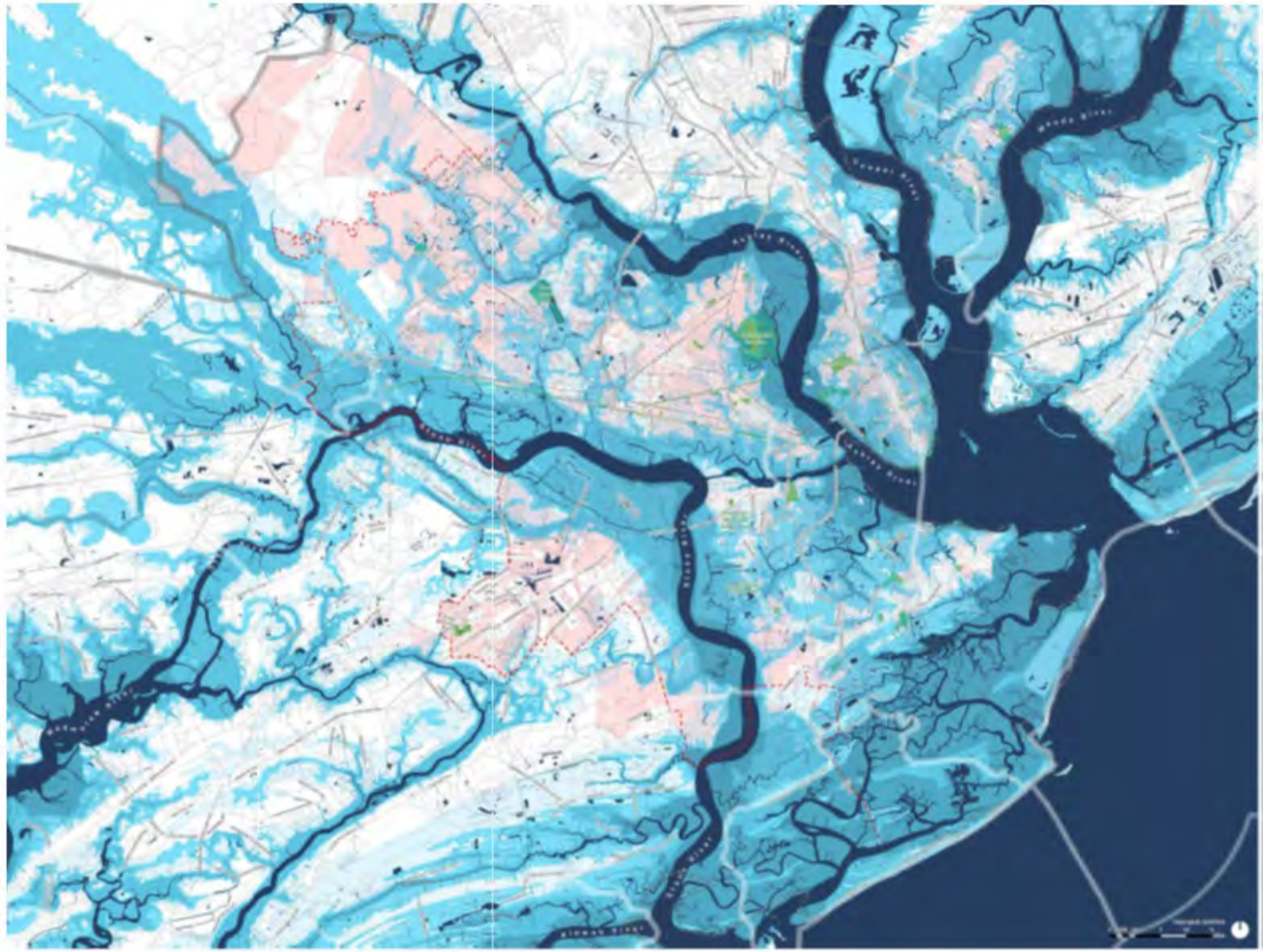
FORCES OF WATER IN CHARLESTON: STORMWATER



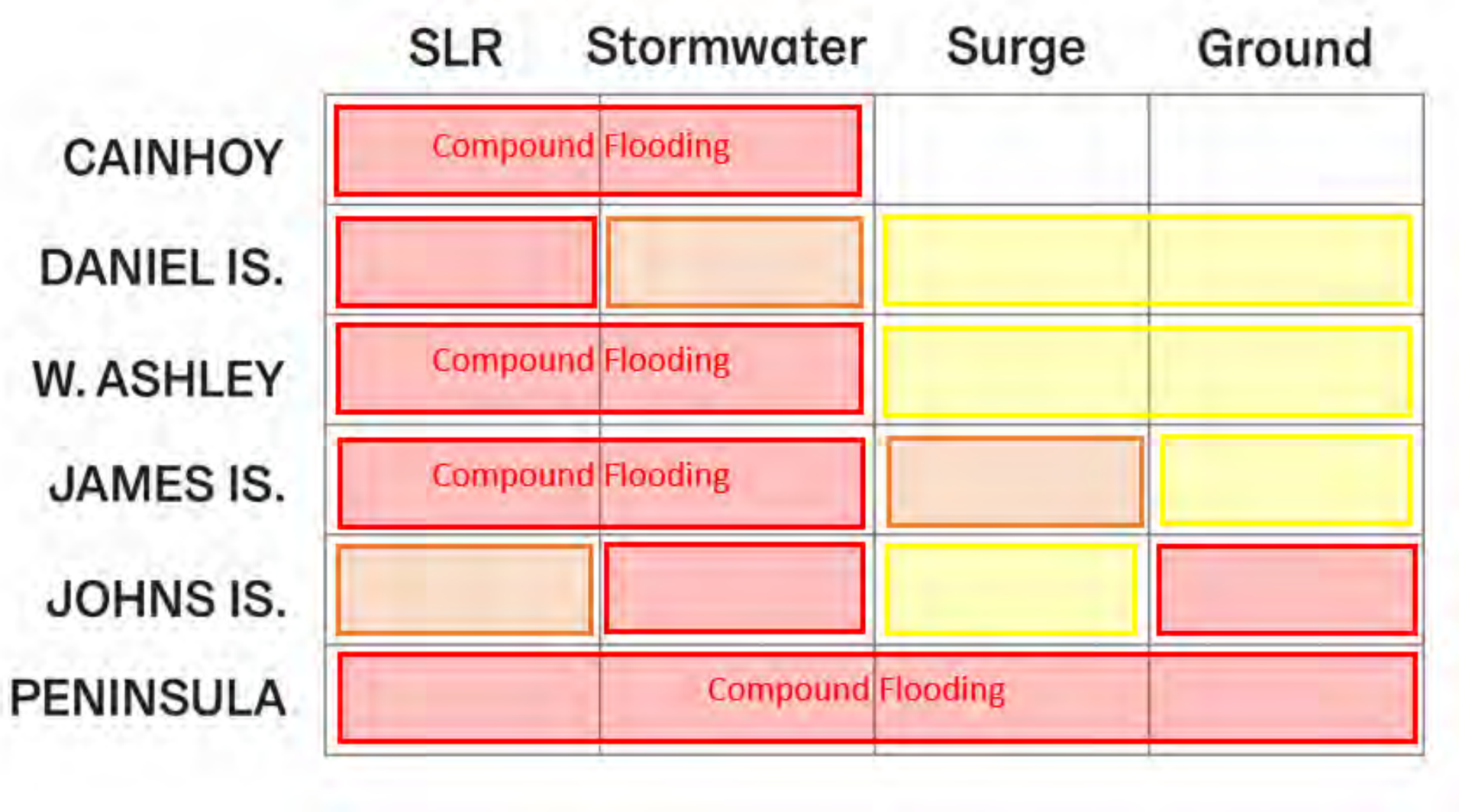
FORCES OF WATER IN CHARLESTON: COMPOUND FLOODING



Charleston: 155 sq miles, 57% of City in floodplain, all flood hazards (coastal, fluvial, pluvial, groundwater, compound). SLR?



