24 SEPTEMBER 2024
GREEN FUTURES NETWORK

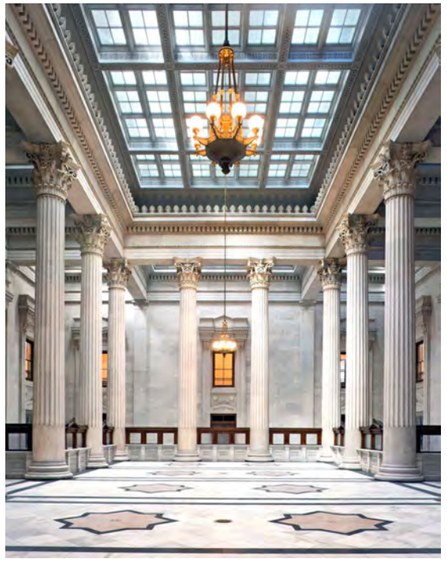
JAIME RAMIRO DIAZ
URBAN DESIGN DIRECTOR

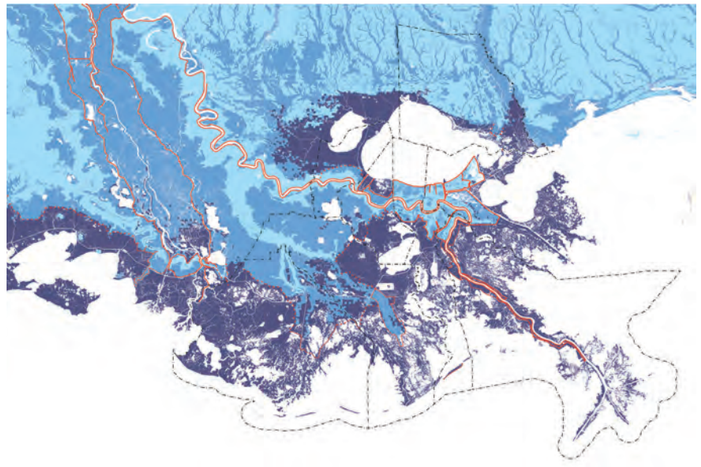
Living With Water®
Adaptation Community of Practice

Jaime Ramiro Diaz

WAGGONNER & BALL
A MOFFATT & NICHOL STUDIO

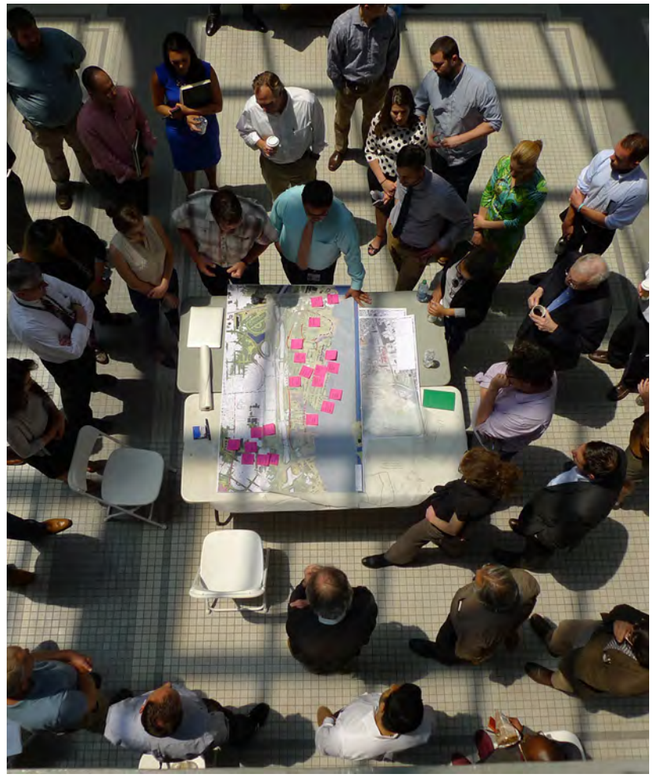
Architecture / Environment





We focus on education, historic preservation, and Living With Water™ projects at all scales.

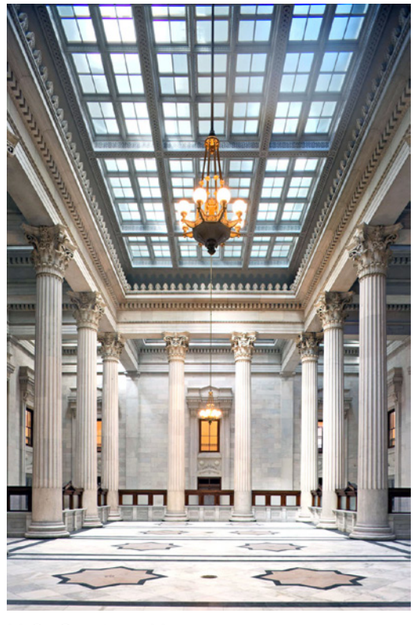
Our Approach



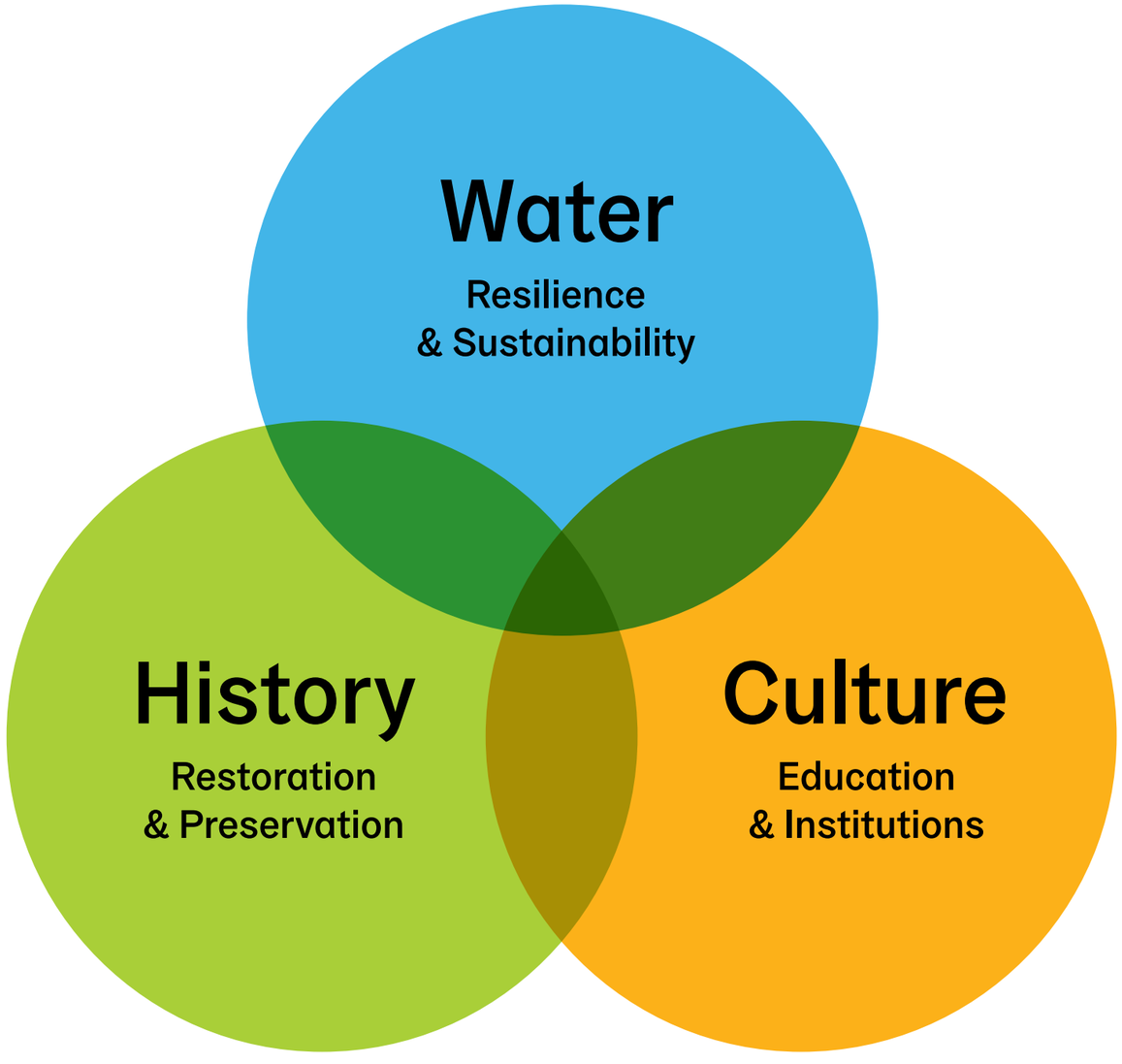
We collaborate with partners and communities all over the world.
Wherever we are, we work local.