COMPOUND FLOODING & IMPACT BY PLANNING AREA

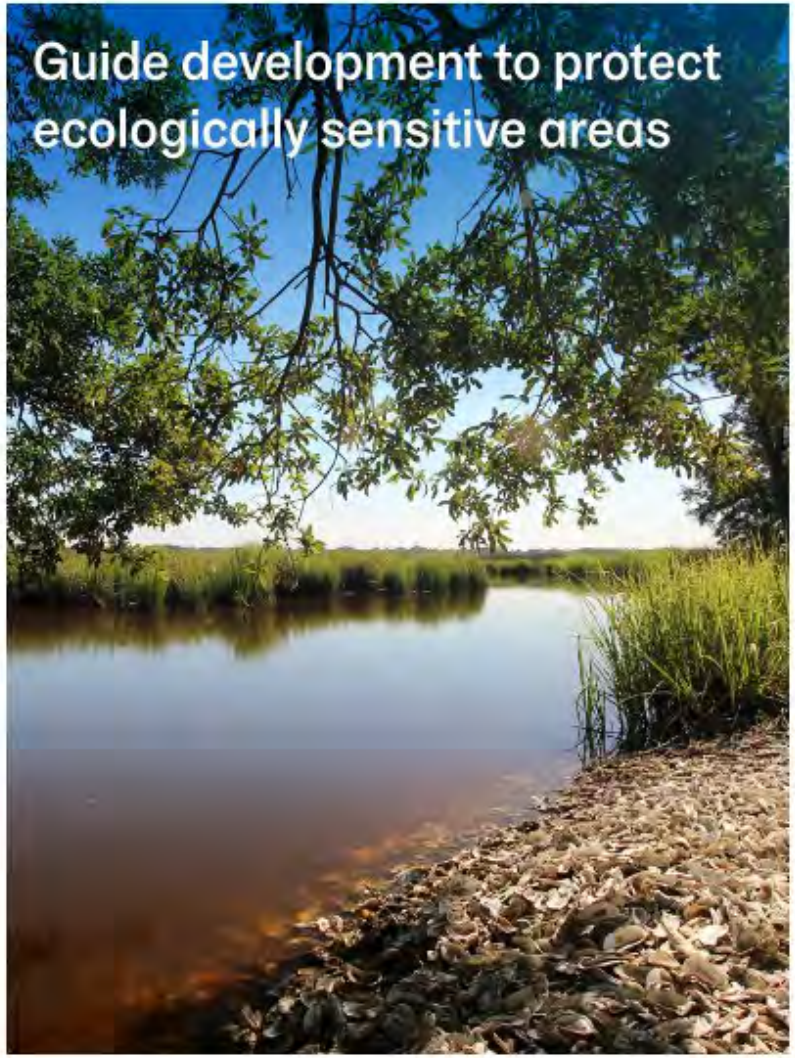


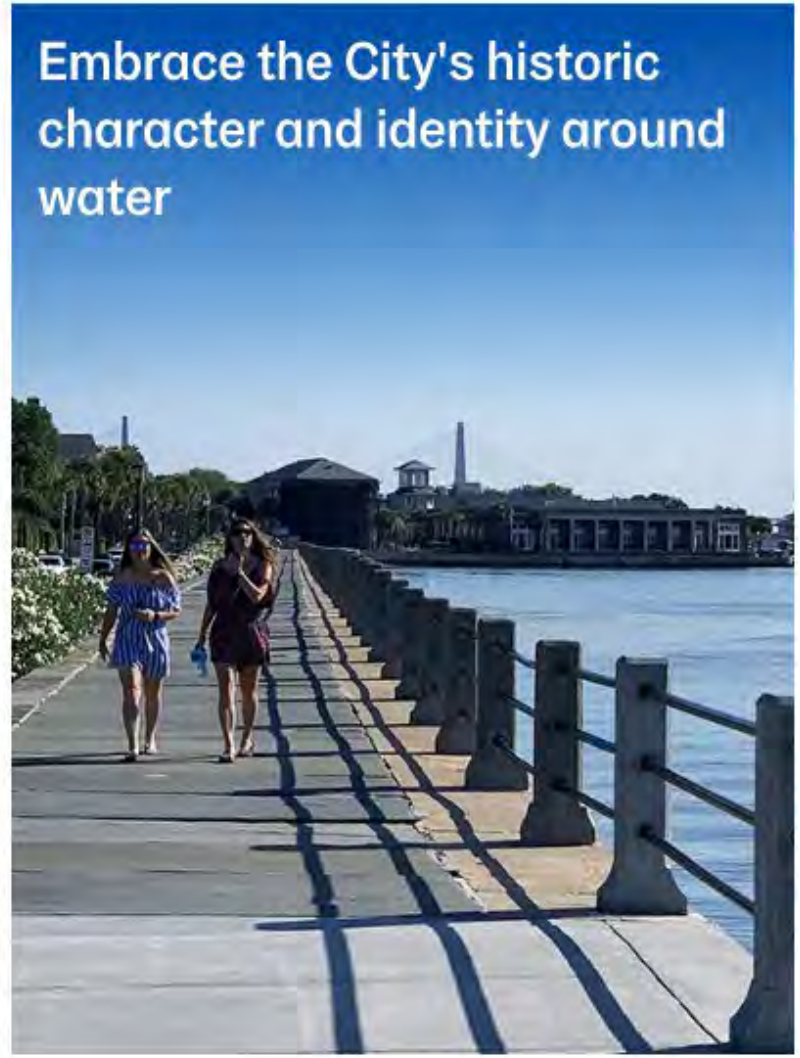
The Charleston Comprehensive Integrated Water Plan

CHARLESTON COMPREHENSIVE INTEGRATED WATER PLAN

A Proactive, Aspirational & Achievable Vision for the City to Embrace its Relationship with Water

The Water Plan seeks to:





CHARLESTON COMPREHENSIVE INTEGRATED WATER PLAN TEAM

Prime - Civil Solutions

BLACK & VEATCH

Water Plan Lead

WAGGONNER & BALL
ARCHITECTURE / ENVIRONMENT

Nature-Based Solutions

Biohabitats

Coastal Solutions

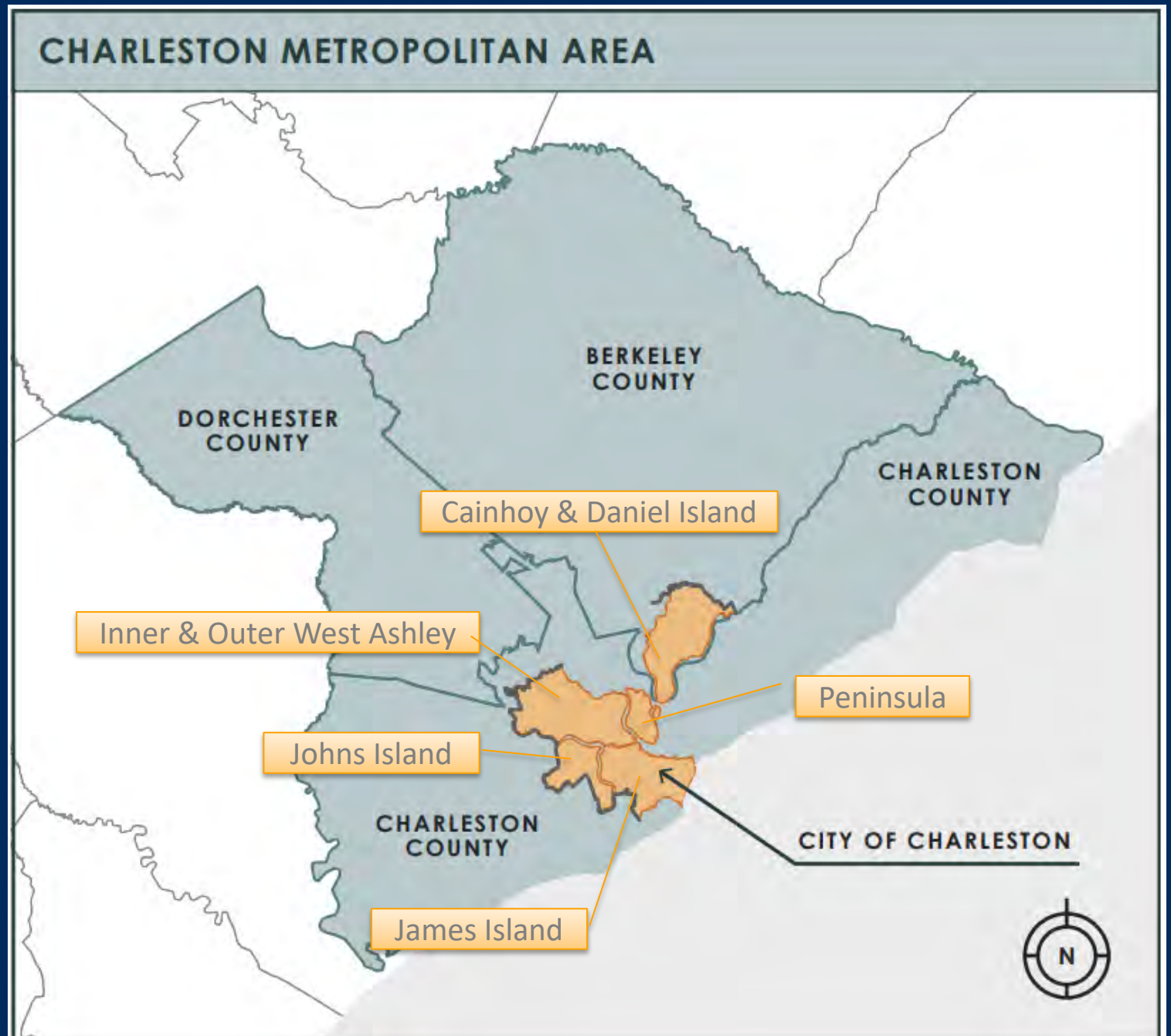
moffatt & nichol

Community Engagement

Community Solutions Consulting LLC.

PLANNING IN CHARLESTON

CITY OF CHARLESTON AND METROPOLITAN AREAS



PLANNING AREAS LAND USE

FUTURE LAND USE MATRIX

RURAL

Areas outside of the designated Urban Growth Boundary, where densities would not exceed one unit per acre, and in general would be much lower. Development in these areas include low density residential (less than 1 dwelling unit per acre), agricultural areas, forestry areas, and recreational areas. Blocks do not follow a pattern and lots vary widely in size.

SUBURBAN EDGE

Generally suburban in character, but lower densities than typical suburban residential areas. Suburban Edge occurs mainly inside and next to the Urban Growth Boundary and often adjacent to neighborhoods in low-lying areas. Uses are almost exclusively residential and densities range from one to four dwelling units per acre (1 du/a to 4 du/a). Examples include: Sandhurst, Shadowmoss, and Stiles Point neighborhoods.

SUBURBAN

Low intensity, suburban-style areas, adjacent to higher-intensity areas that include a mix of uses. Limited mixed-use occurs at key cross roads. Densities range from four to eight dwelling units per acre (4 du/a to 8 du/a). Examples include: Wagener Terrace, Riverland Terrace, Avondale, and St. Johns Woods neighborhoods.