Focus Areas

Gretna City Park
Gretna, LA/ Waggonner & Ball



U.S. Custom House
New Orleans, LA / Waggonner & Ball



Louisiana Children's Museum
New Orleans, LA / Mithun with Waggonner & Ball

Historic New Orleans Collection
New Orleans, LA / Waggonner & Ball

Hurricane Katrina

New Orleans

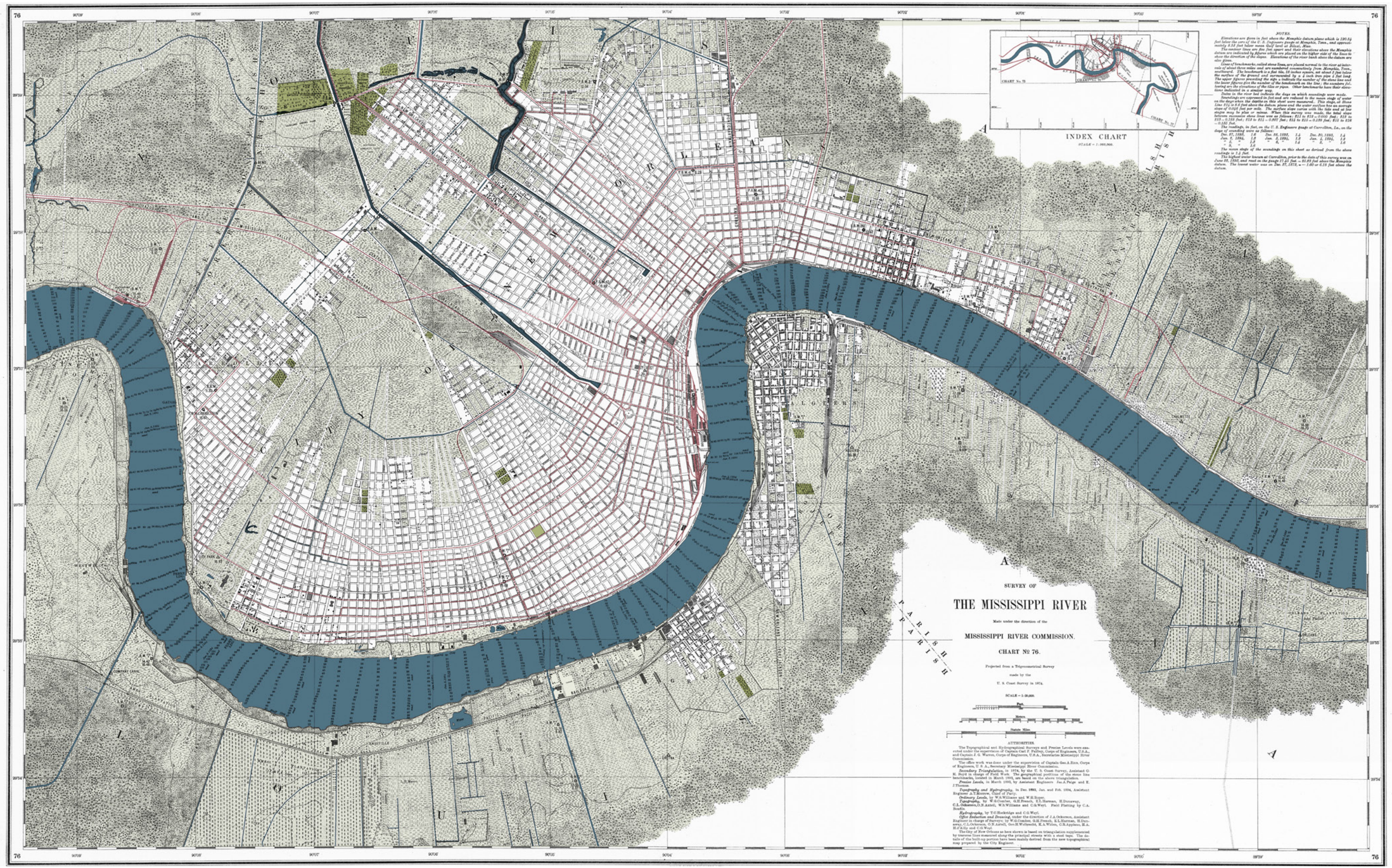
source: Ralph Madison

Flooded City, 2005

New Orleans

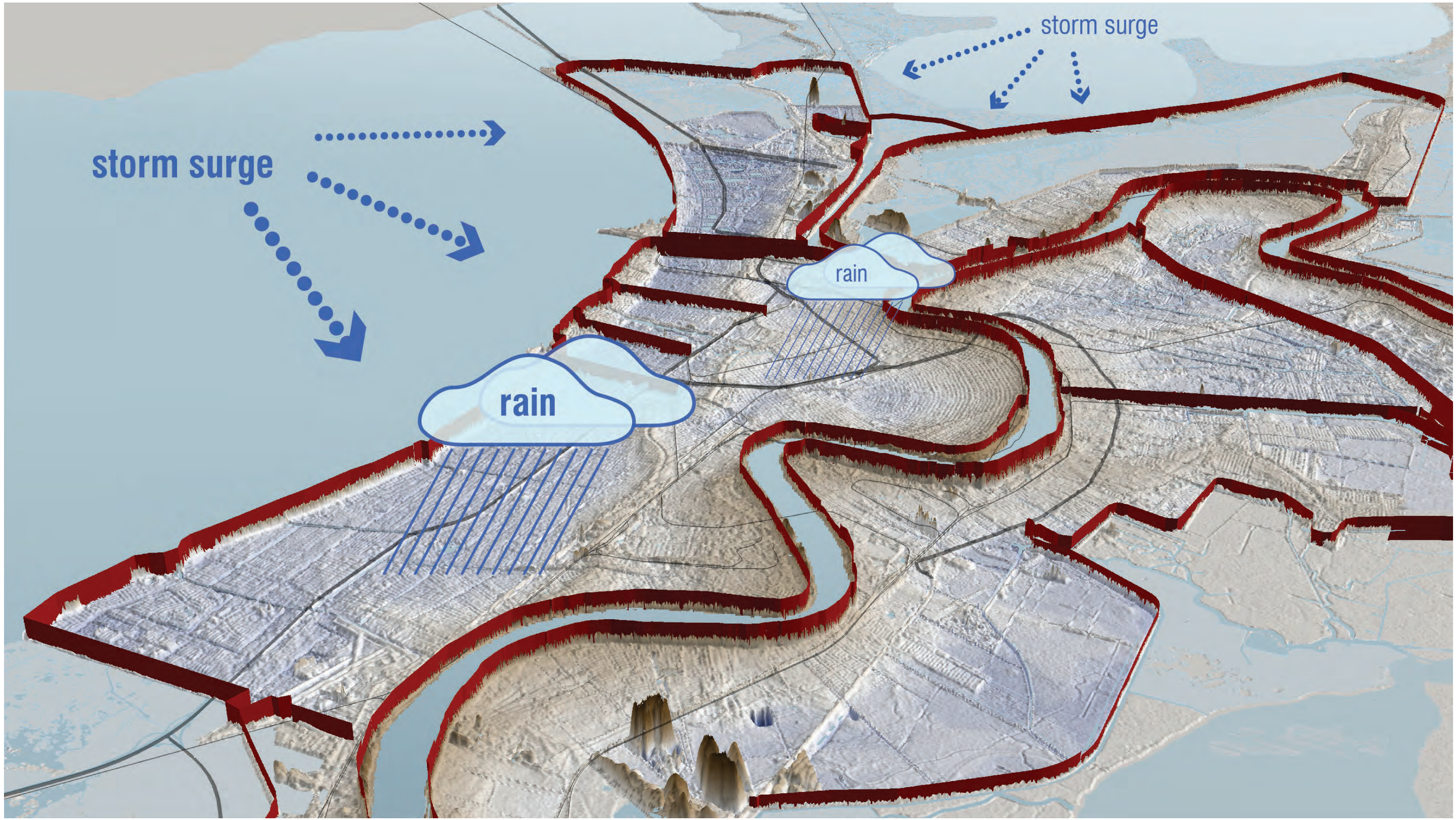
Historic City, 1888

New Orleans



Lines of Defense

New Orleans



Concealed Assets

New Orleans

Lines of Defense

New Orleans

Lines of Defense

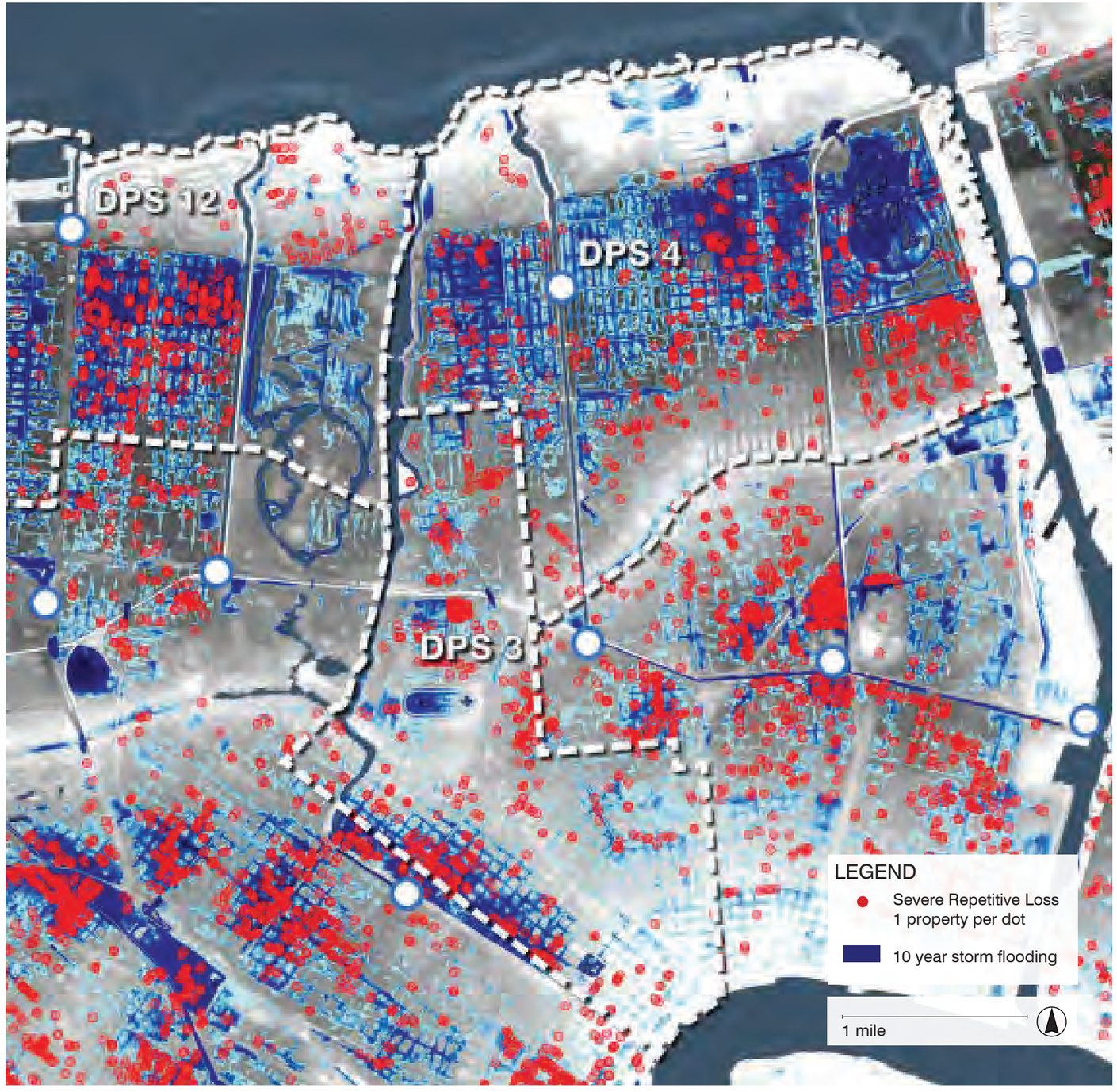
New Orleans

Street Flooding

New Orleans

Repetitive Flood Loss

Greater New Orleans Urban Water Plan



Integrated Flood Protection

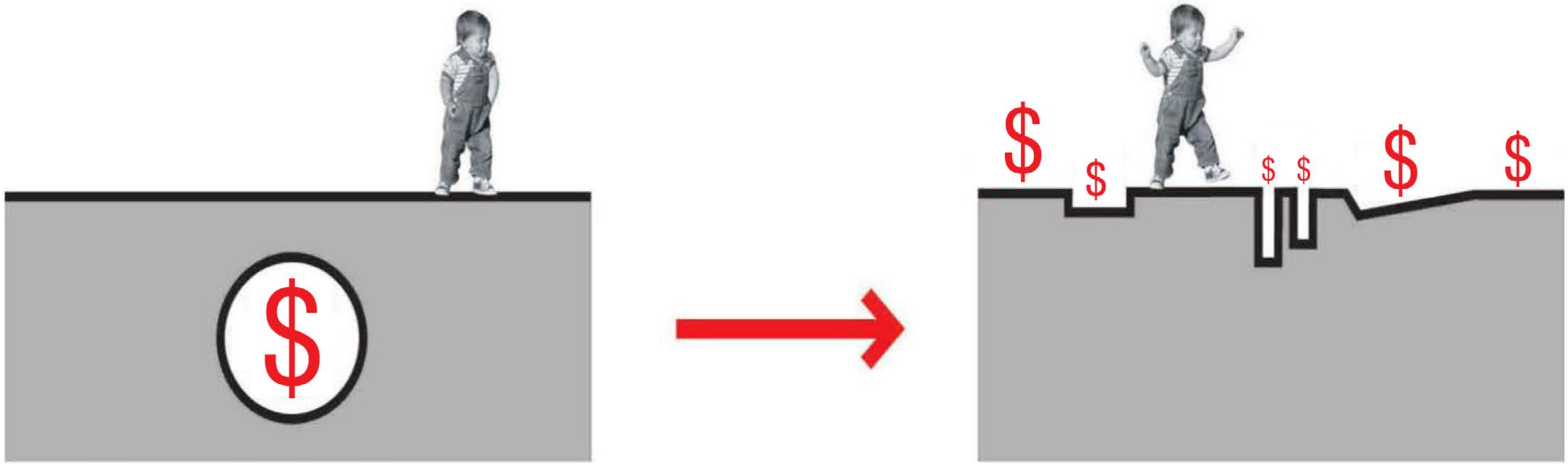
Westzeedijk, Rotterdam

Integrated Flood Protection

Westersingel, Rotterdam

Infrastructure Investment + Amenity

Greater New Orleans Urban Water Plan

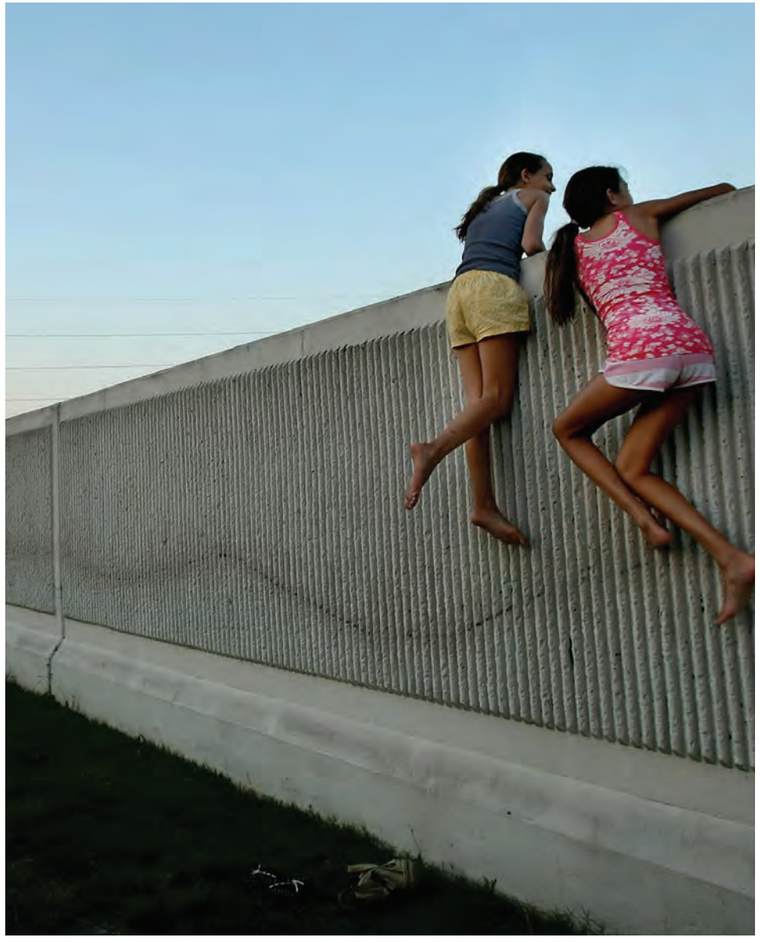


Problems Identified

Greater New Orleans Urban Water Plan

1 **Drainage systems are regularly overwhelmed by too much runoff, causing flooding.**

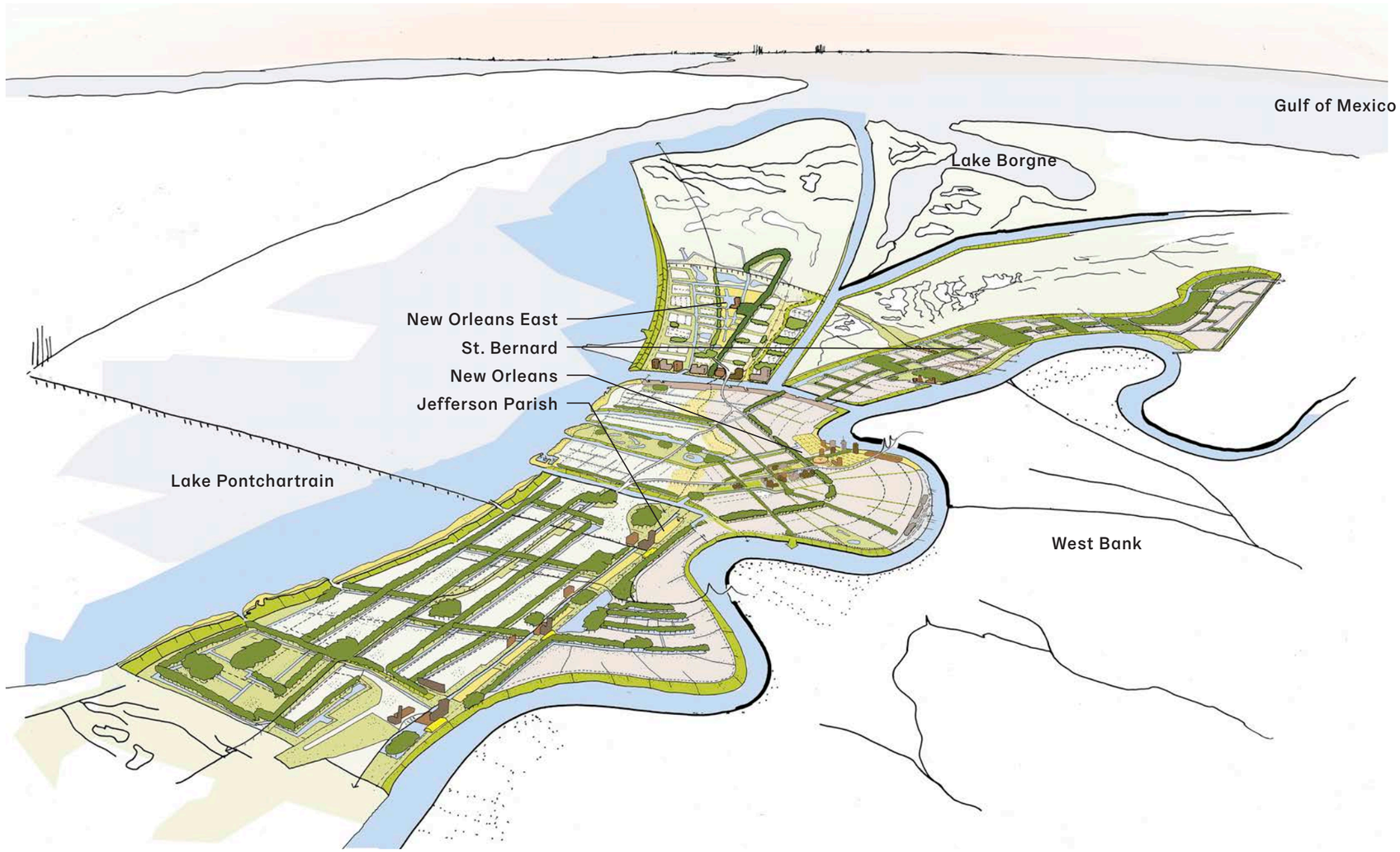
2 **Excessive pumping causes the land to sink by lowering groundwater levels.**



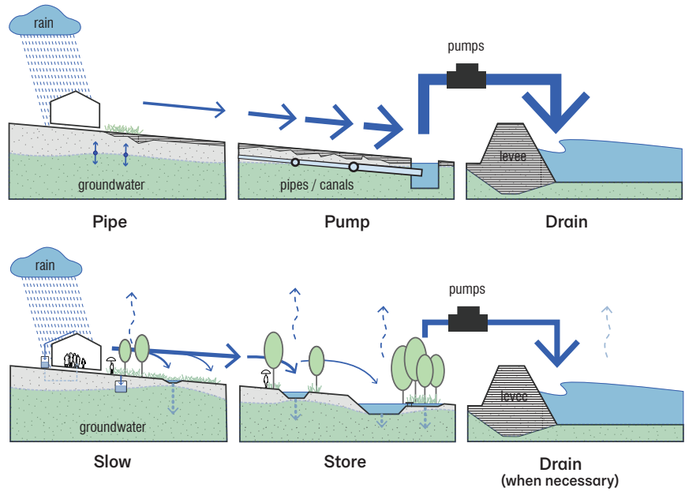
3 **Critical water assets are wasted, hidden behind walls, buried underground, or pumped out of sight.**

Greater New Orleans Urban Water Plan

Develop first Water Plan in the United States towards a paradigm shift in local stormwater management



Vision Plan



Paradigm Shift

Outfall Canal

Mirabeau Water Garden

Gentilly Resilience District

Wet - Typical Rain Storm (1-3 inches)

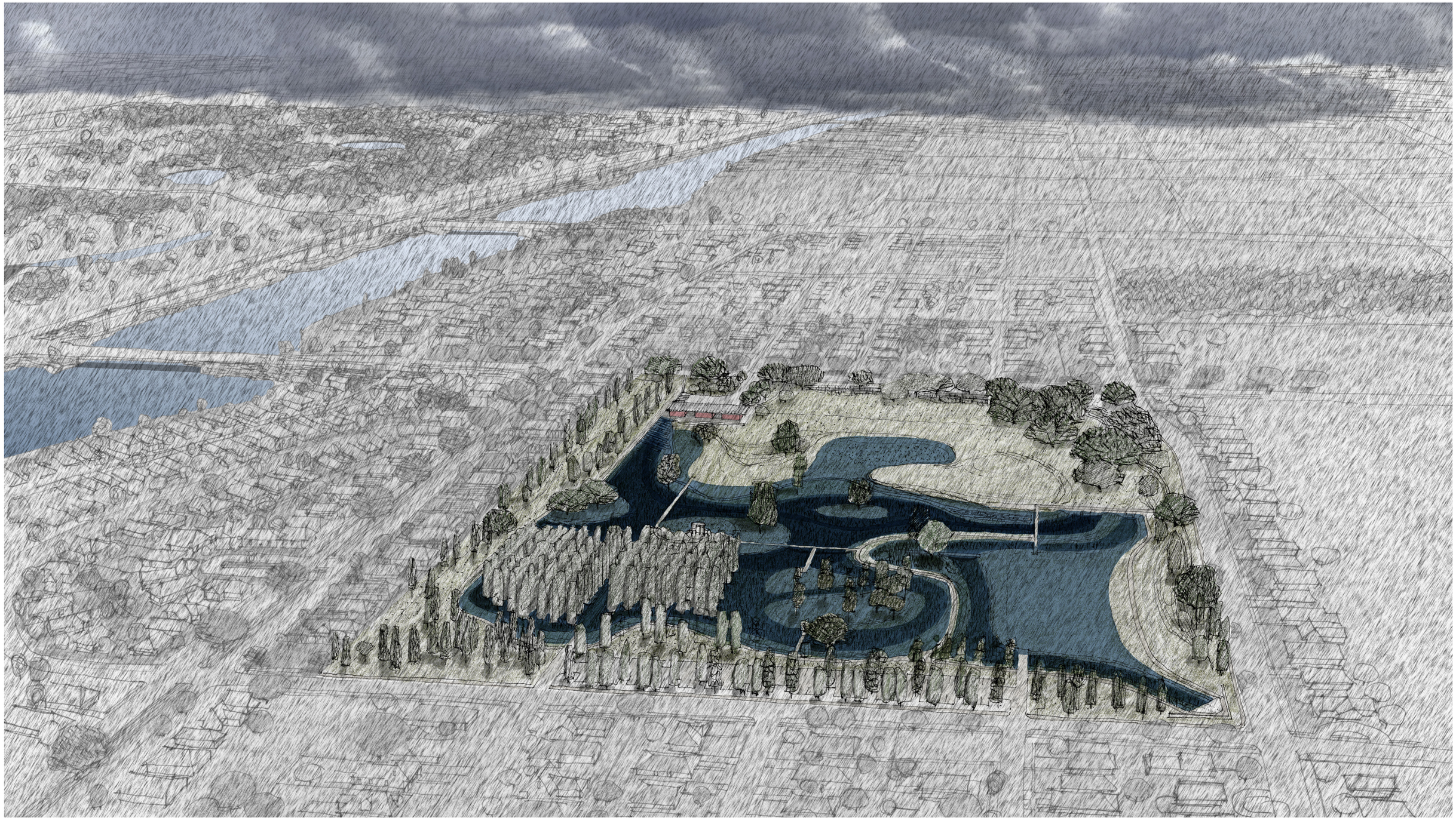
Mirabeau Water Garden

Wet - Heavy Rain Storm (2-year event)

Mirabeau Water Garden

Wet - Heavy Rain Storm (10-year event)

Mirabeau Water Garden



Norfolk

Norfolk 1877

Flood Risk

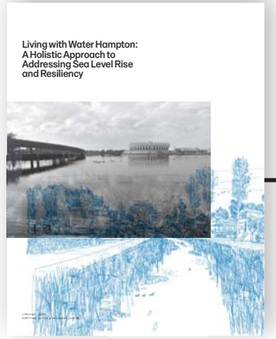
High Tide Flooding on East Water Street

September 20th 2024

Catalyst for Hampton Roads Resilience

Dutch Dialogues Virginia → Resilient Hampton, Norfolk Resilience, to Chesapeake

Dutch Dialogues Virginia



Resilient Hampton

Langley JLUS

Newmarket Creek Water Plan

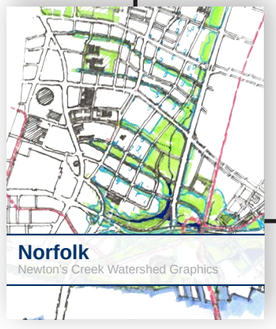
Environmental Impact Bond Pilot Projects

Downtown, Phoebus Buckroe Water Plan

Chesapeake Industrial Waterfront

Future Projects

HUD NDR Ohio Creek Project

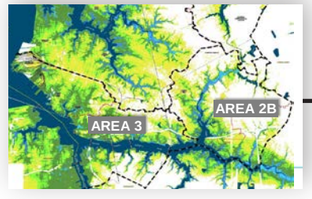


NDRC Application

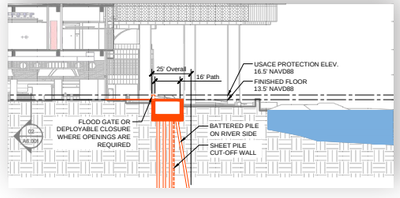
St. Paul's Blue Greenway

Freemason Bridge

Norfolk Resilience Strategy



Norfolk RVAR



USACE Workshops

USACE PED

2015 2016 2017 2018 2019 2020 2021 2022 2023

Norfolk Ohio Creek Watershed Resilience

Enhancing resiliency and quality of life for a coastal urban community through nature-based design

Proposed projects identified through a workshop-centered process that began with the Dutch Dialogues Virginia

Norfolk Ohio Creek Watershed Resilience

Enhancing resiliency and quality of life for a coastal urban community through nature-based design

Public fishing pier improves waterfront access in coordination with strengthened edge protection from sea level rise and storm surge