NEIGHBORHOOD

These areas include a mix of uses, but primarily residential areas with regular block patterns and a wide range of building types and setbacks. Often next to more urban areas, uses can include a variety of neighborhood compatible services and densities range from six to twelve dwelling units per acre (6 du/a to 12 du/a). Examples include: Ansonborough, and Hampton Park Terrace neighborhoods.

NEIGHBORHOOD EDGE

Theses areas are found on the periphery of existing neighborhoods and future neighborhoods. Uses vary widely but are mainly those things that residents need such as offices, stores and restaurants that are typically found along roads and transit routes forming the edges of neighborhoods rather than the centers. While traditionally threaded along major roads, over time, these areas could transition to more urban compact design patterns and contain more residential uses; especially along major transit routes. Residential densities can range from 6-20 units per acre. Examples include: many portions of Folly Road and some portions of Savannah Highway, Sam Rittenberg Boulevard and Bees Ferry Road.

CITY CENTERS

City Centers consist of the most dense and mixed-use portions of the city. The tallest buildings would occur here along with the most buildings of regional significance. Blocks may be smaller, streets have steady street tree planting, and buildings are set close to wide sidewalks. These areas occur on the highest ground elevations in the city allowing for best opportunities for new or infill development. Densities range from 10 dwelling units per acre and up. Development in City Centers is dependent on the surrounding context. Examples: The Central Business District of Charleston (portions of King, Calhoun, Meeting and East Bay Streets) and Daniel Island Town Center.

CAMPUS

The Campus areas primarily encompass significant education, medical or office uses that do not conform to traditional urban block patterns. No residential uses occur here other than those associated with a school or large senior living campus. Examples include: College of Charleston, Charleston area high schools and the Peninsula medical district.

JOB CENTER

The Job Center areas primarily contain light manufacturing, warehousing, office and some commercial uses that cannot conform to traditional urban block patterns. These areas serve as incubators for small and entrepreneurial businesses. Residential are very limited in order to help reserve these areas for business expansion and job generation. Examples include: areas along Clements Ferry Road, around the Dupont-Wappoo area, the Fort Johnson research area, and around the Charleston Executive Airport on Johns Island.

INDUSTRIAL

The Industrial areas primarily include more intensive manufacturing, warehousing and distribution uses involving heavy truck traffic and potential emissions not found with lighter manufacturing operations. Residential uses are not typically allowed in an effort to preserve these areas for job generation and reduce conflicts from industrial traffic, emissions, and noise. Examples include: the eastern side of the Charleston Neck area and the Columbus Street Terminal.

PARK

Publicly or privately owned lands open to the general population for all types of recreational purposes, active or passive, or designated for future such uses.

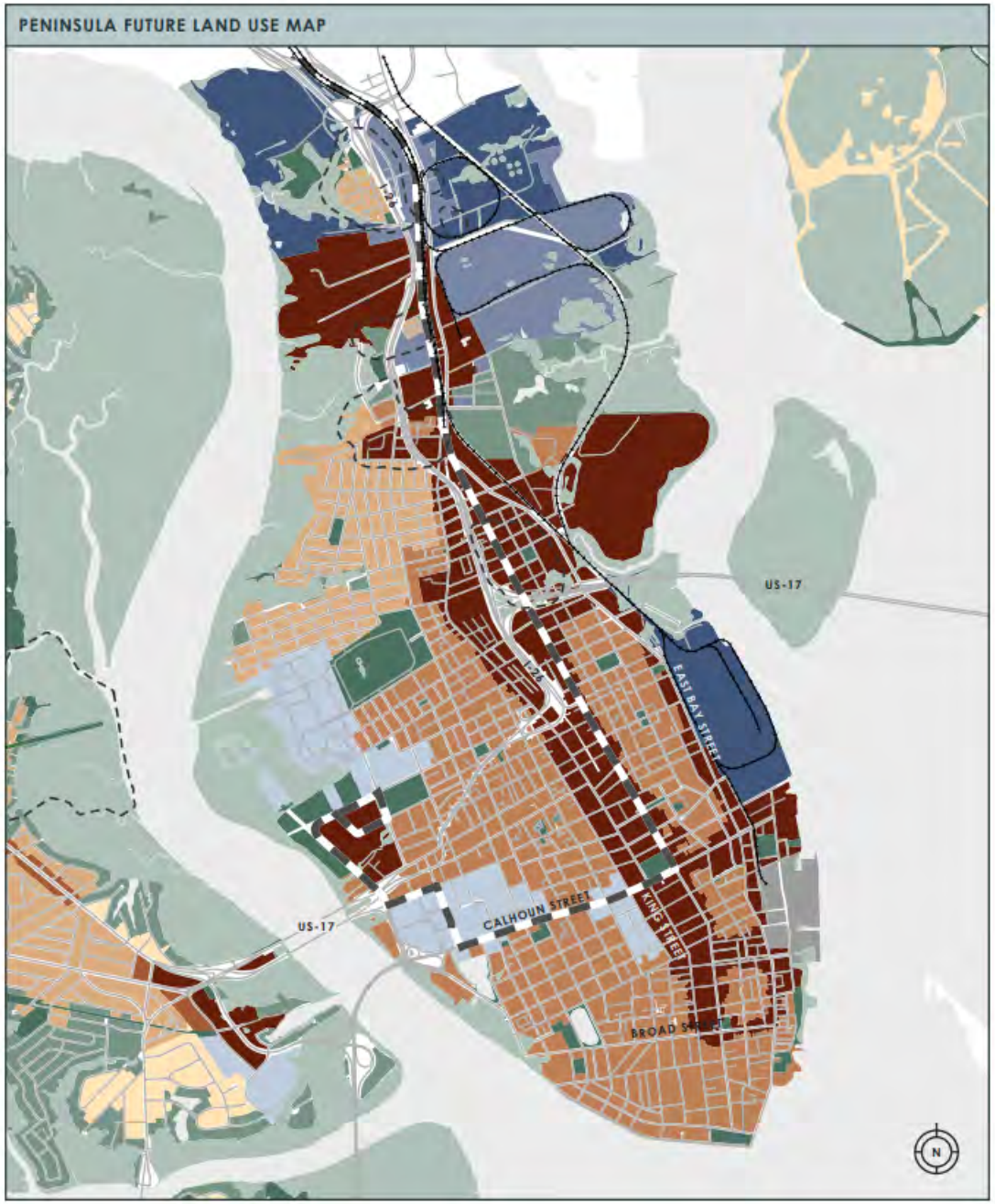
LOW IMPACT / CONSERVED

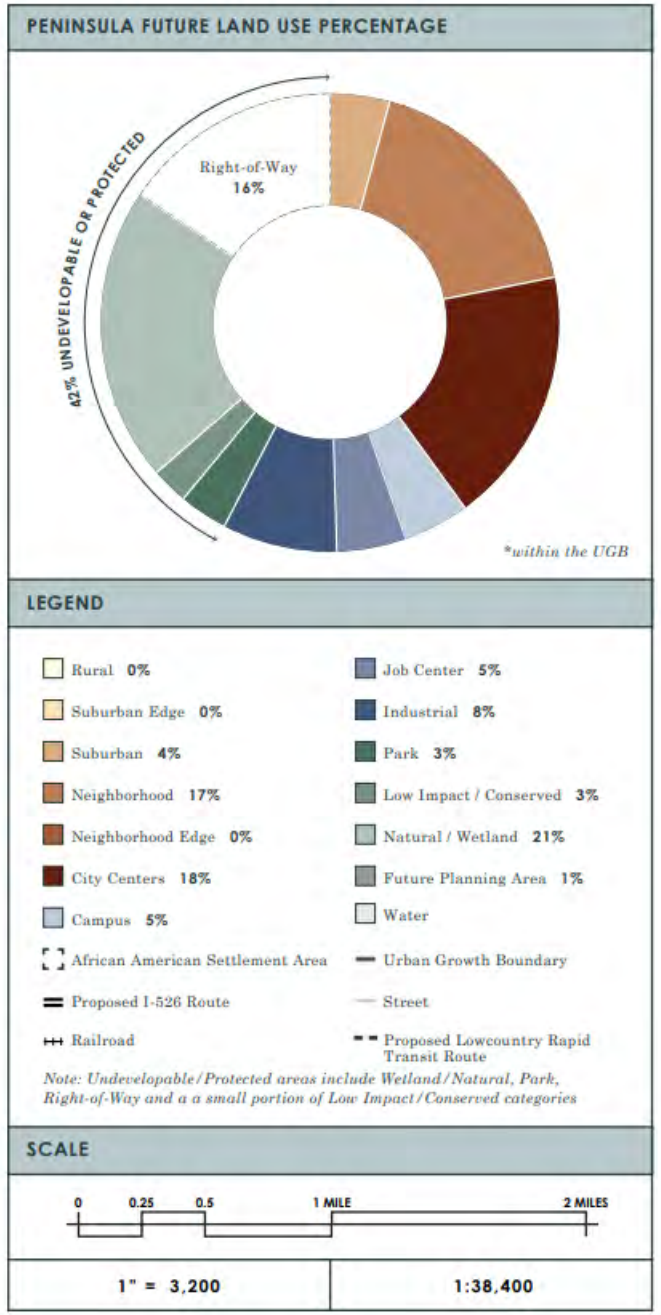
This designation encompasses two types of land area. 1) Low-elevation lands in potential tidal flood-risk areas and future marsh migration areas. Some of these areas may see limited development, but structures are likely to be elevated so as not to impair natural intertidal systems. Uses are limited and residential densities limited to less than one unit per acre. 2) Lands preserved via public ownership (not necessarily open to the general population) or private ownership with preservation or conservation easements that significantly restrict development.

NATURAL / WETLAND

Marsh, wetlands, small water bodies or other lands that cannot be developed due to their geography or topography.

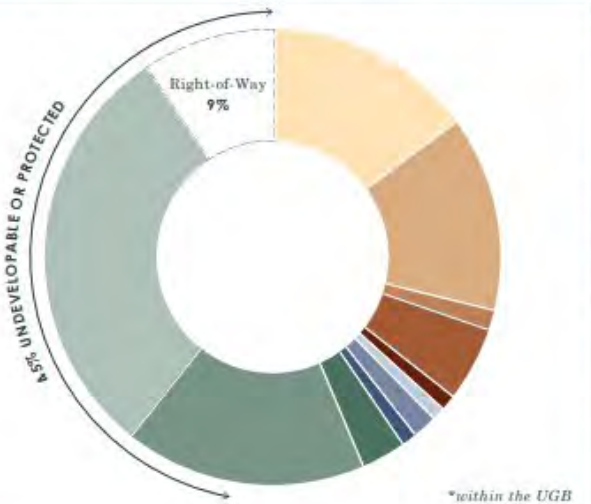
PLANNING AREAS LAND USE: THE PENINSULA





PLANNING AREAS LAND USE: OUTER WEST ASHLEY

TOTAL WEST ASHLEY FUTURE LAND USE PERCENTAGE



*within the UGB

LEGEND

- Rural 0%
- Suburban Edge 15%
- Suburban 14%
- Neighborhood 1%
- Neighborhood Edge 5%
- City Centers 1%
- Campus 1%
- African American Settlement Area
- Proposed I-526 Route
- Railroad
- Job Center 2%
- Industrial 1%
- Park 3%
- Low Impact / Conserved 17%
- Natural / Wetland 30%
- Water
- Urban Growth Boundary
- Street
- Proposed Lowcountry Rapid Transit Route

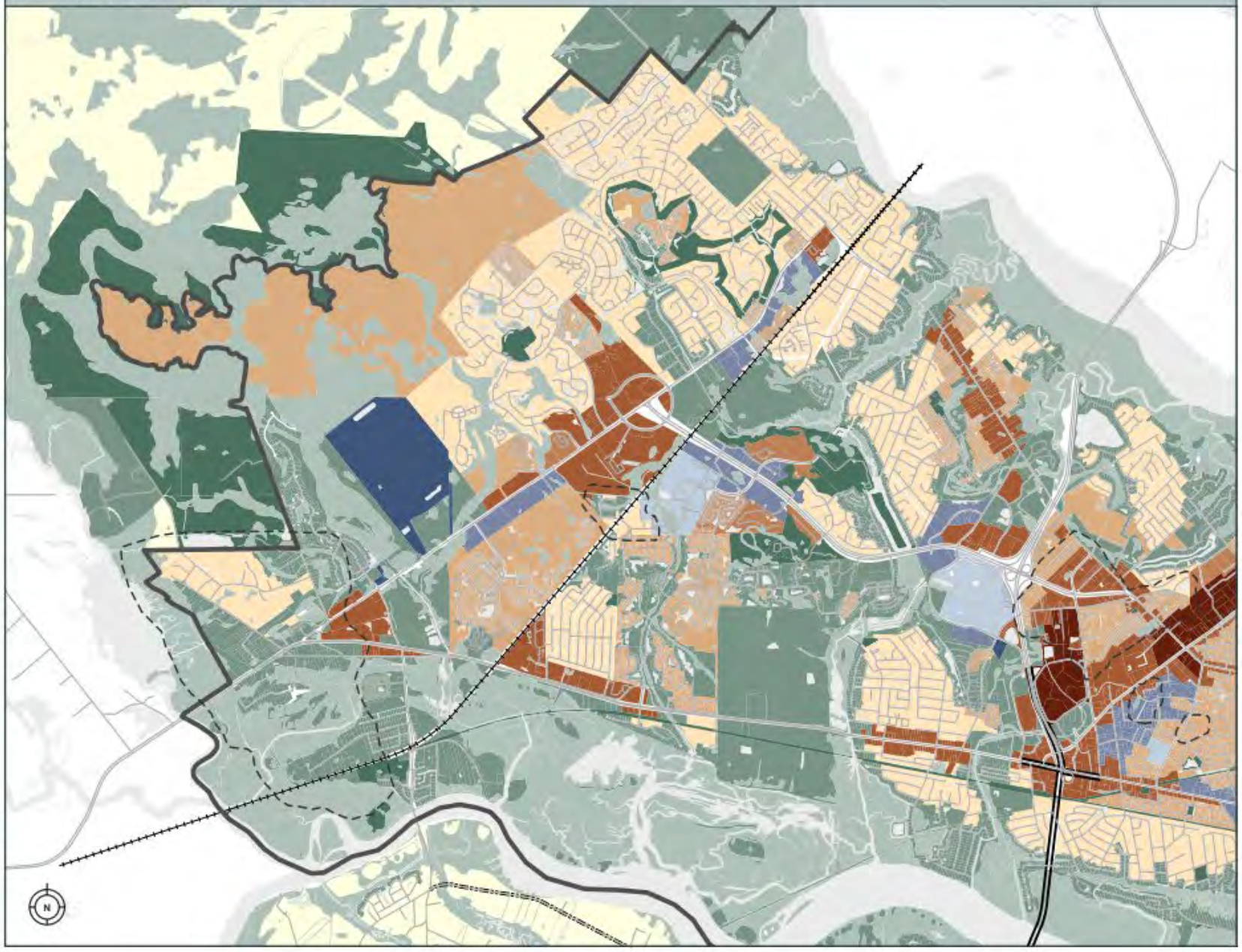
Note: Undevelopable/Protected areas include Wetland/Natural, Park, Right-of-Way and a a small portion of Low Impact/Conserved categories