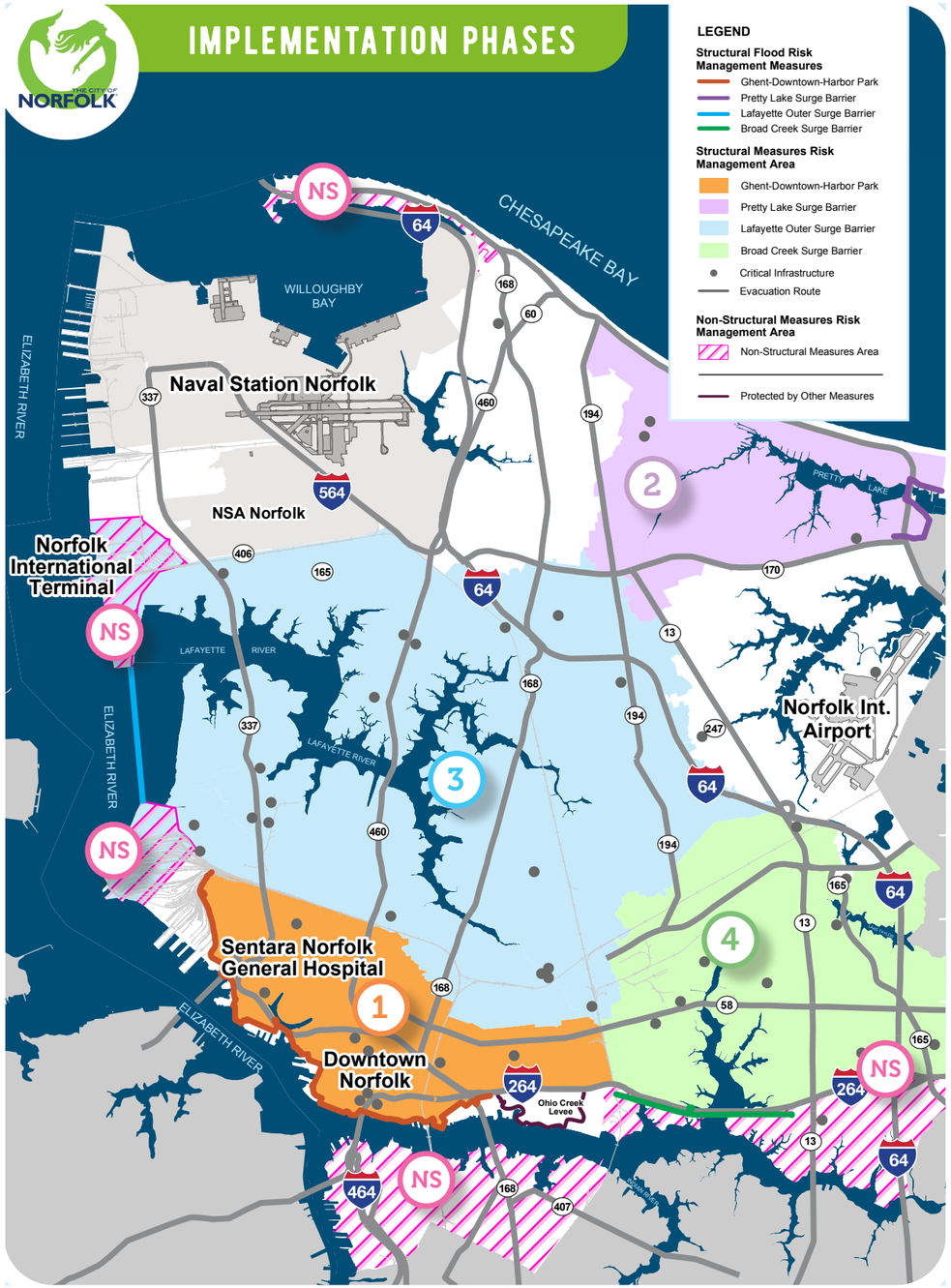
Design vision developed through charrettes

Aerial photo of living shoreline and berm under-construction

Pump station is a reslience hub that serves as a gateway to the new public fishing pier

Project Phases

The City wide project is divided into 5 implementation phases



1 Downtown

A system of floodwalls with a levee, surge barriers, and natural and nature-based features, extending from Ghent through downtown connecting to the Ohio Creek Watershed project.

2 Pretty Lake

A system of floodwalls and storm surge barriers to reduce storm surge from entering Pretty Lake at Shore Drive.

3 Lafayette

A storm surge barrier from Norfolk International Terminal (NIT) to the Lambert's Point area to reduce storm surge risk to the Lafayette River watershed.

4 Broad Creek

A system of floodwalls, storm surge barriers, and tide gates to reduce storm surge from entering Broad Creek at I-264.

5 Nonstructural

A series of property-specific flood mitigation projects: home elevations, basement fills, floodproofing, etc.

PHASE	LOCATION	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
1A	Berkley Bridge to Chesterfield Heights												
1A PS	Harbor Park and Newtown Creek												
1B	Town Point Park/Waterside												
1C	Ghent to Town Point Park												
1D	Downtown Floodwall												
2	Pretty Lake Surge Barrier												
3	Lafayette Outer Surge Barrier												
4	Broad Creek Surge Barrier												
NS	Multiple Areas in the City												

Structural Projects

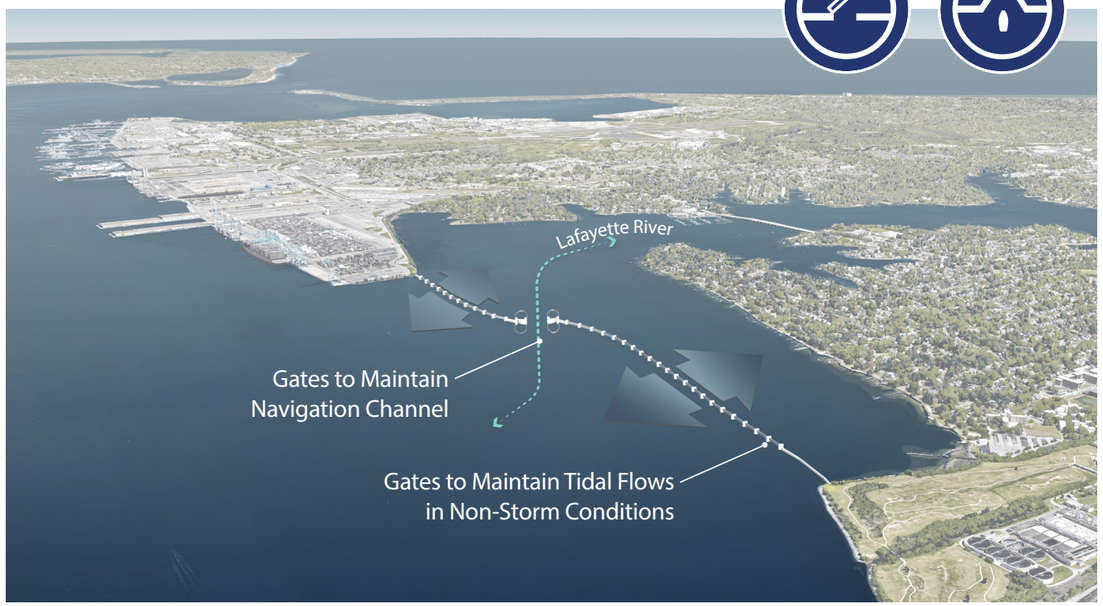
Lessening the impact of a hazard by modifying the hazard itself through construction

Ohio Creek Watershed Project Coastal Protection Alignment

Waterside Drive Phase 1

Ohio Creek Watershed Project Pump Station

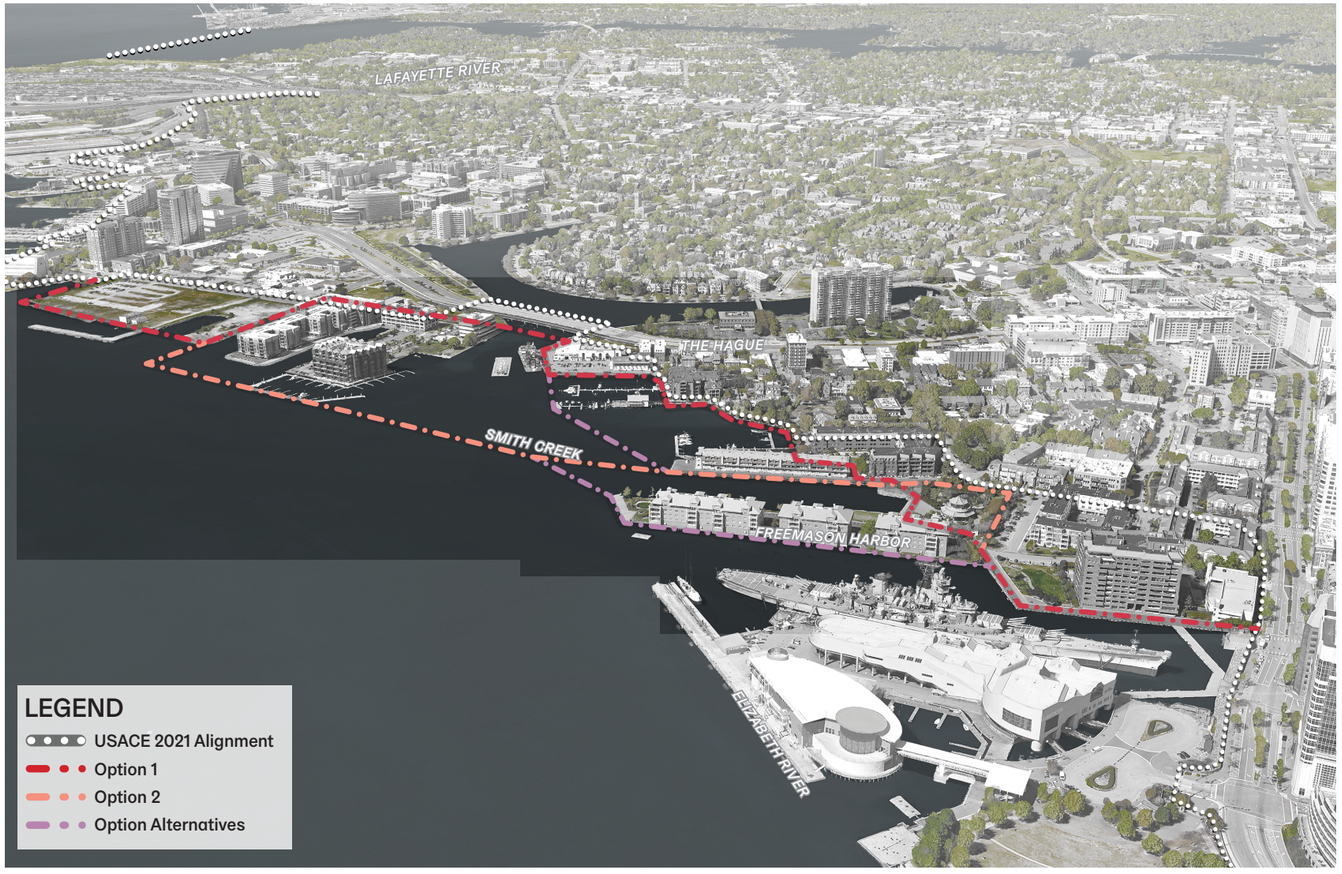
Lafayette Storm Surge Barrier Phase 3

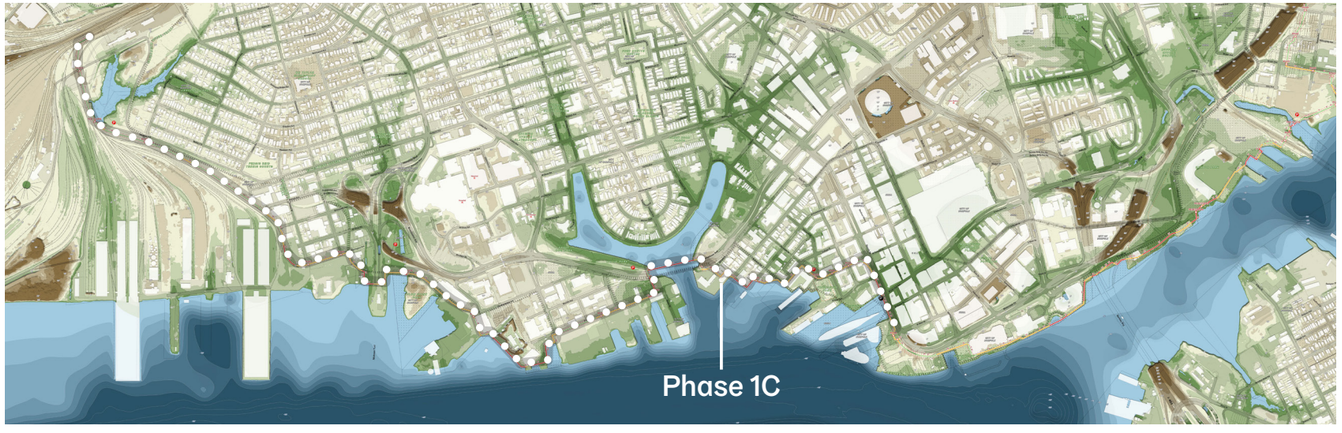


Phase 1C

1 Downtown

February 2024 Strategy Workshop

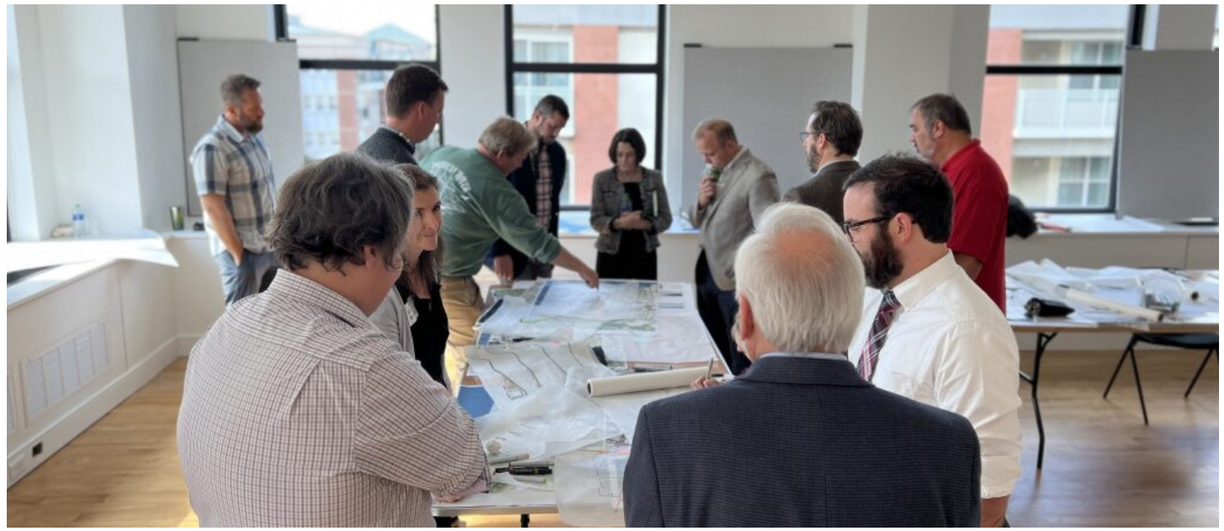


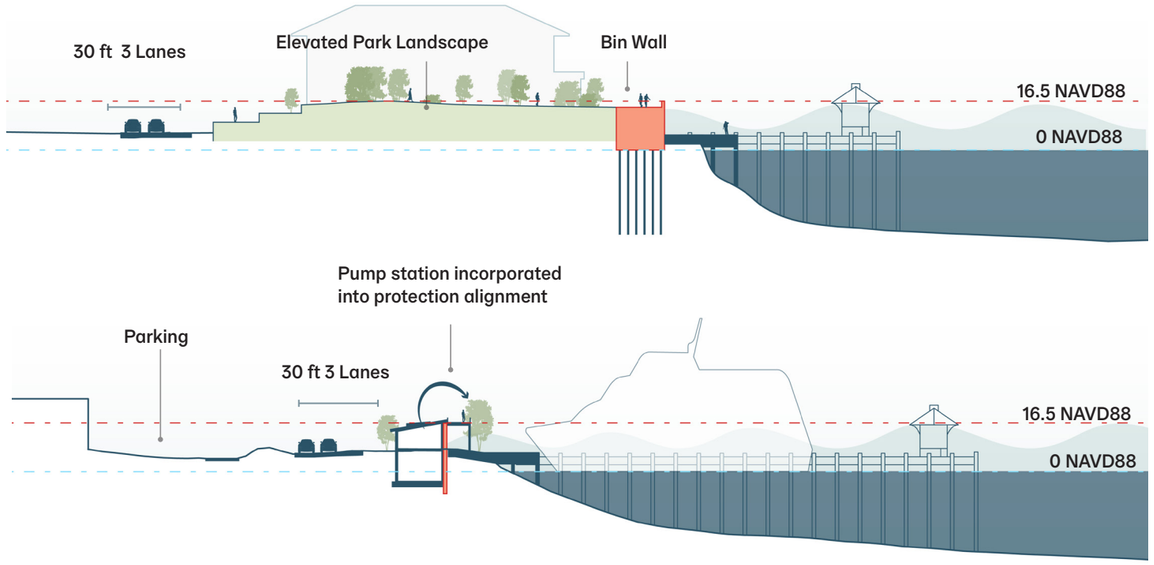


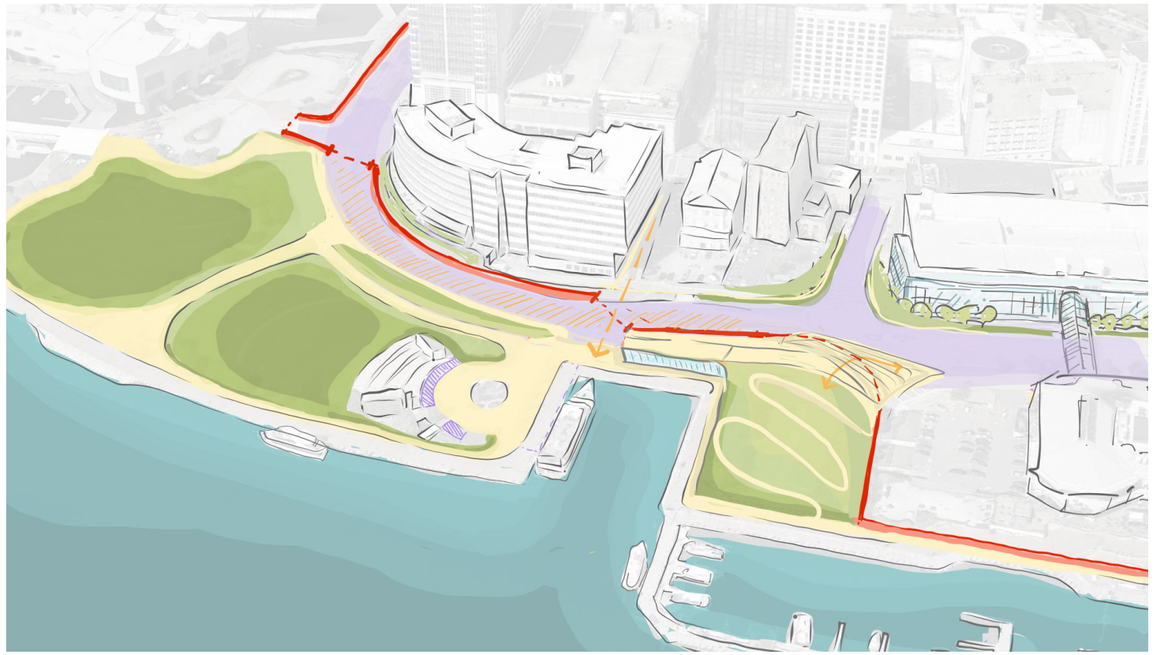
Phase 1A

1 Downtown

October 2023 Waterside Drive Workshop



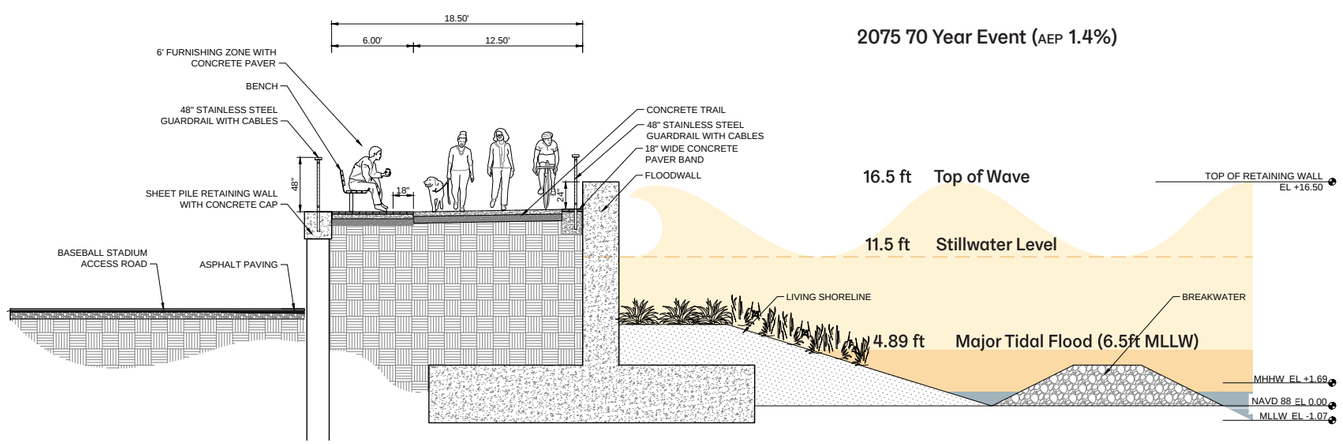




Norfolk Coastal Storm Risk Management Program

Assisting the City of Norfolk implement US Army Corps of Engineers flood risk reduction projects

Ferry landing access at Harbor Park

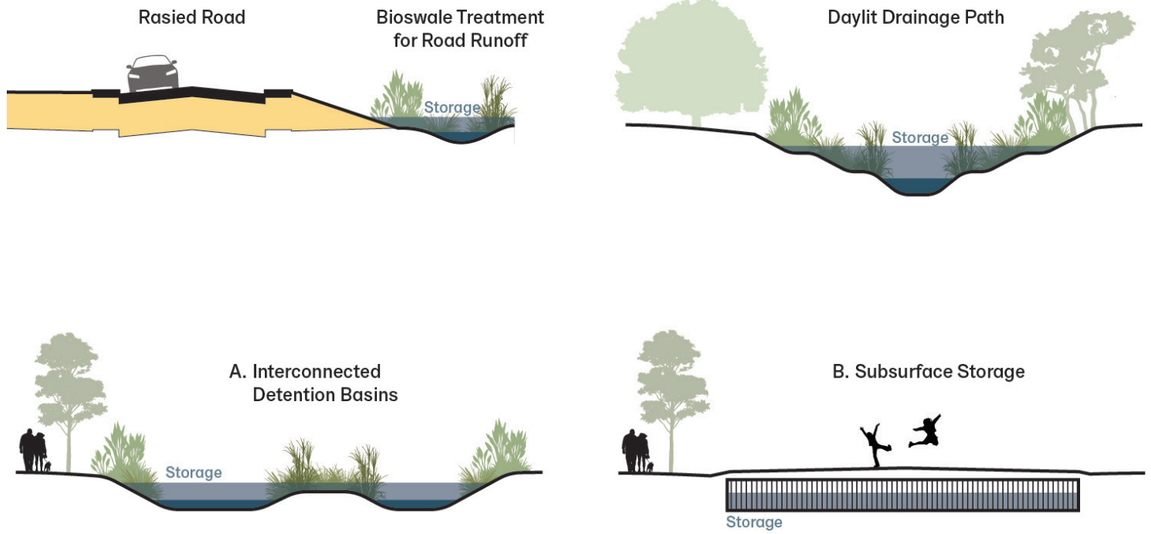


Typical profile with trail, floodwall, and living shoreline

Elizabeth River Trail on top of floodwall alignment at Harbor Park

Natural & Nature-Based Features

Flood mitigation solutions that mimic natural processes



St. Paul's Blue Greenway

Ohio Creek Watershed Project Living Shoreline

Stormwater

Managing water within the CSRM alignment

Ohio Creek Watershed Project Permeable Parking Surfaces and Pump Station

St. Paul's Blue Greenway

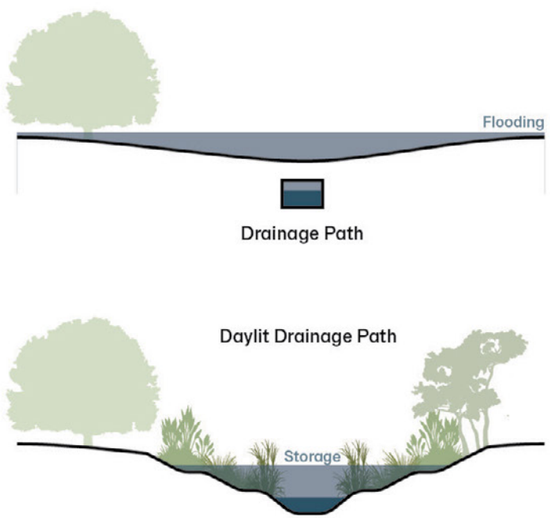
Newton’s Creek Daylighting

MOFFATT & NICHOL / WAGGONNER & BALL / SGA / WSSI

Blue/Greenway

The Blue/Greenway is designed to mitigate flooding by replicating former natural conditions. Although now filled and long forgotten, it is possible to hypothesize the historic character of the creek based upon nearby precedents.

Broad Creek located west of Downtown Norfolk in the River Oaks neighborhood.



02/06/2024

View Looking South from North Plaza and Weir

02/06/2024

View Looking North from South Pedestrian Bridge and Weir

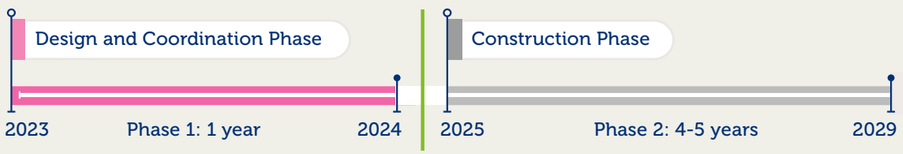
02/06/2024

Non-Structural Projects

Focused on reducing property damage

Critical infrastructure facilities in the City include water treatment plants, waste water treatment plants, pumping stations and highway facilities. These facilities are crucial to the services provided by the City.

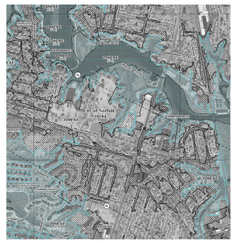
PROJECT TIMELINE

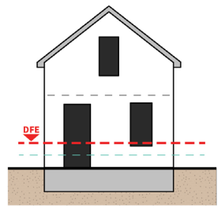


The Elevating Homes Pattern Book

1 Identify your Flood Zone & Elevation.

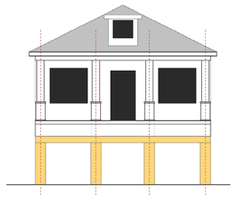
- Refer to NorfolkAIR & FIRM Maps
- Determine the BFE & DFE and Freeboard levels for your district
- Set your target elevation

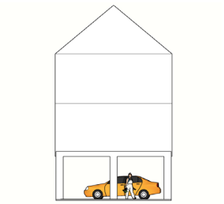




2 Identify your Needs.

- Evaluate Style & Structure.
- Additional site needs - parking, storage, etc.
- Maintain connection to the street and sidewalk levels



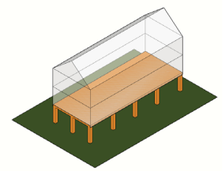


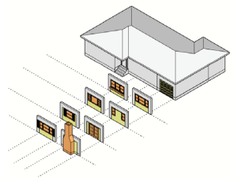
3 Identify your Character District.

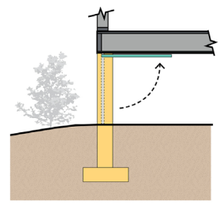
- Refer to NorfolkAIR.
  - Traditional District
  - Downtown District
  - Suburban District
  - Coastal District

4 Use the Kit of Parts.

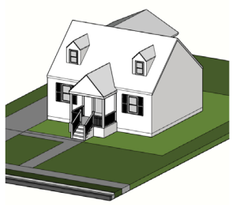
- Select your new foundation type.
- Select new access paths and strategies.
- Determine if your existing structure requires any infill or detail changes due to elevation.
- Determine if you are retrofitting porches and/or accessory structures.
- Select site treatment, improvements, and landscape patterns.







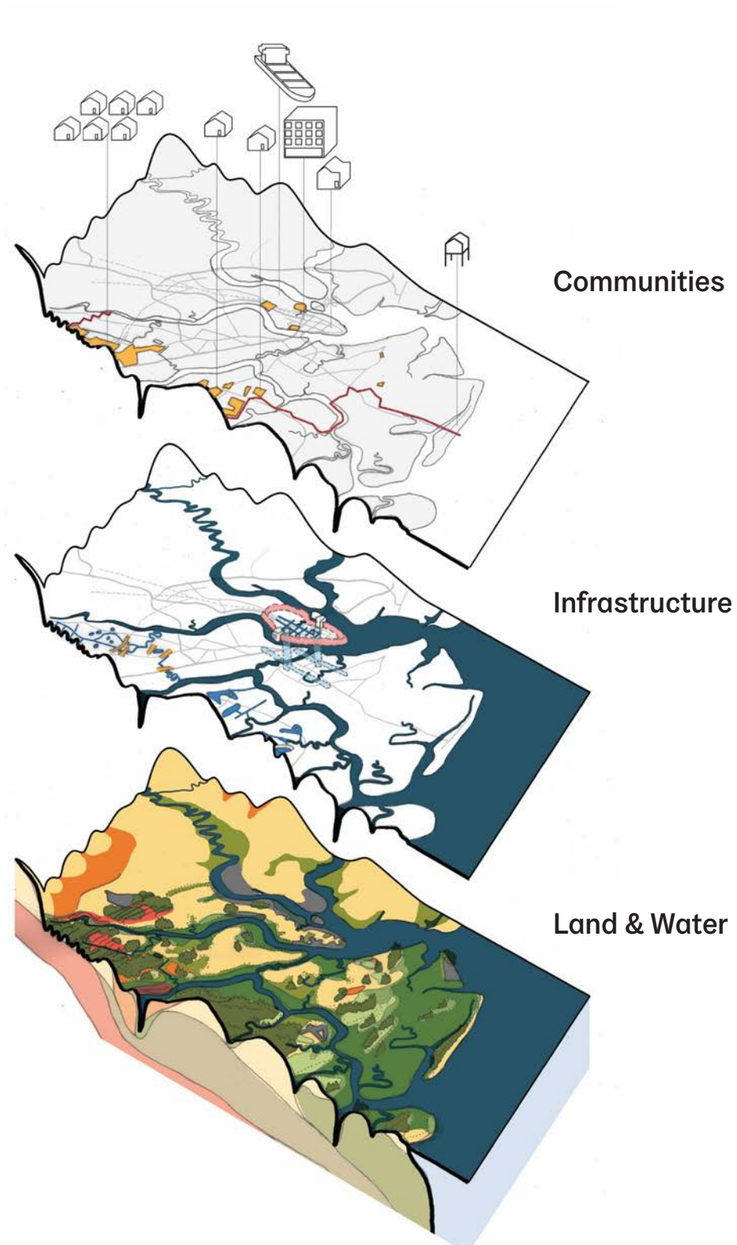
5 Assemble Parts to Create a Whole.



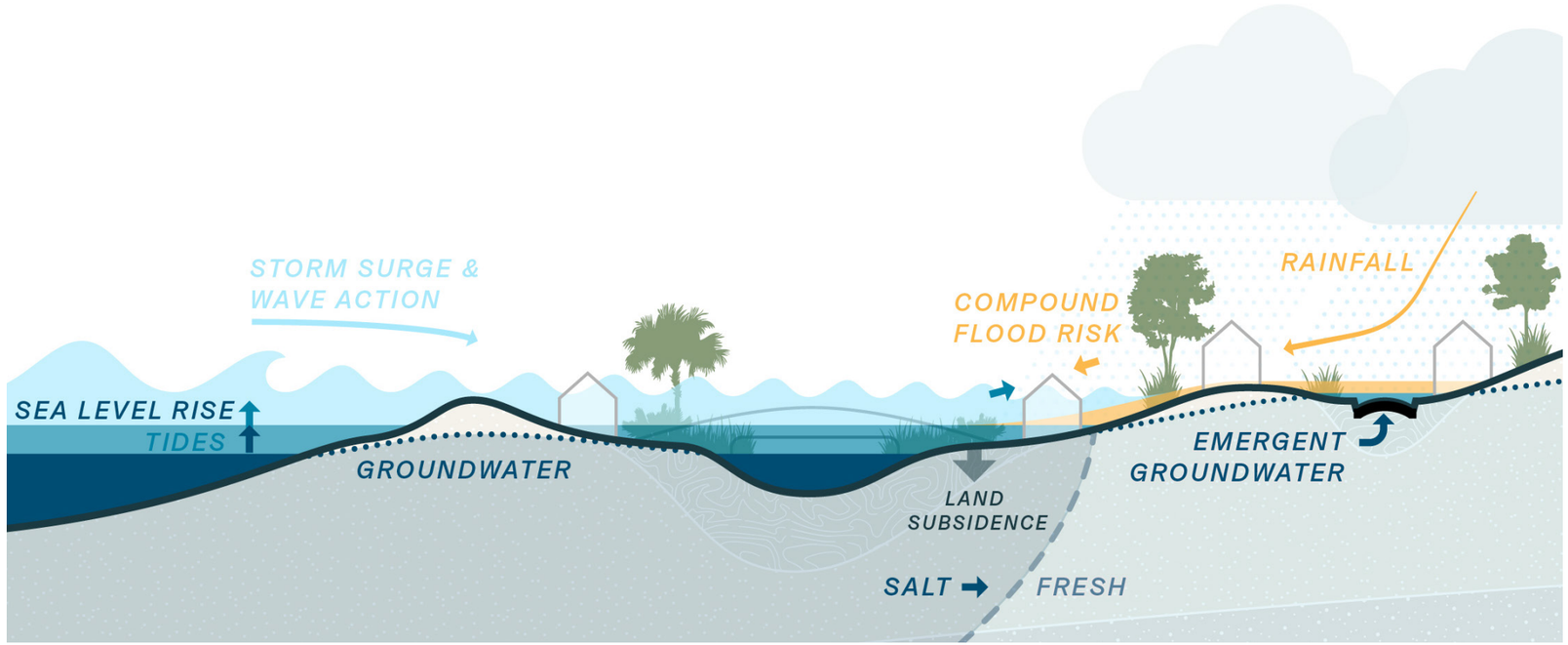
Charleston

Charleston Water Plan

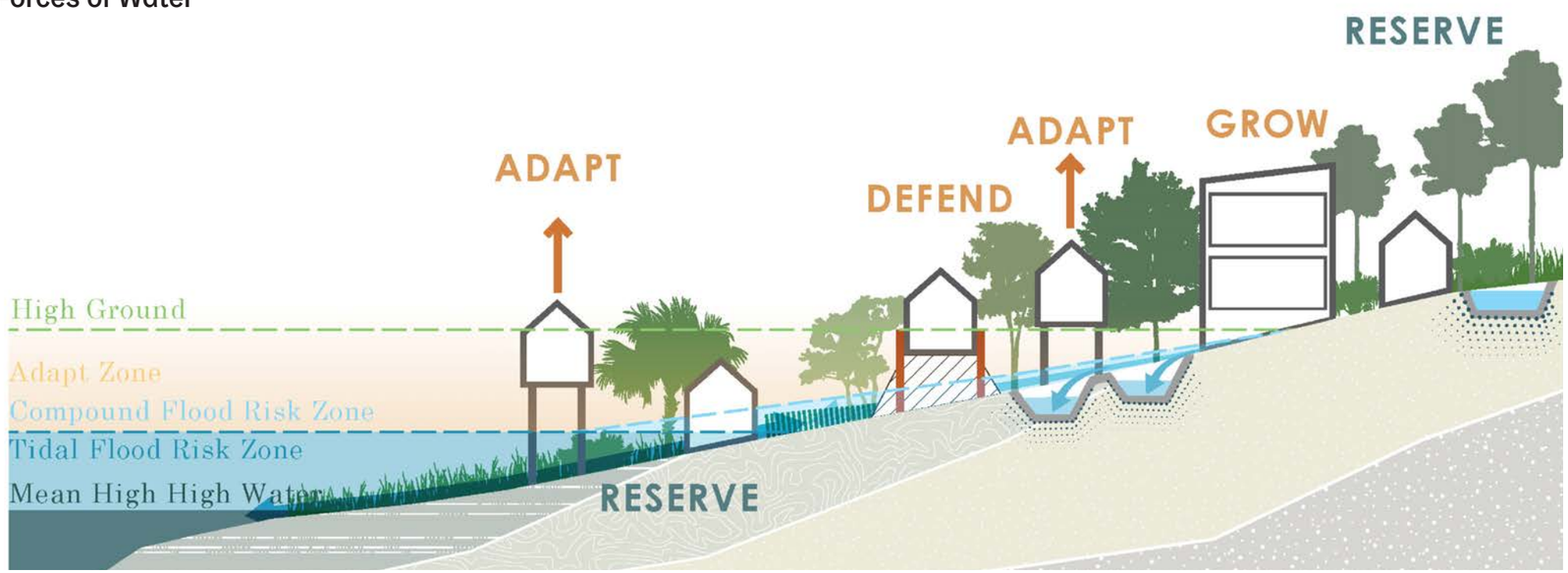
A Foundational Strategy for Managing Flood Risks and Embracing Water's Place in the City's Future