SCALE

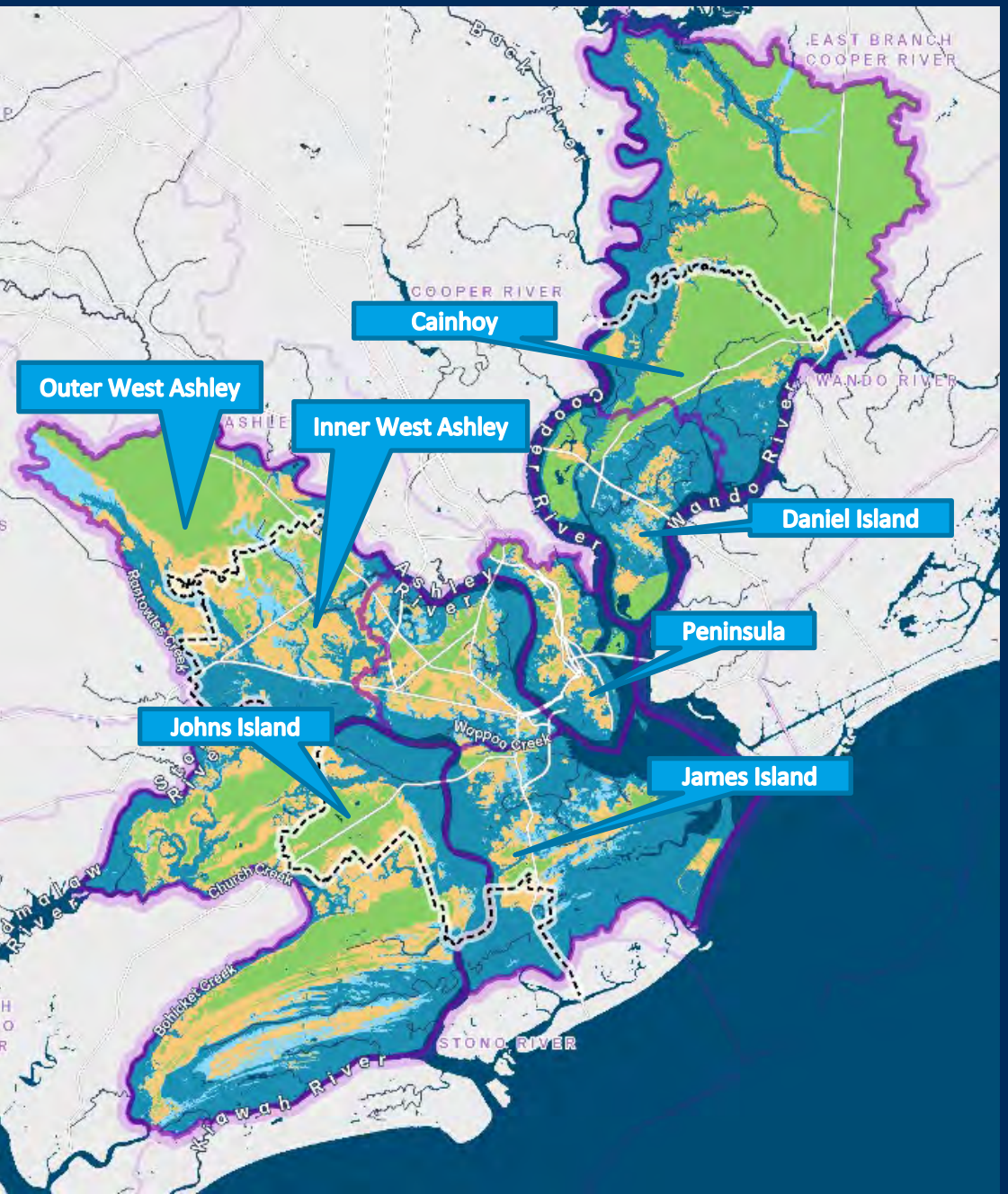
0 0.25 0.5 1 MILE 2 MILES

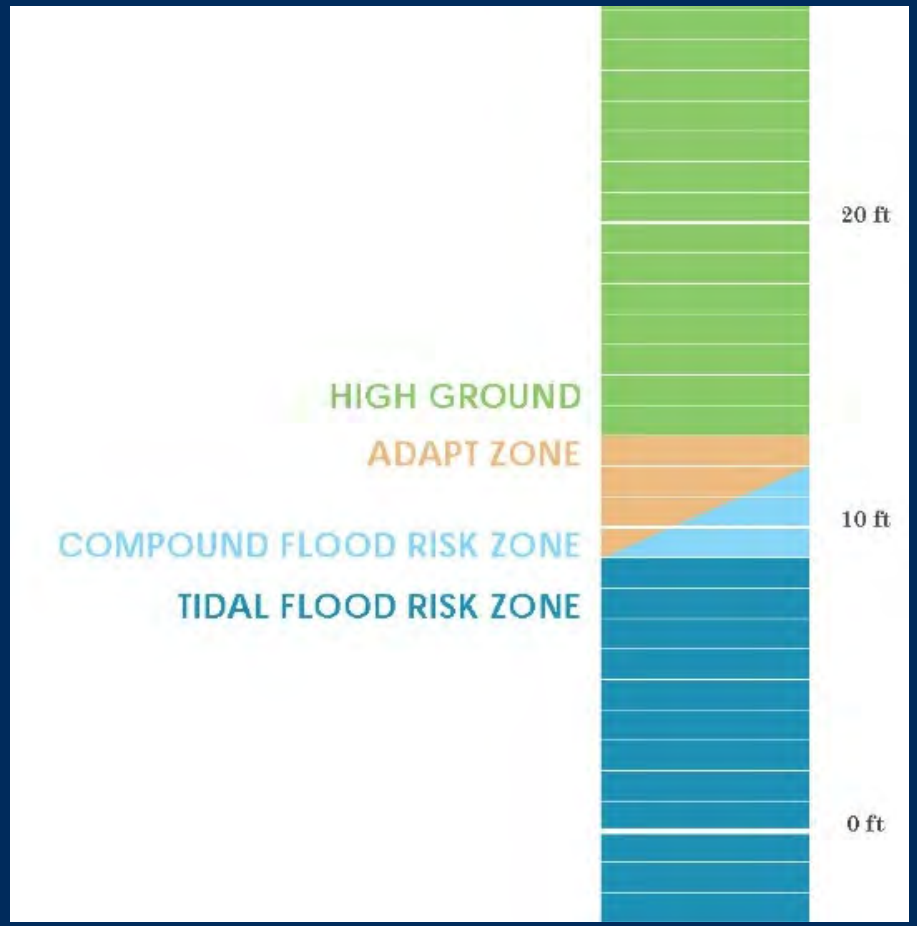
1" = 4,133
1:49,600

OUTER WEST ASHLEY FUTURE LAND USE MAP

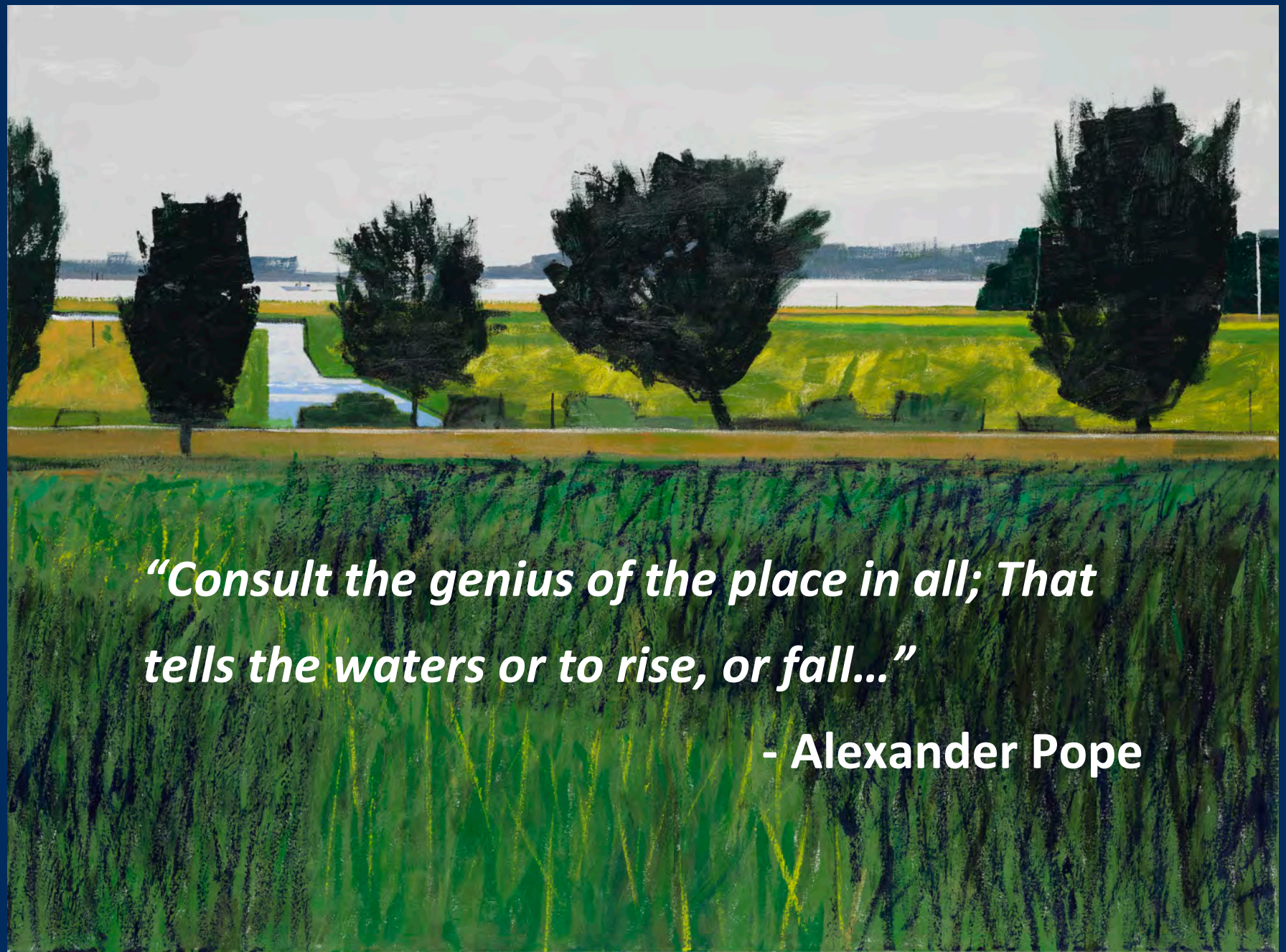


ELEVATION BASED PLANNING ZONES



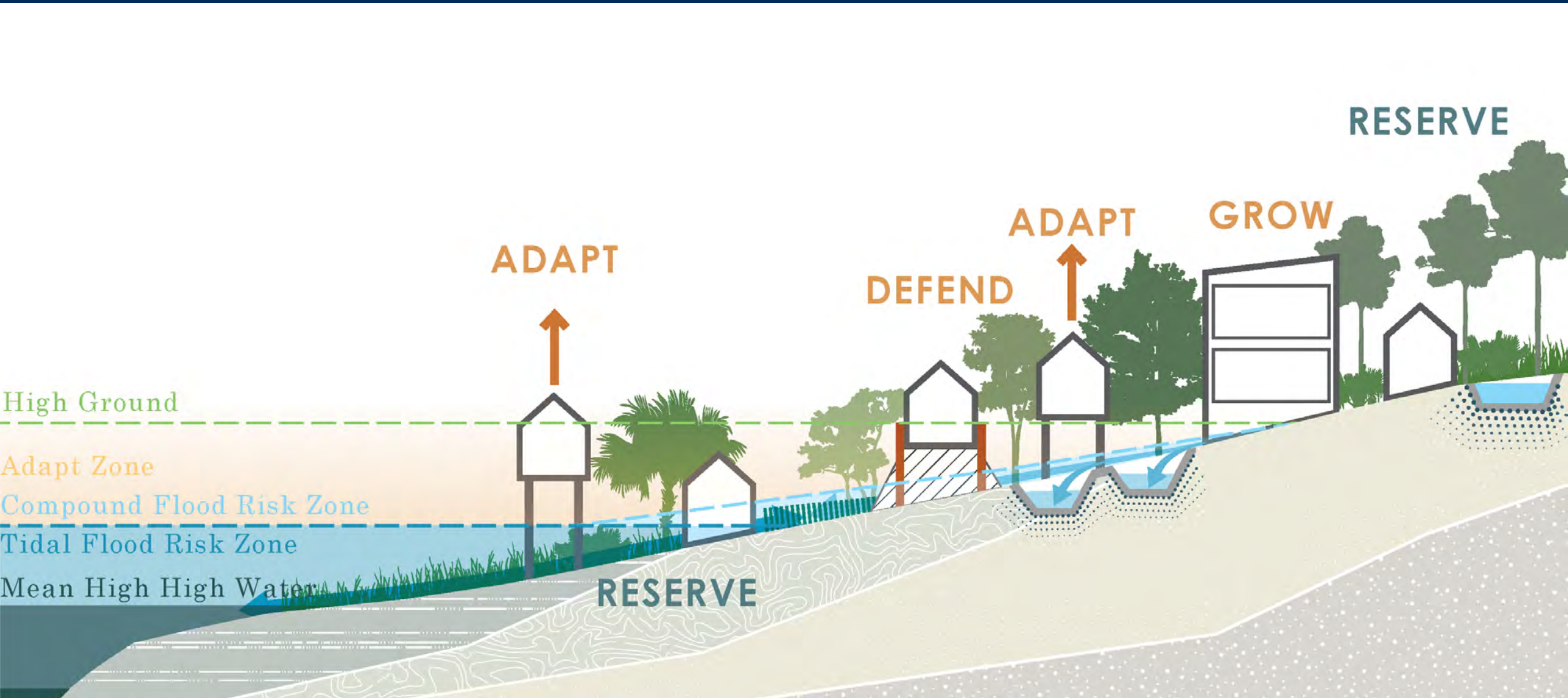


LEVERAGING PLACE



ELEVATION BASED PLANNING STRATEGIES:

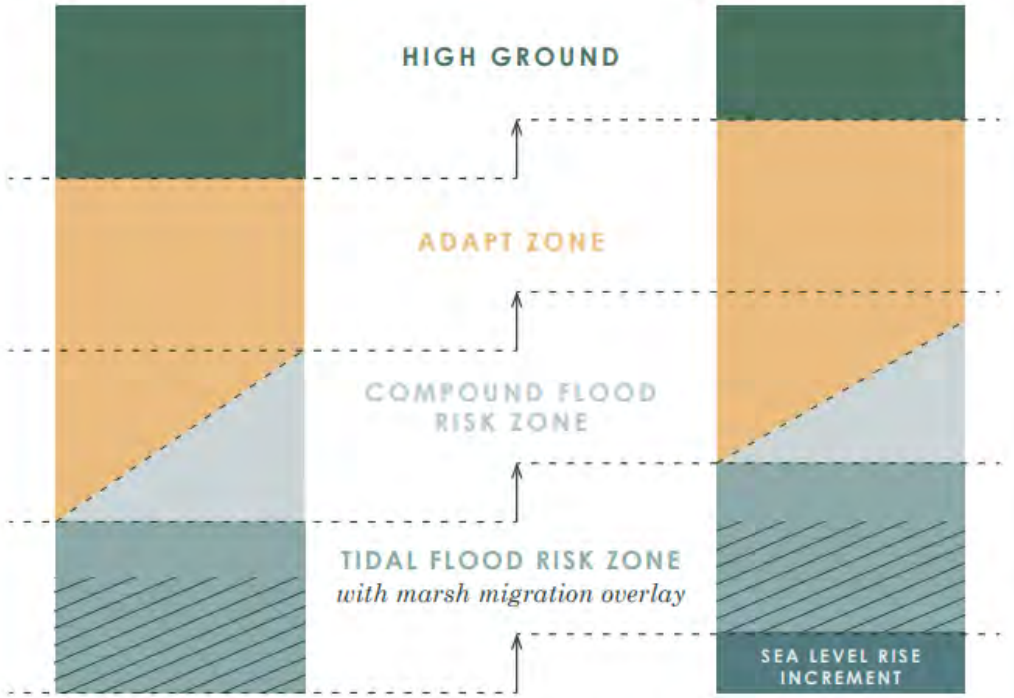
ADAPT DEFEND GROW RESERVE



ELEVATION BASED PLANNING STRATEGIES: NATURAL PROTECTION

ELEVATION RISK ZONES & SEA LEVEL RISE

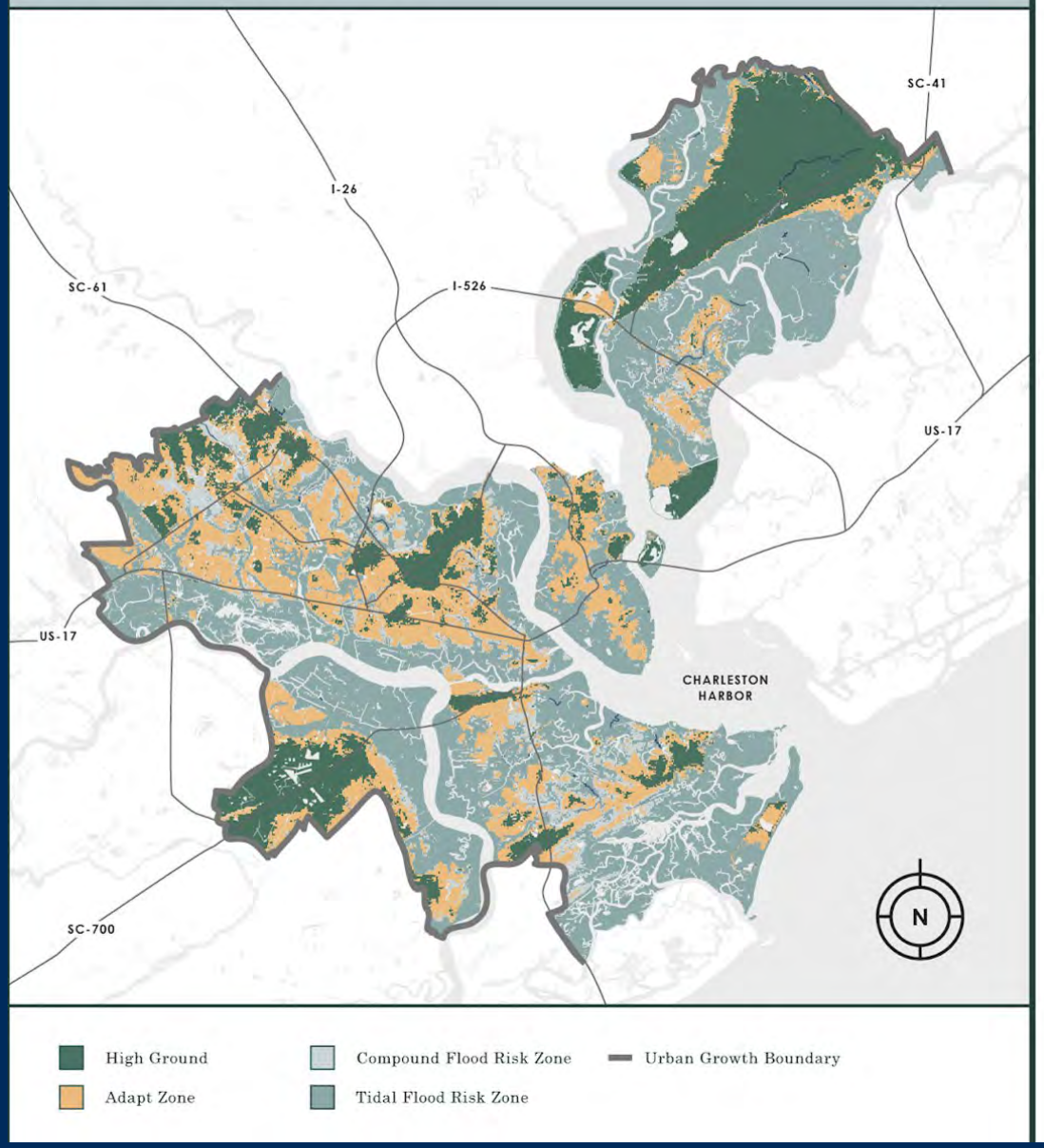
The elevation risk zones shift upwards with sea level rise. By defining risk in terms of elevation, risk mitigation strategies can be adapted to future sea level rise scenarios.



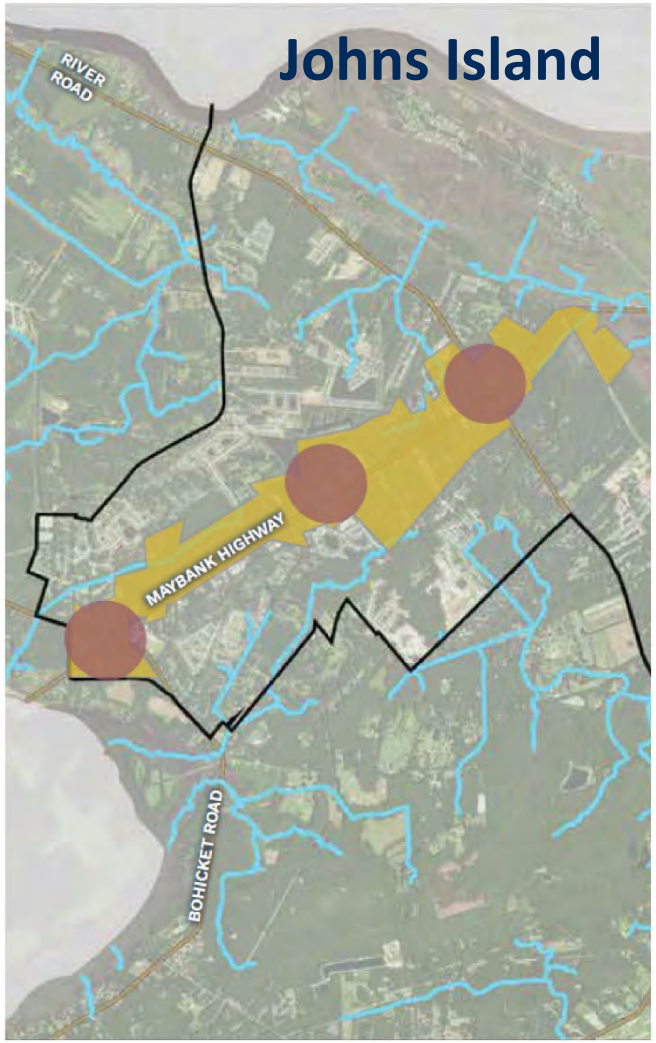
RISK ZONES SHIFT UP WITH SEA LEVEL RISE

Zones may not shift evenly depending on drainage conditions.