Layered Planning



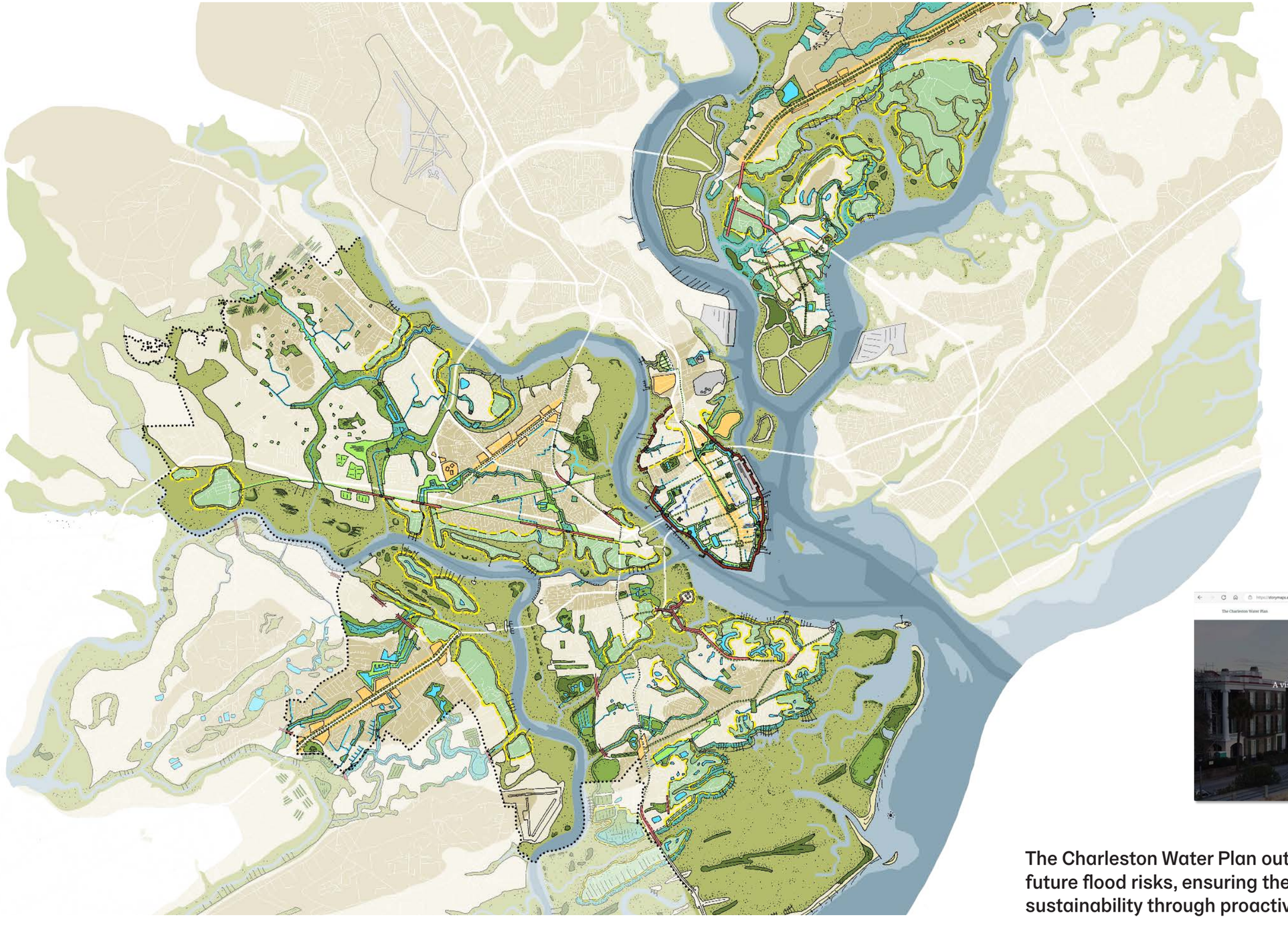
Forces of Water

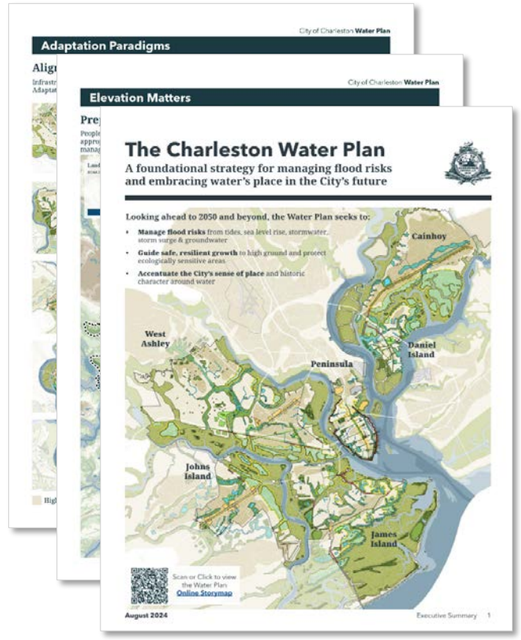


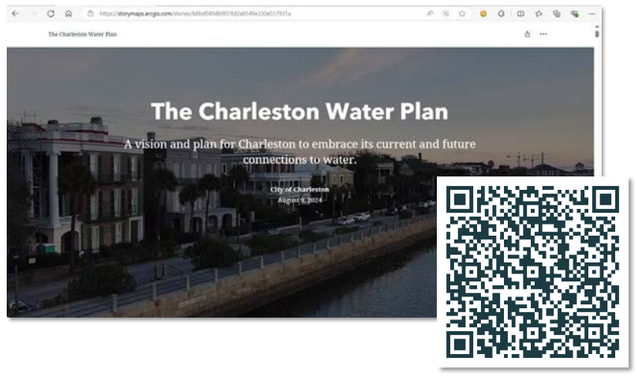
Elevation-based Planning

Charleston Water Plan

A Foundational Strategy for Managing Flood Risks and Embracing Water's Place in the City's Future







The Charleston Water Plan outlines strategies & projects to manage future flood risks, ensuring the City's long-term resilience and sustainability through proactive & inclusive measures.

LA SAFE

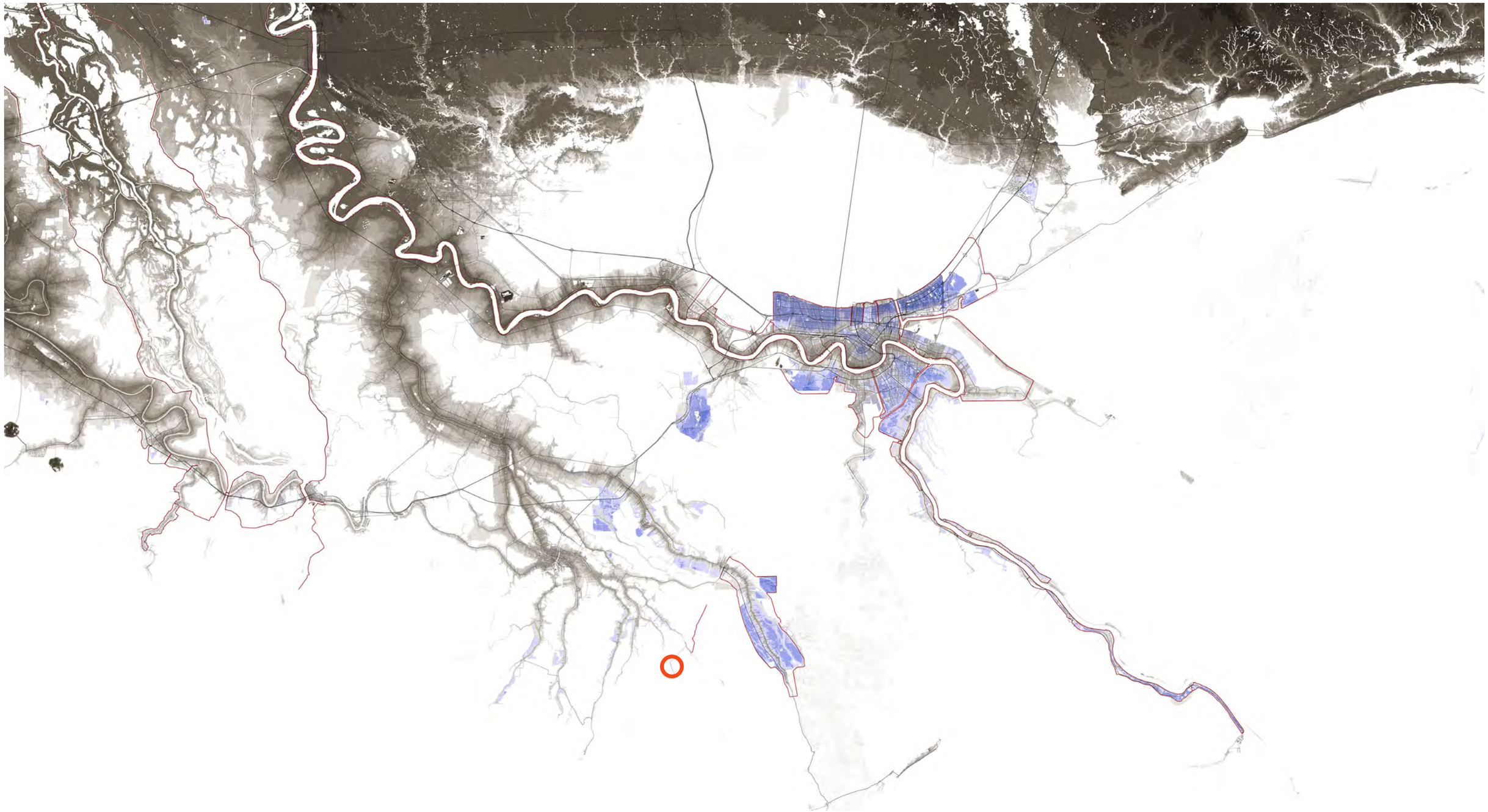

Baton Rouge
Manchac
Galveston
Manchac ou Iberville R.
Madisonville
LAC MAUREPAS
LAC PONTCHARTRAIN
Donaldsonville
N. ORLEANS
Oskibe
Grande R.
B. Sorrel
B. Pigeon
Indigo Creek
Bayou Teche
Mchafalaya R.
B. ATCHAFALAYA
La Fourche
L. DUCKS
L. OUATACHE
L. BARATARIA
B. Perot
B. Barataria
B. St. Denis
Bayou Bastian
L. BORGNE
English Turn
Covington
Pearl R.
B. de St. Louis
B. Biloxi
Pass Christian
I. Cat
I. Ship
S. Michaels keys
Samphire I.
Macon I.
I. au Breton
Grand Gosier
B. Macdi 6
Plaquemine, Bend
Balize
Passe du S.E.

Coastal Condition

Louisiana

Louisiana: High + Low Landscape

Water and wetlands removed. Areas below sea level are shown in purple.



DATA SOURCE: USGS / MAP CREDIT: WAGGONNER & BALL ARCHITECTURE/ENVIRONMENT

Lines of Defense

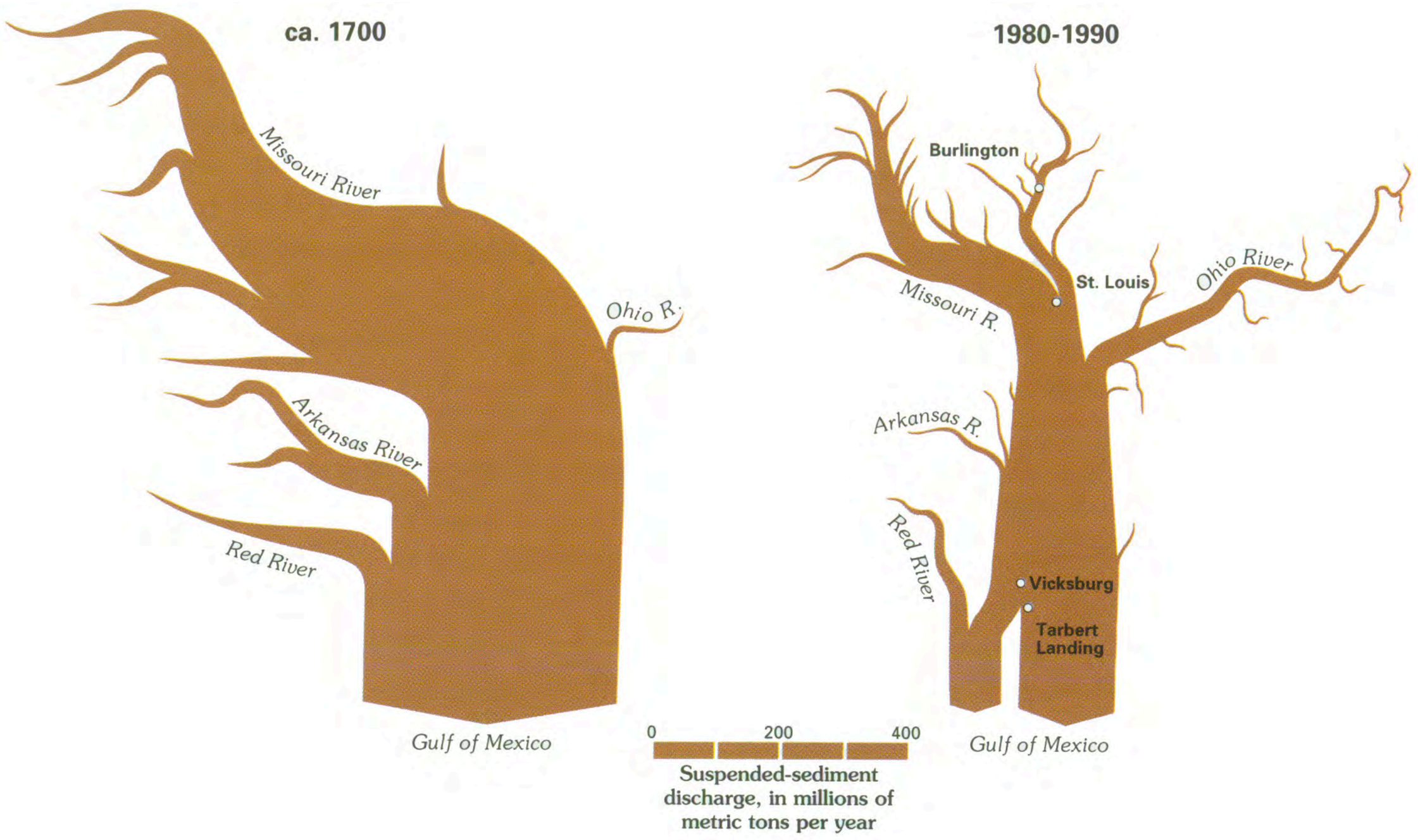
Mississippi Delta

Lines of Defense

Mississippi Delta

Sediment Discharge

Missouri River and Mississippi River



source: U.S. Geological Survey

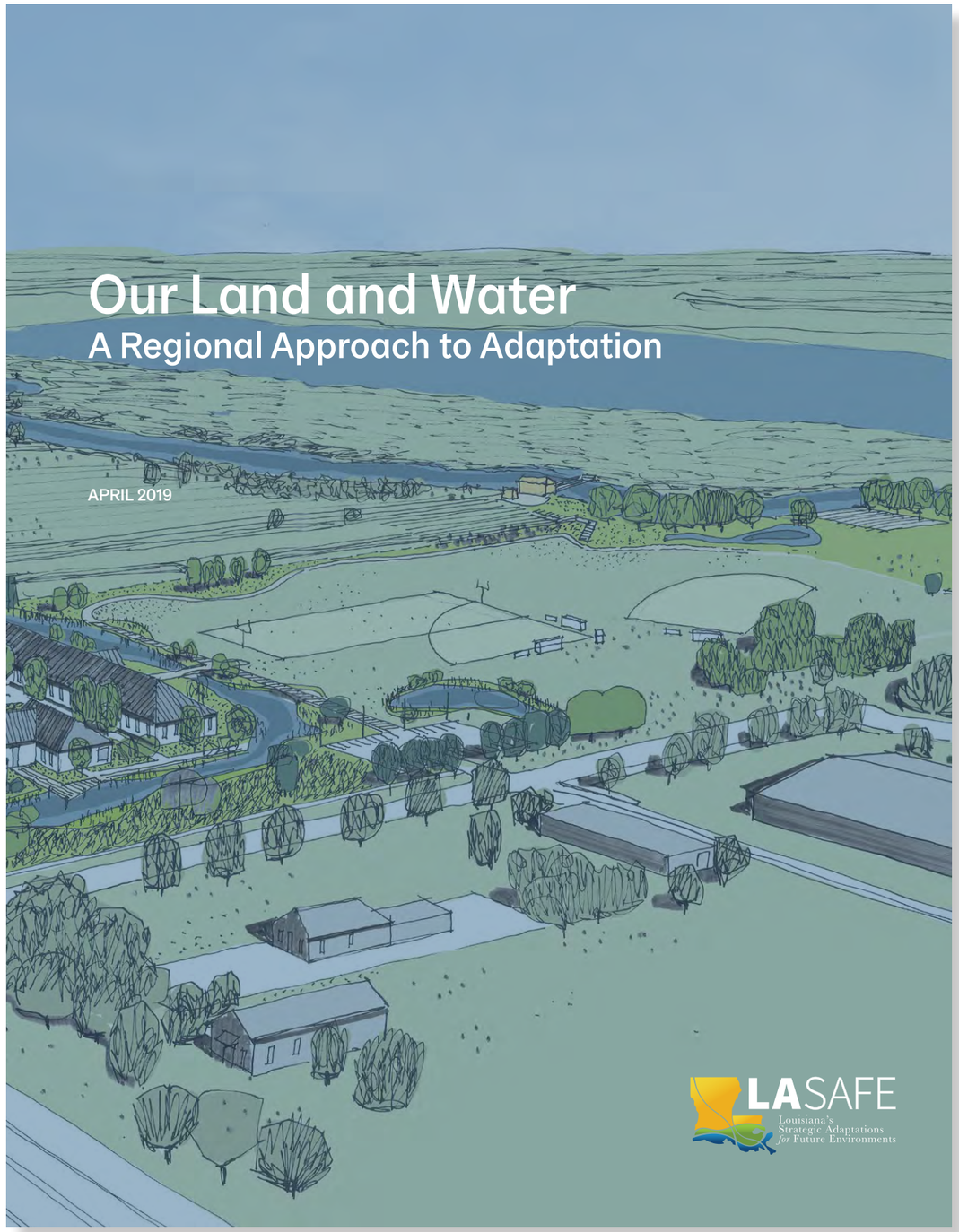
Wetland Loss

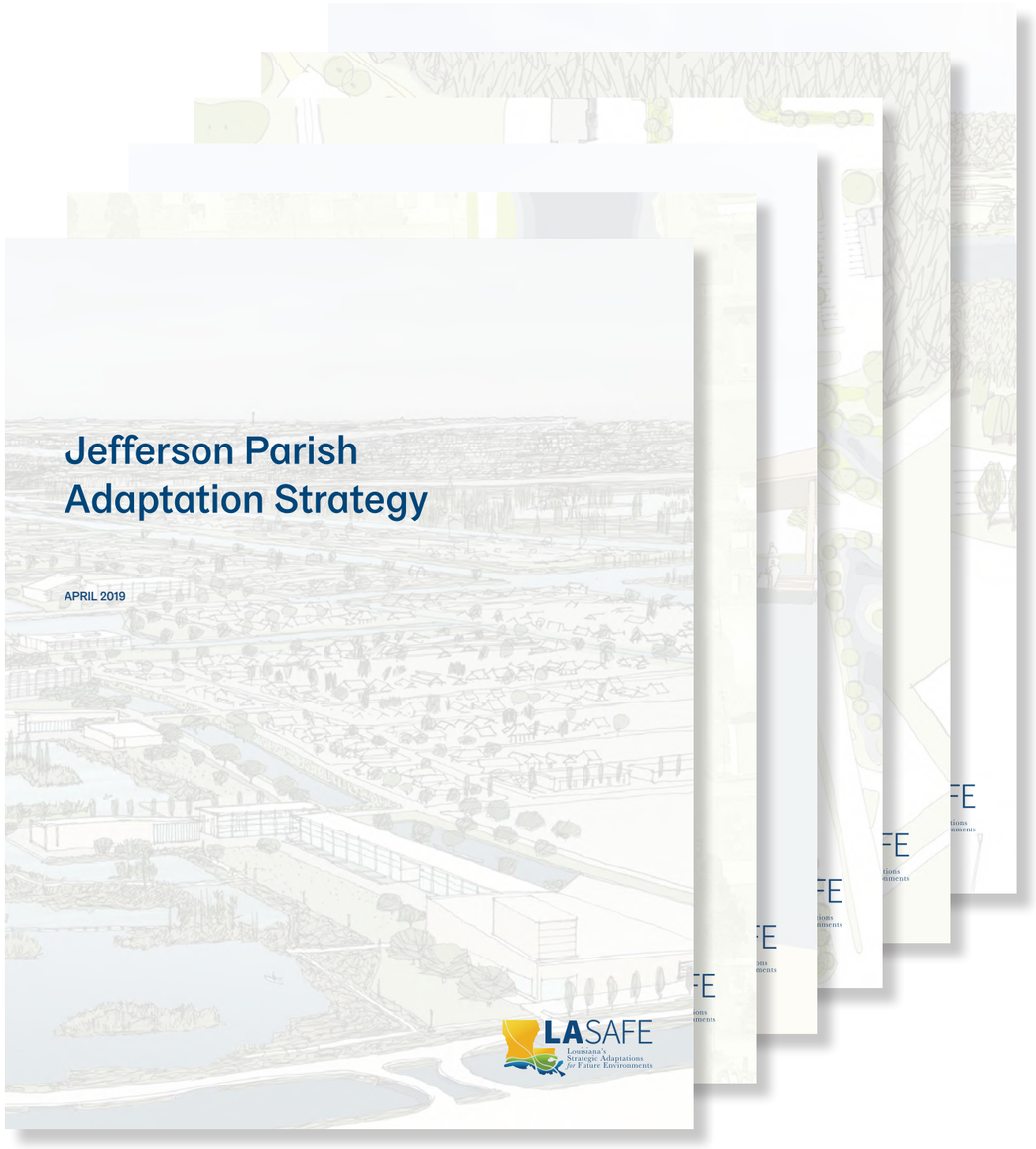
Louisiana

source: Monique Verdin

Regional & Parish Adaptation Strategies

LA SAFE





LASAFE.la.gov

Adaptation Goals & Strategies

LA SAFE

Goal 1: Manage Flooding and Subsidence

Goal 2: Direct Growth to Low Risk Areas

Goal 3: Improve Mobility throughout the Parish and Region

Goal 4: Strengthen and Diversify Local Economies

Goal 5: Protect and Promote Historic and Cultural Assets

Coastal Condition, 1820

LA SAFE

Water

Wetlands

N

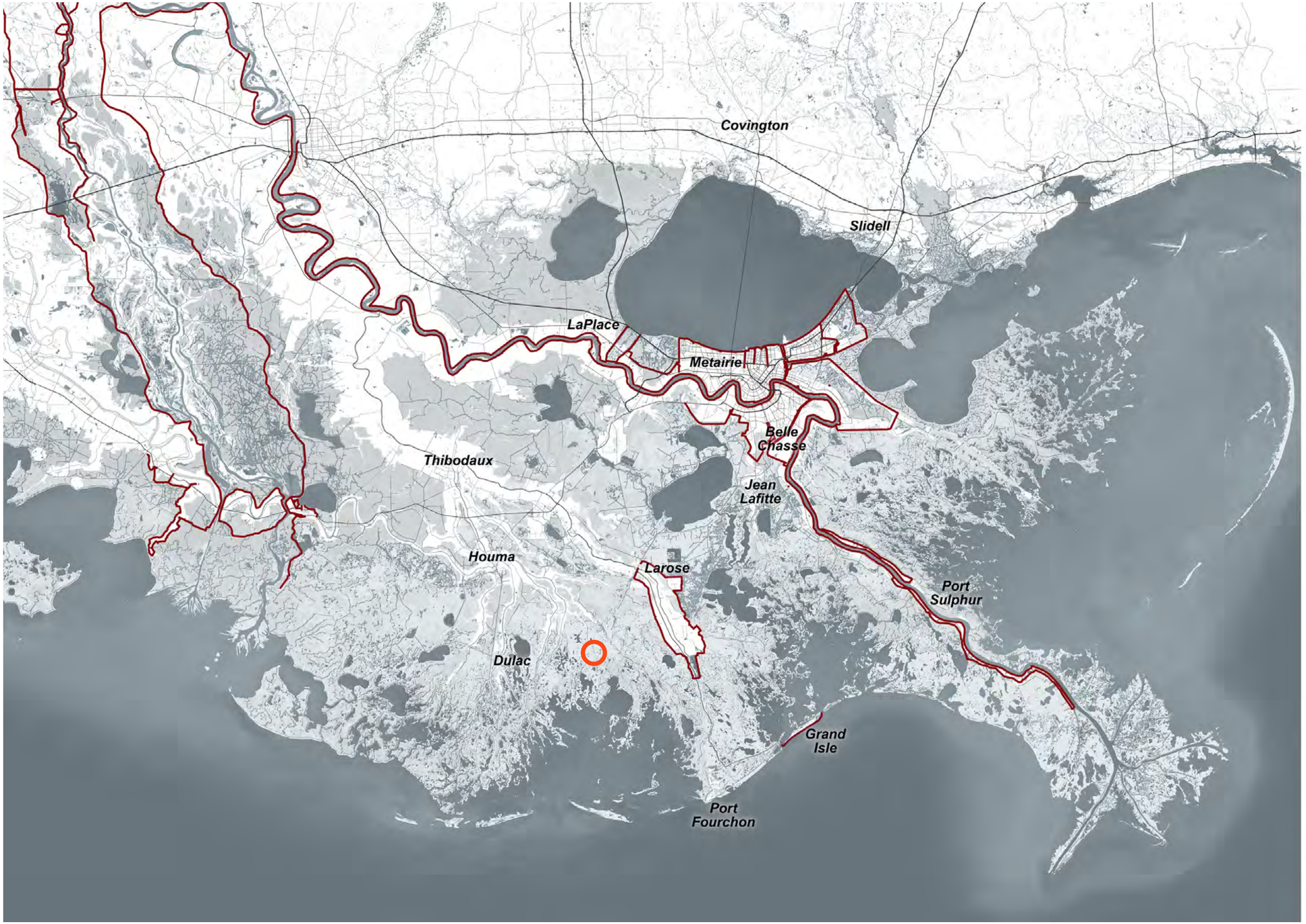
0 5 10 20 Miles

Sources: David Rumsey Map Collection

US Census TIGER/Line 2010, USGS National Hydrography Dataset, NOAA, Atlas: The Louisiana Statewide GIS, Esri, TomTom, Tele Atlas North America, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Coastal Condition, 1960

LA SAFE

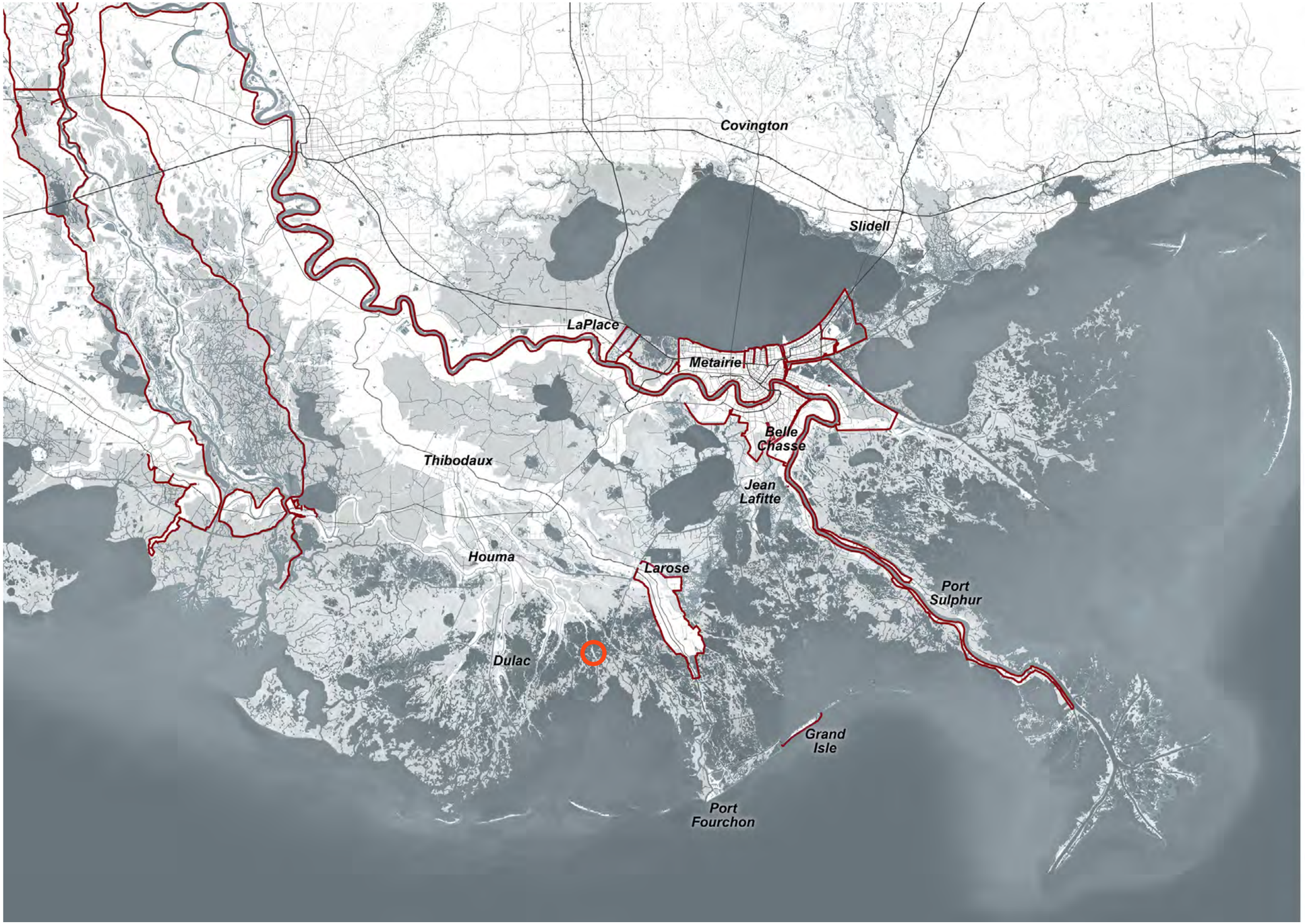


Sources: CPRA Coastal Master Plan 2017 and USGS

US Census TIGER/Line 2010, USGS National Hydrography Dataset, NOAA, Atlas: The Louisiana Statewide GIS, Esri, TomTom, Tele Atlas North America, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Coastal Condition, 2017

LA SAFE

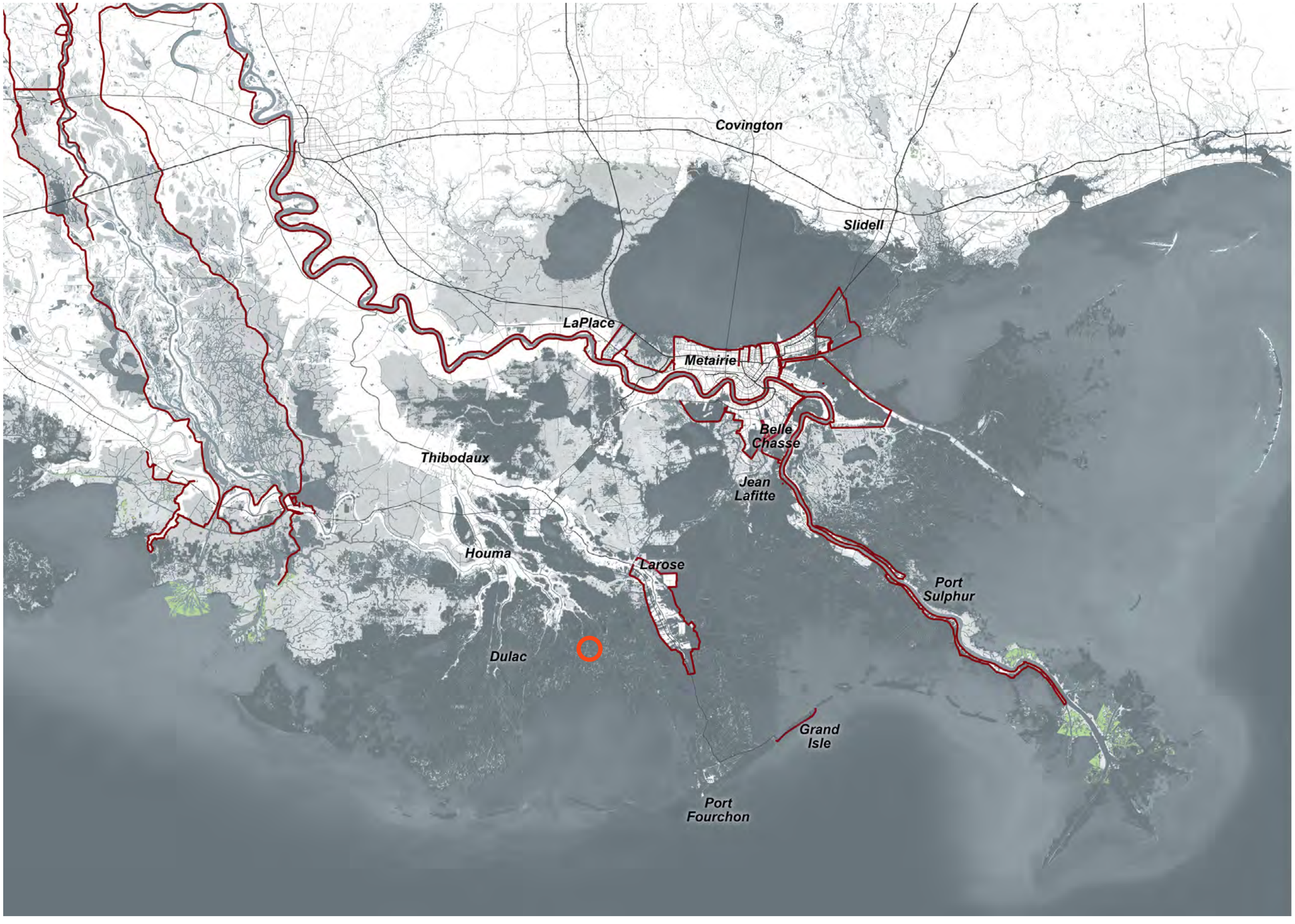


Sources: CPRA Coastal Master Plan 2017 and USGS

US Census TIGER/Line 2010, USGS National Hydrography Dataset, NOAA, Atlas: The Louisiana Statewide GIS, Esri, TomTom, Tele Atlas North America, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Coastal Condition, 2067 (No Action)

LA SAFE



Water

Wetlands

Wetlands Created

Levees

N

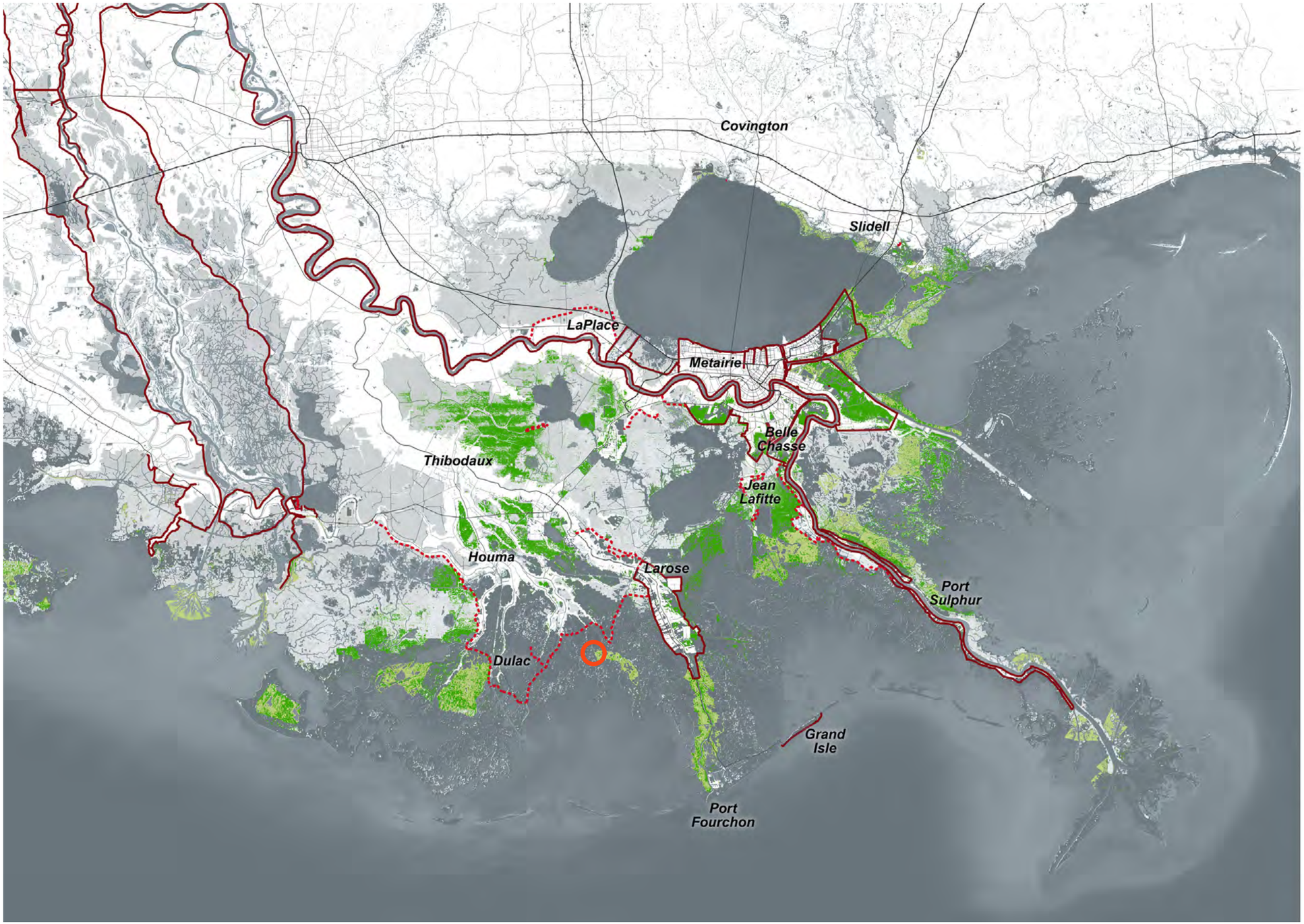
0 5 10 20 Miles

Sources:

US Census TIGER/Line 2010, USGS National Hydrography Dataset, NOAA, Atlas: The Louisiana Statewide GIS, Esri, TomTom, Tele Atlas North America, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Coastal Condition, 2067 (With Action)