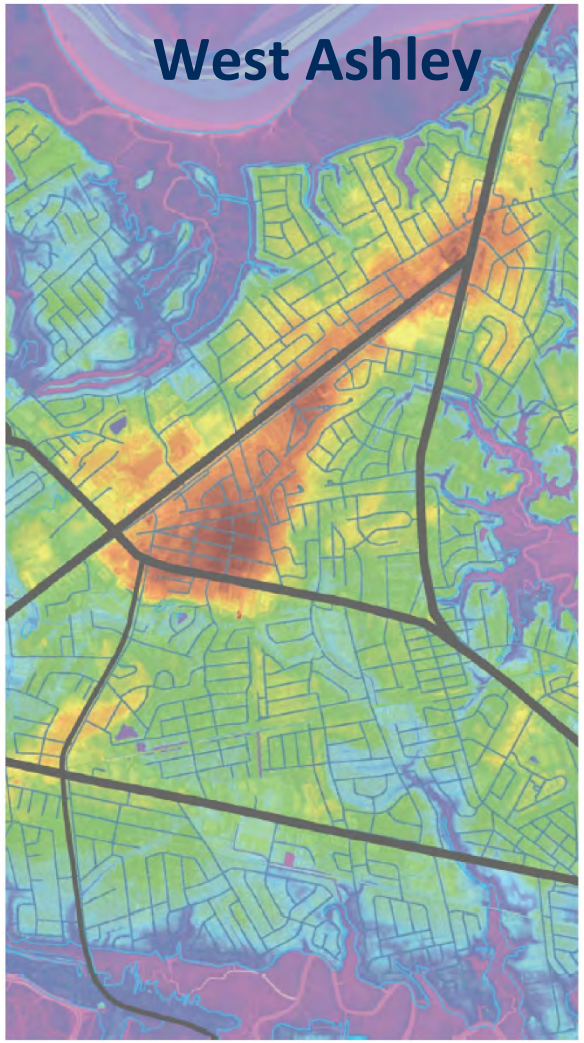
ELEVATION RISK ZONES



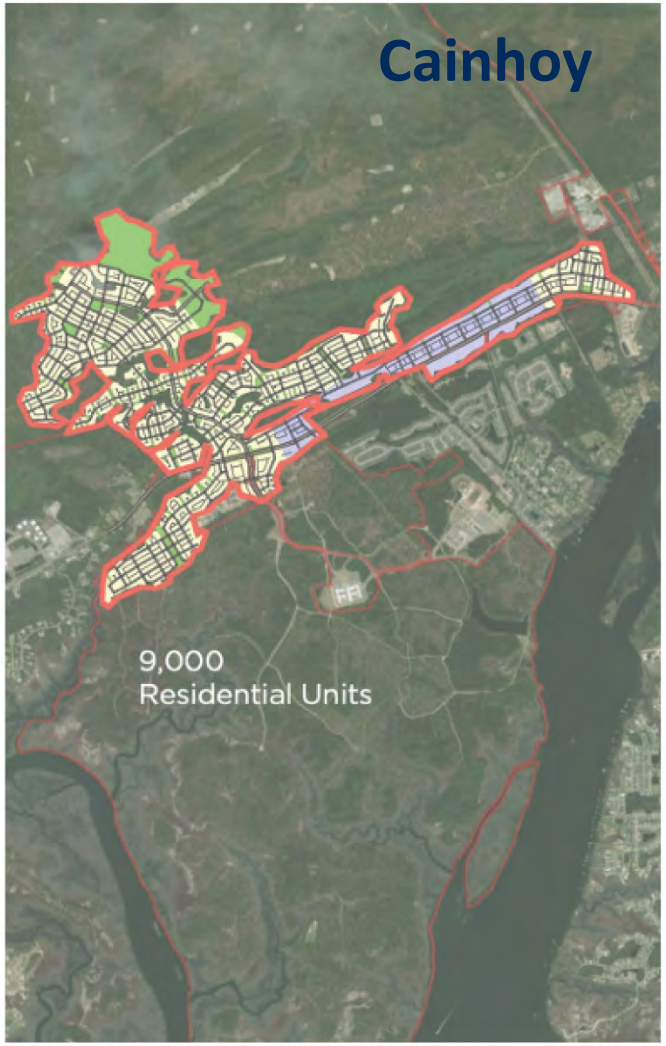
ELEVATION BASED PLANNING STRATEGIES: IDENTIFYING DEVELOPMENT ZONES



Maybank Highway Ridge



Sam Rittenberg Blvd Ridge



Clements Ferry Road Ridge

WORKING TOGETHER FOR RESILIENCE

City Stormwater Resiliency Projects & Reports **Working Toward Resiliency TOGETHER**

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

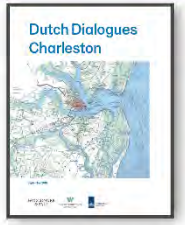
2022
Concord Street Pump Station Rehabilitation (CMAR Procurement)

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

1984
Drainage Plan

2019
Dutch Dialogues Charleston

Flooding & Sea-Level Rise Strategy



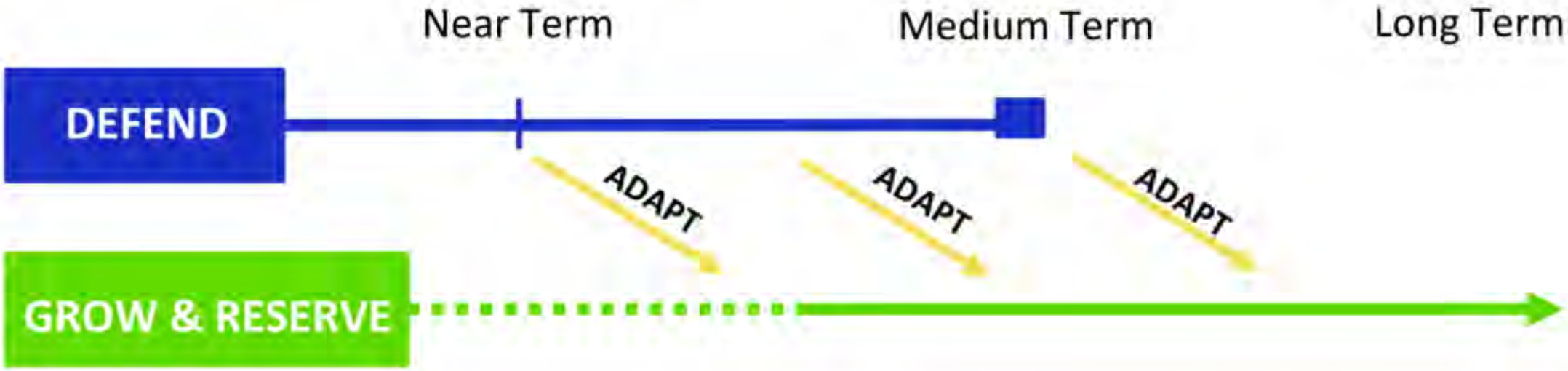
2021
Perimeter Protection Analysis Discovery Report

City Comprehensive Plan

*In 2019, Charleston City Council unanimously adopted the Dutch Dialogues Charleston Report and policy recommendations.

EXAMPLE PROJECTS

INVESTMENT STRATEGIES



The benefit/cost equation and overall effectiveness of resilience investments will shift away from defensive measures in the long term in most locations.

Individual planning areas can establish their own sets of milestones, decision points and timelines.

DEFEND: PERIMETER PROTECTION

8-mile storm surge structure @ 12’ NAVD 88

Tentative alignment – all on public property -- at edge of peninsula. SCPA facilities now inside protection.

Added nature-based features (more needed)