LA SAFE



Water
Wetlands
Wetlands Sustained
Wetlands Created
Levees
CPRA Proposed Levees

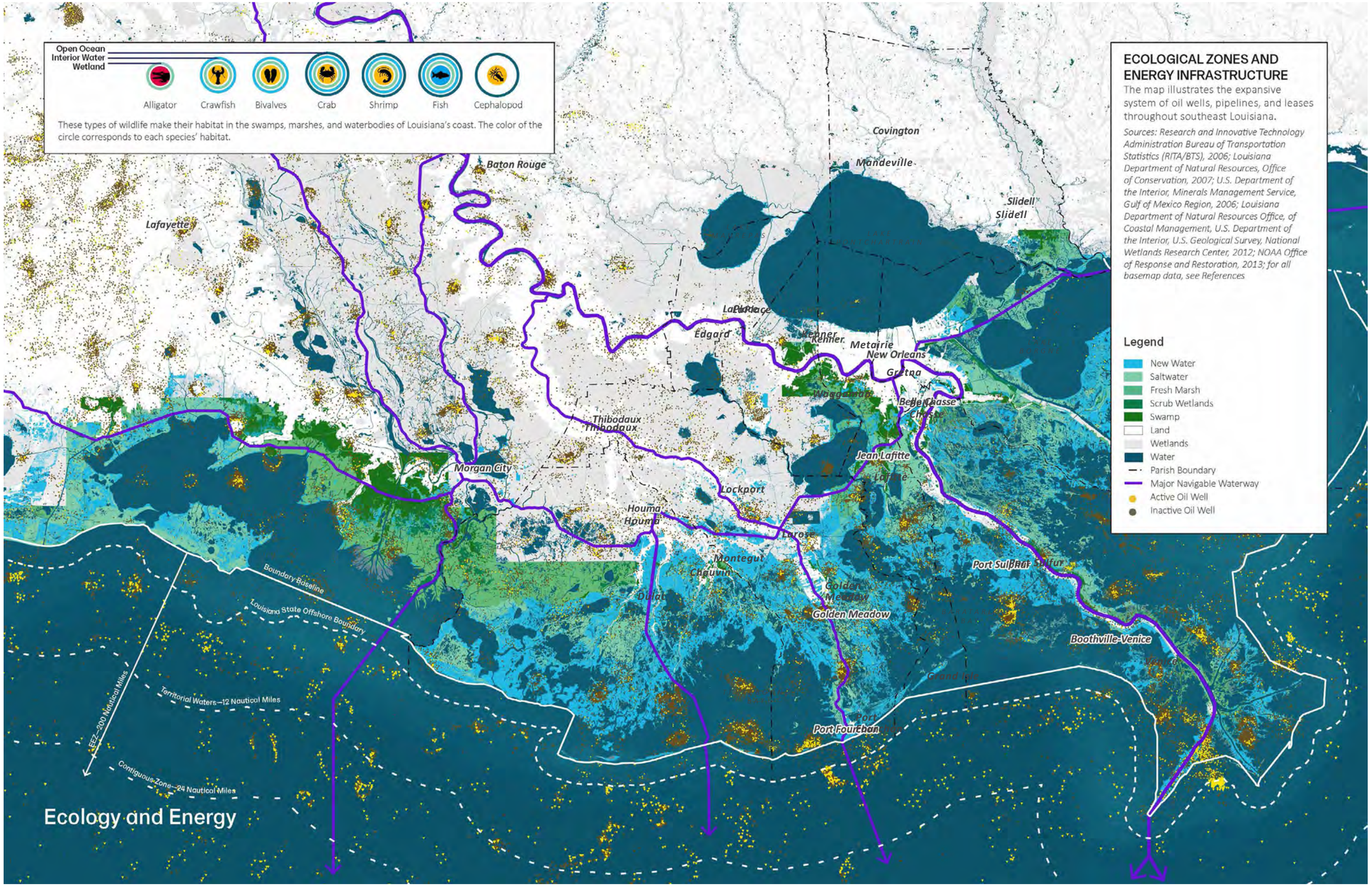
N
0 5 10 20 Miles

Sources: CPRA Coastal Master Plan 2017 and USGS

US Census TIGER/Line 2010, USGS National Hydrography Dataset, NOAA, Atlas: The Louisiana Statewide GIS, Esri, TomTom, Tele Atlas North America, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Ecology and Infrastructure

LA SAFE



Risk Zones

LA SAFE

Low Risk

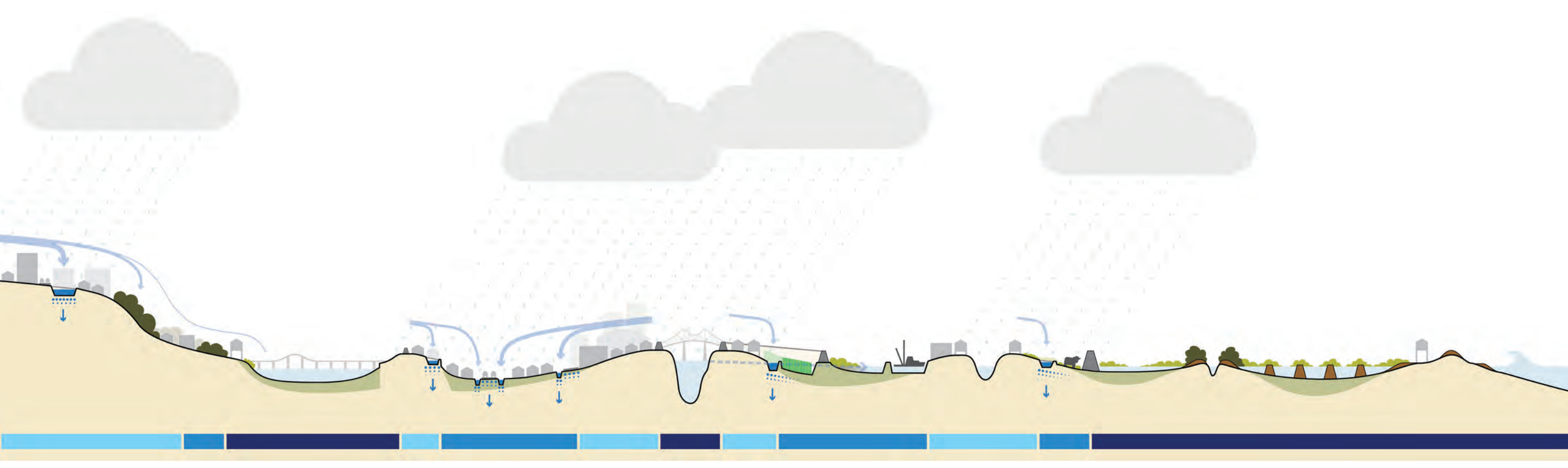
Minimal storm surge flood risk projected and outside the current 100-year floodplain

Moderate Risk

>0 – 6’ projected storm surge flood depths or within the current 100-year floodplain

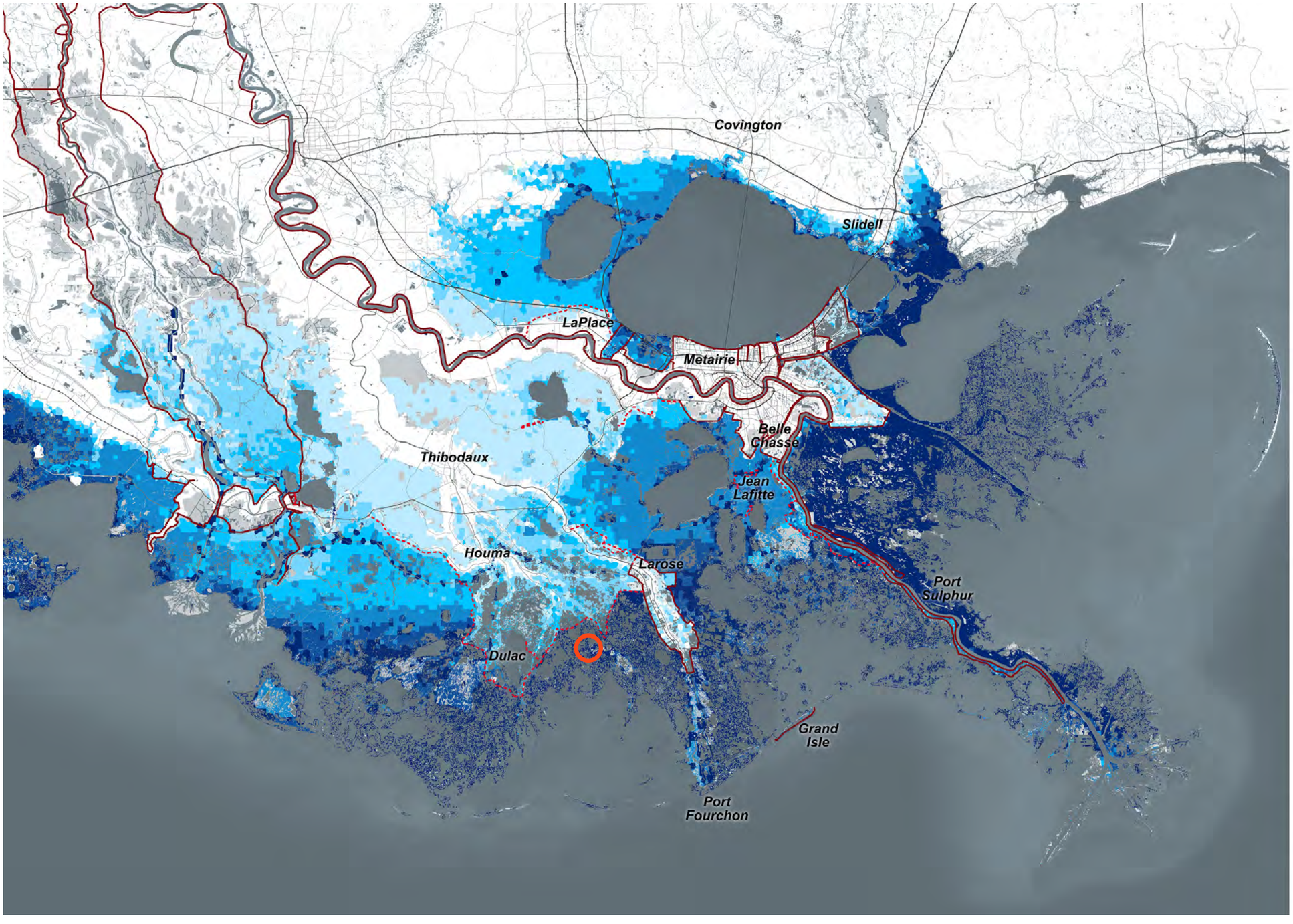
High Risk

>6’ projected storm surge flood depths



Flood Risk, 2067 (With Action)

LA SAFE

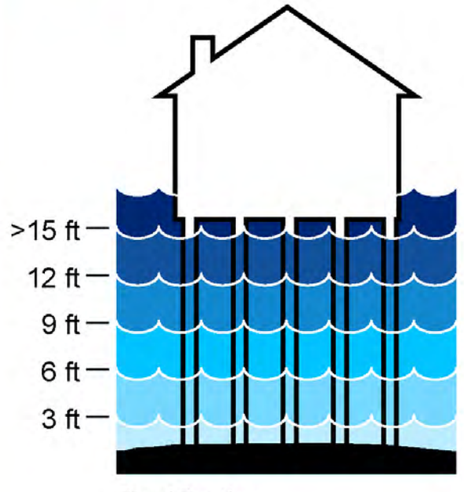


Water

Wetlands

Levees

CPRA Proposed Levees



Flood Depths

N

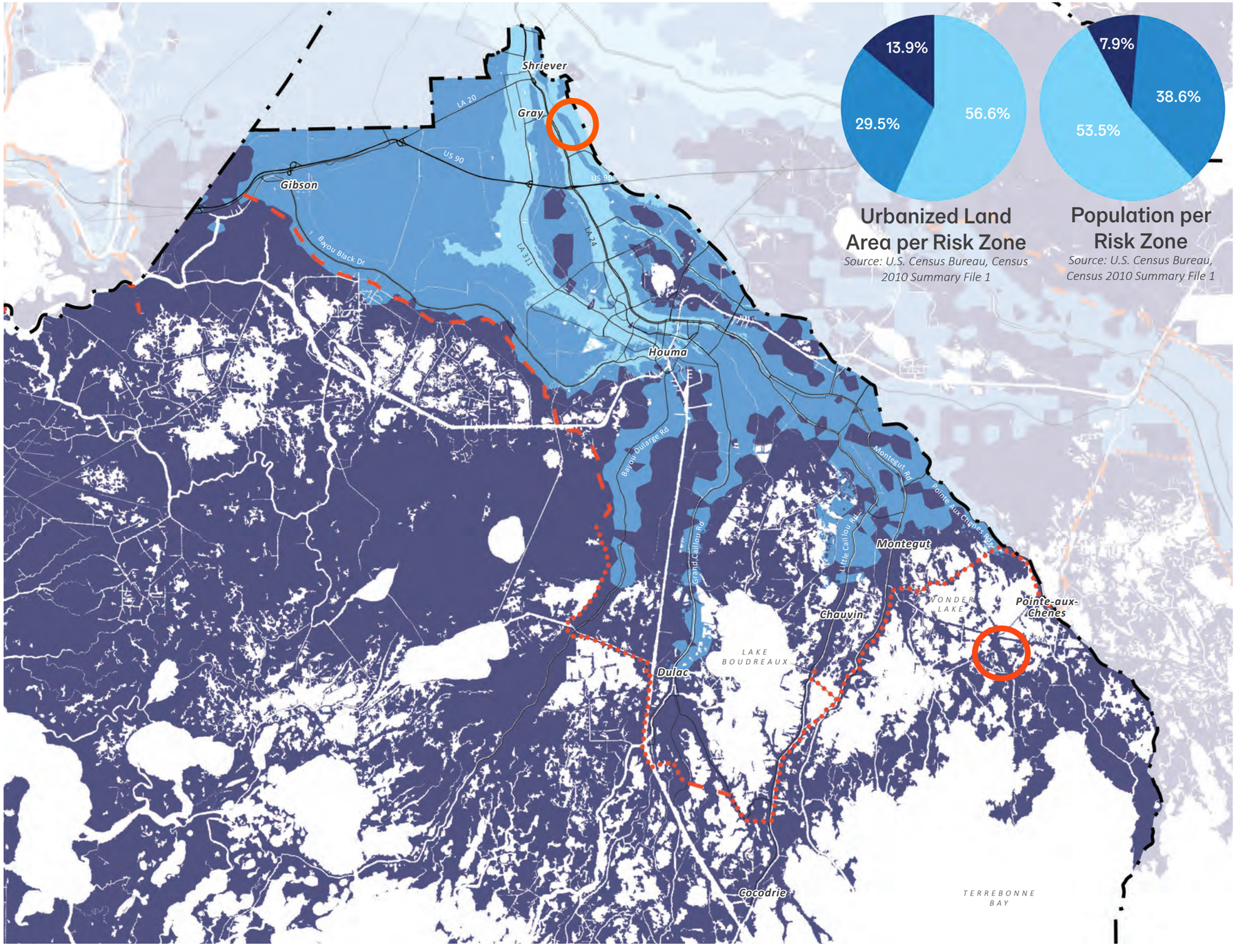
0 5 10 20 Miles

Sources: CPRA Coastal Master Plan 2017 and USGS

US Census TIGER/Line 2010, USGS National Hydrography Dataset, NOAA, Atlas: The Louisiana Statewide GIS, Esri, TomTom, Tele Atlas North America, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Combined Flood Risk Zones