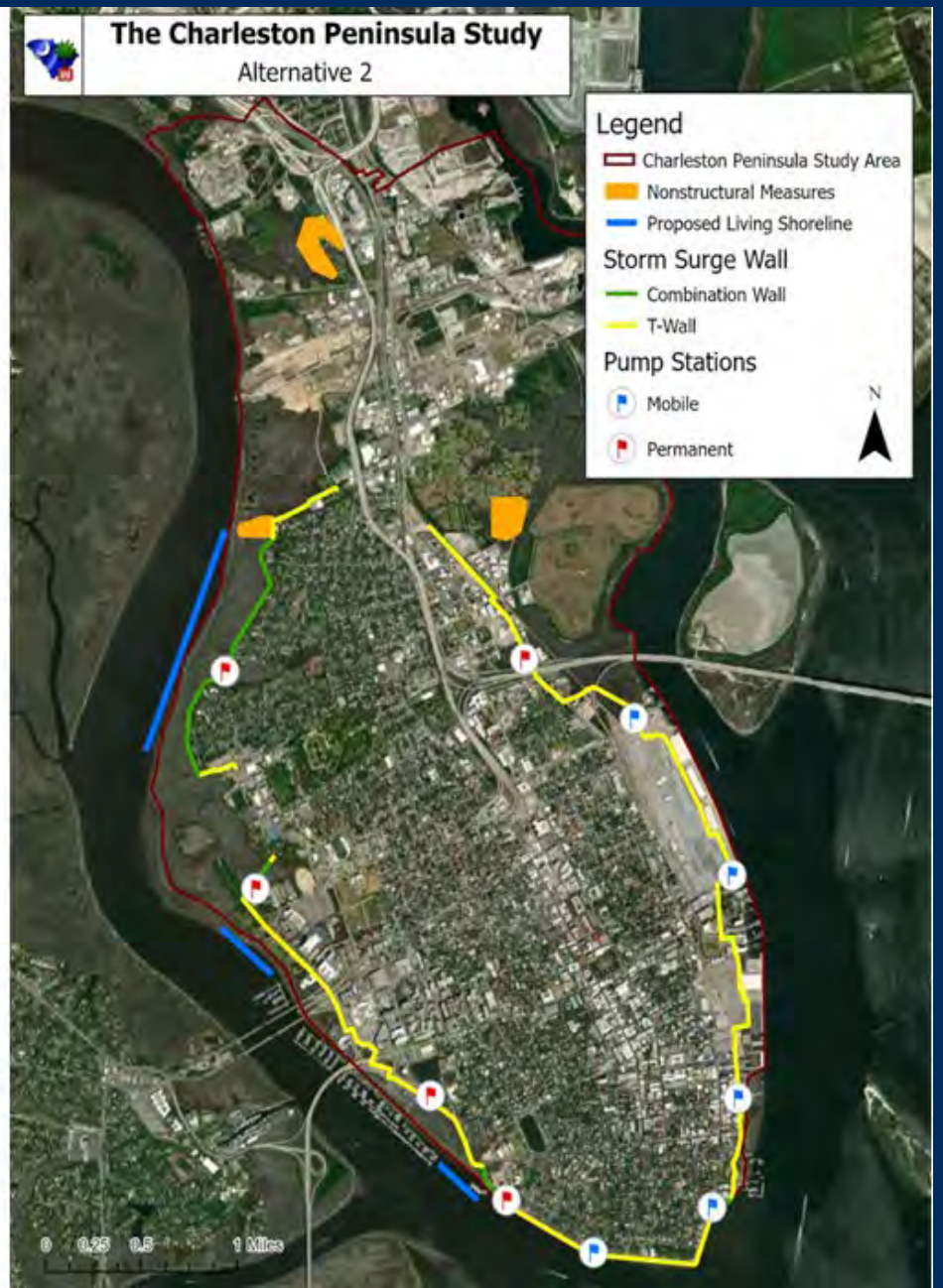
10 pumps (impoundment and overtopping)

$1.3b, cost shared 65%-35%. City net cost: +/- $250m

10.8 – 1 benefit-cost ratio

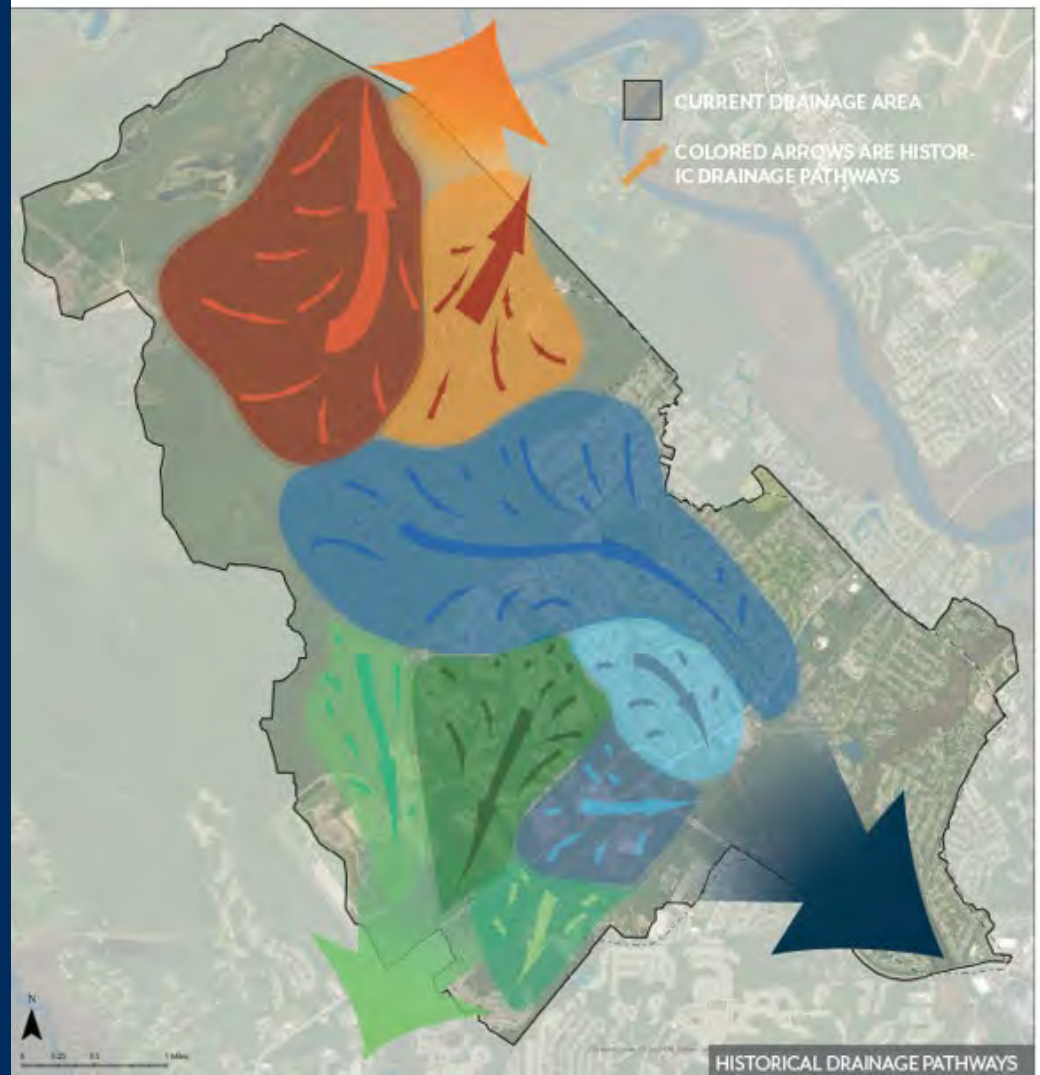
Design goal: to replicate and extend Low Battery around peninsula.

Overall goal: design and eventually construct a structure acceptable to Charleston with Feds paying 65%.

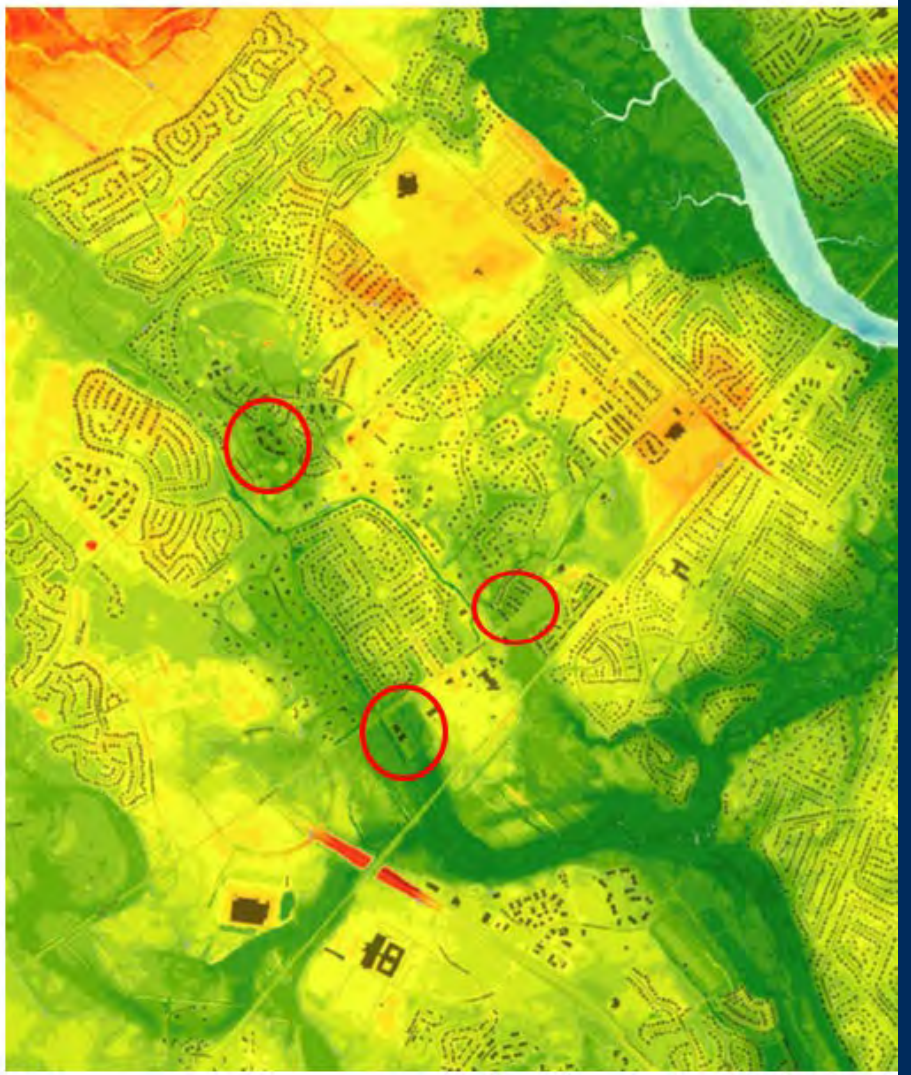


ADAPT: CHURCH CREEK

Constrained basin



Buyout pilot sites



ADAPT: CHURCH CREEK

Three pilot sites, *templates* for rest of City

GROW: DEVELOP ON HIGHGROUND

RESERVE: BARBERRY WOODS


Q&A