LA SAFE - Terrebonne Parish



Urbanized Land Area per Risk Zone

Source: U.S. Census Bureau, Census 2010 Summary File 1

Population per Risk Zone

Source: U.S. Census Bureau, Census 2010 Summary File 1

Legend

Low Risk
0' - 3' projected flood depths

Moderate Risk
3' - 6' projected flood depths
Within the 100-year floodplain

High Risk
6' + projected flood depths

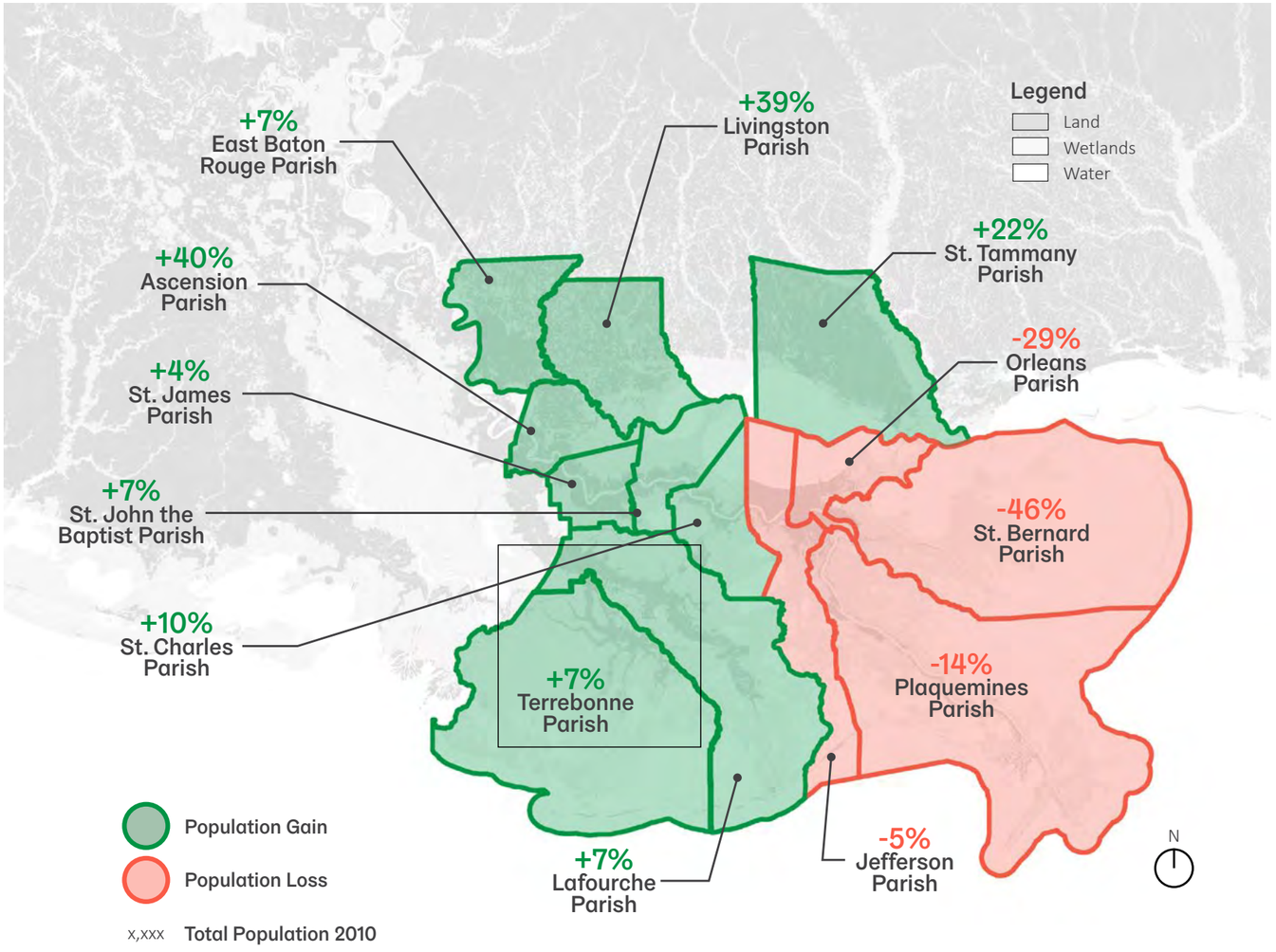
Non-Federal Levee

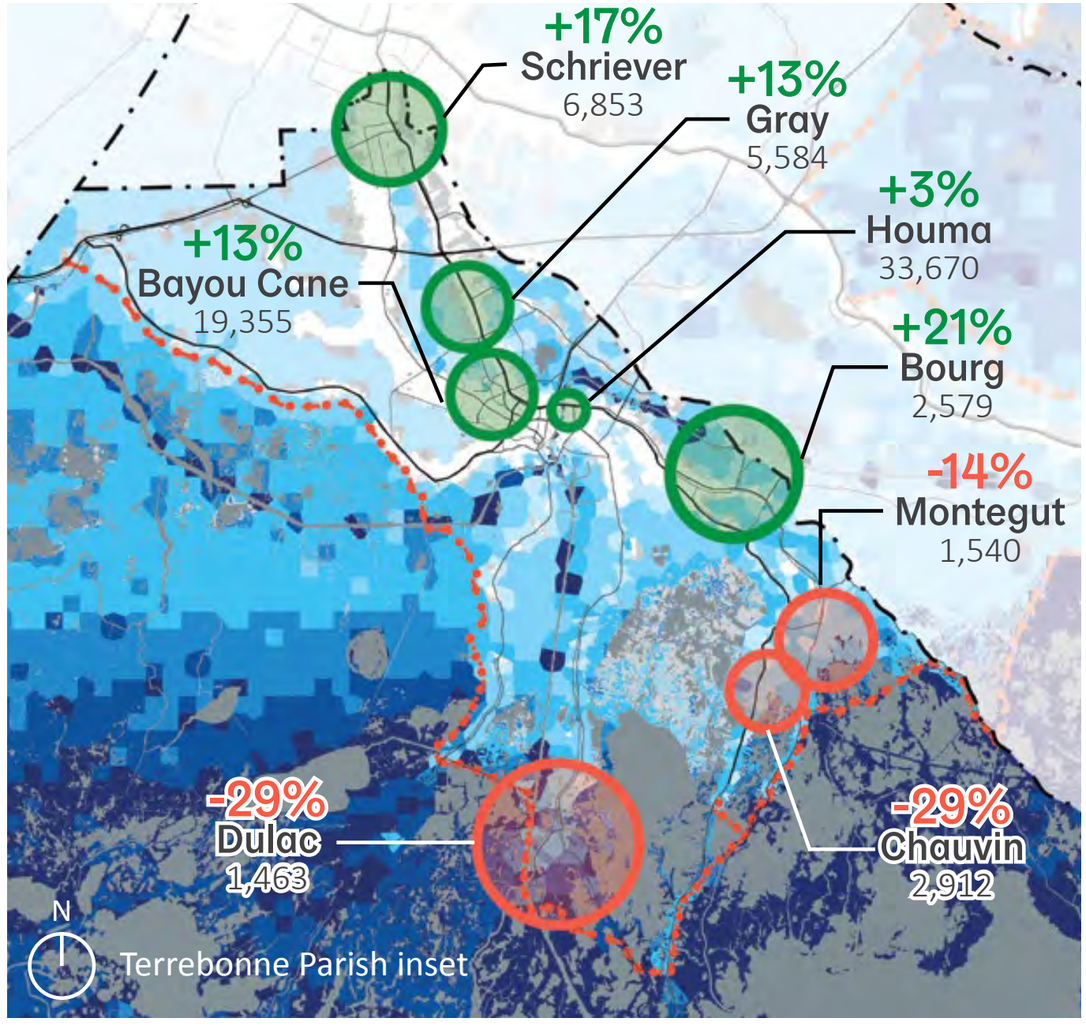
CPRA Proposed Levee

Parish Boundary

Shifting Populations 2000-2010

LA SAFE



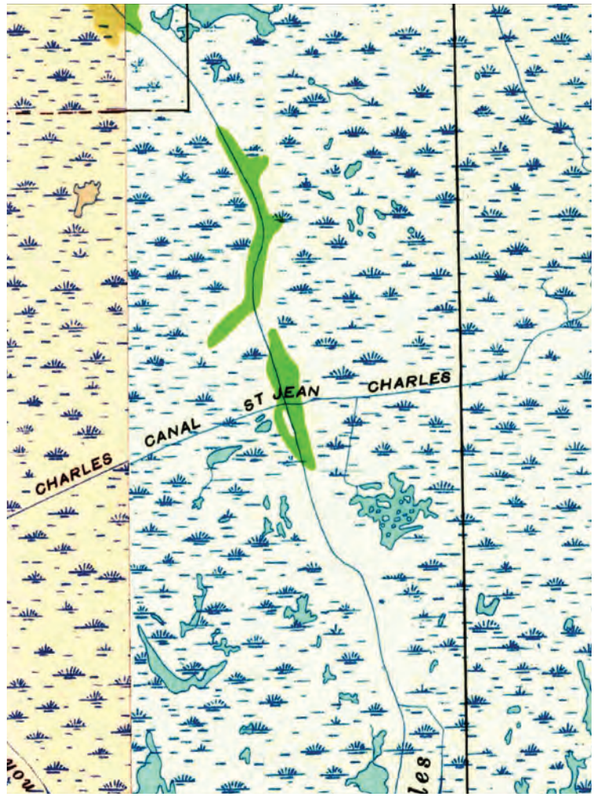


LASAFE Community Resettlement

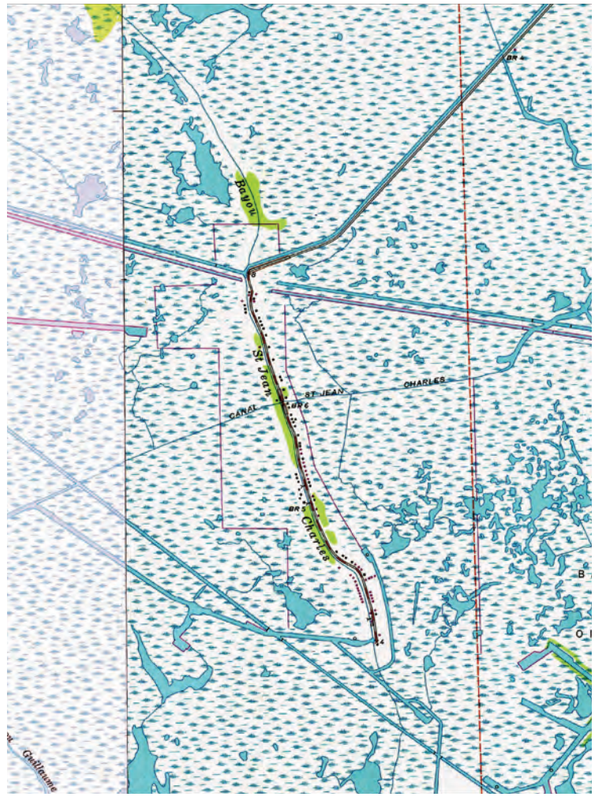
Historic Landscape

source: isledejeancharles.com

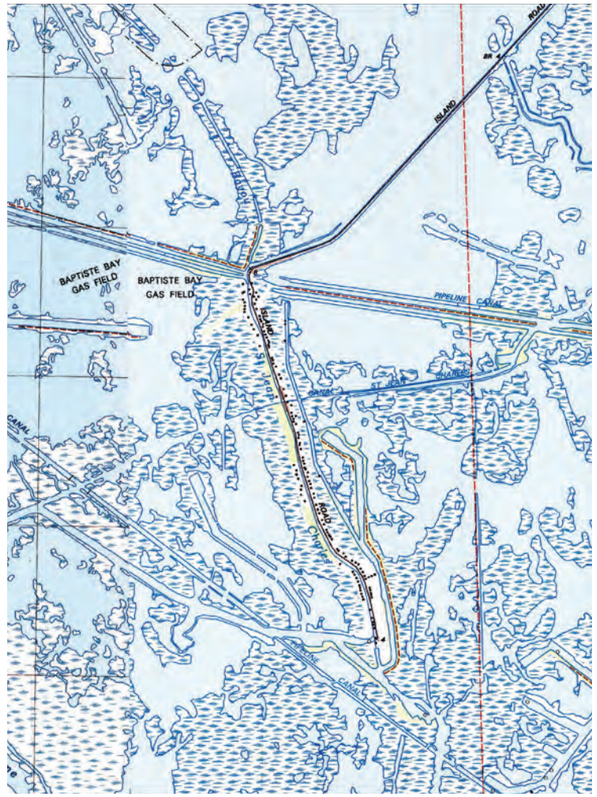
Wetland Loss



1939



1979



1998

2018

source: USGS

Island Road

source: OLIN

Housing

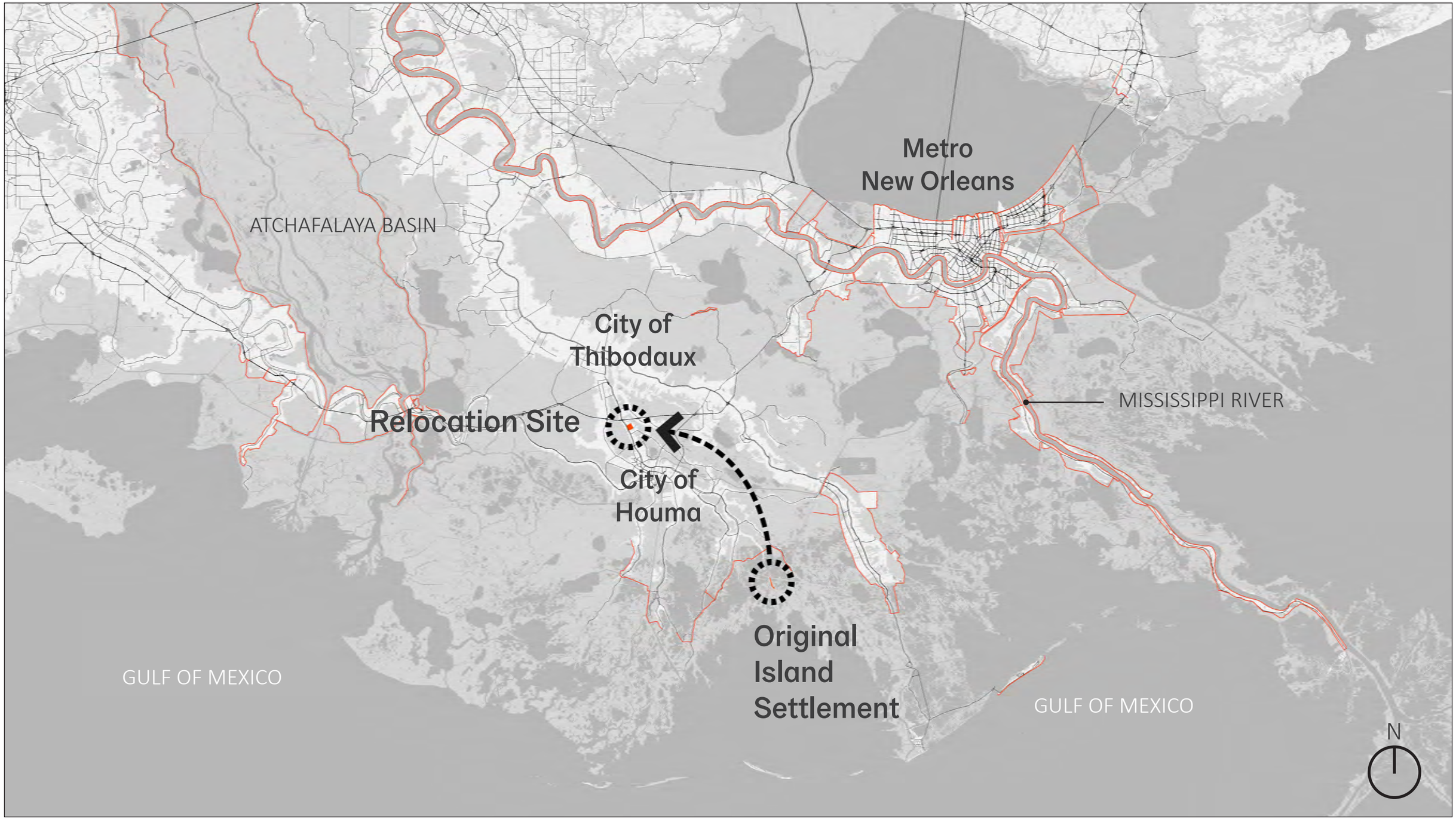
source: OLIN

Housing

source: CB&I

LASAFE

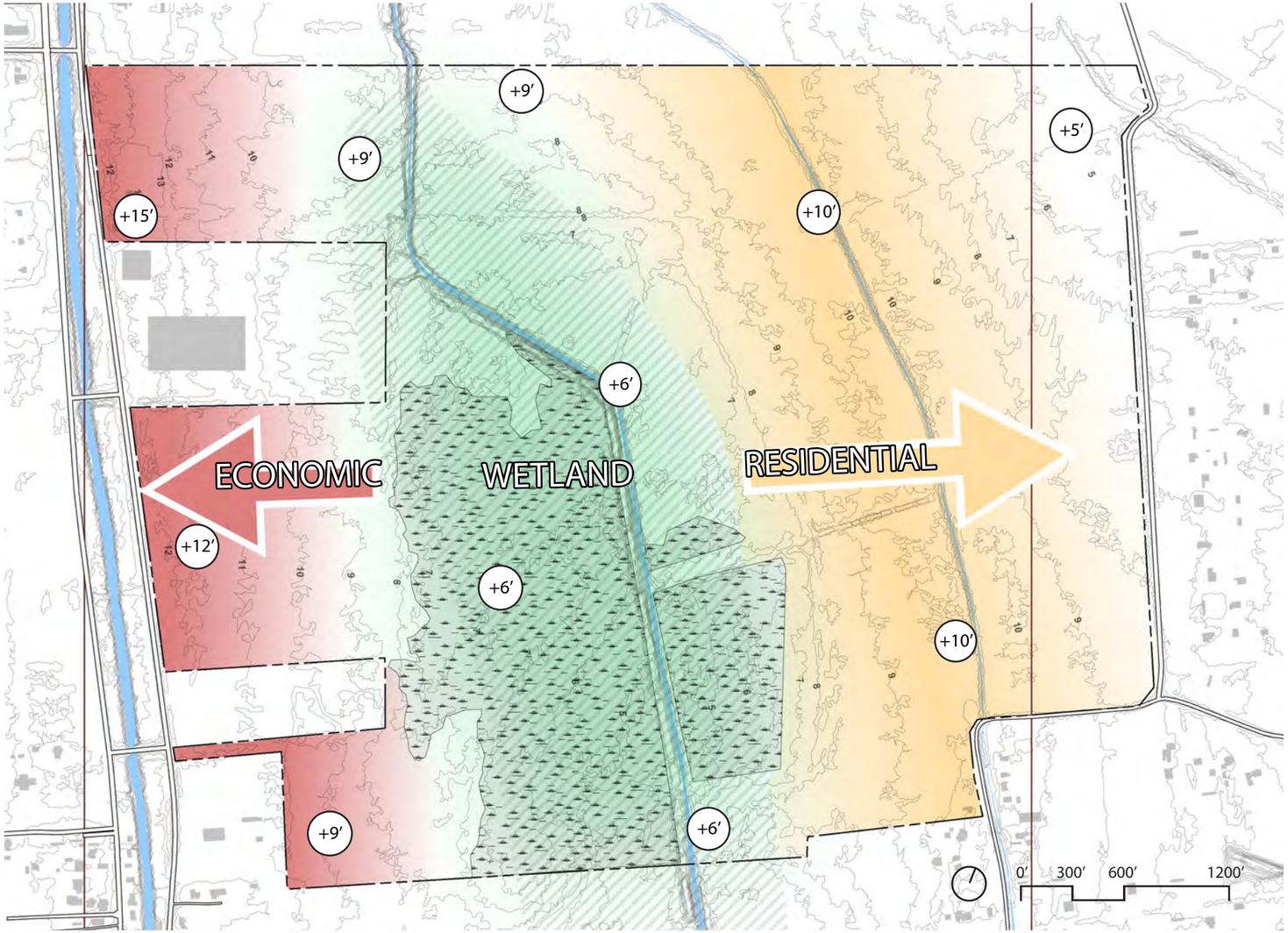
Community Resettlement

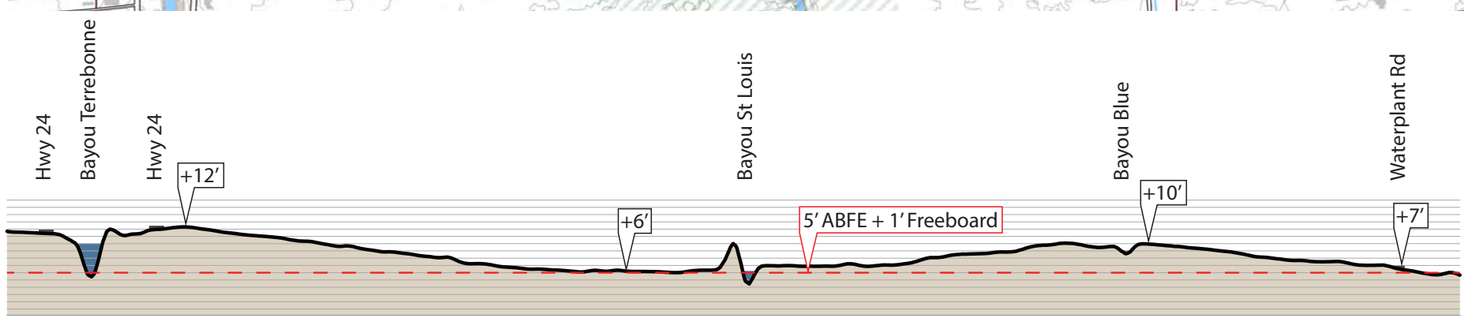


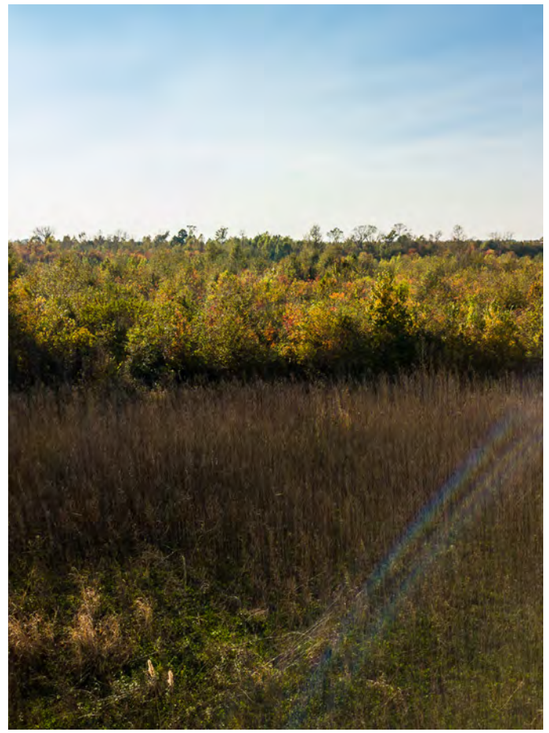
Community Workshops

Community Workshops

Site Approach



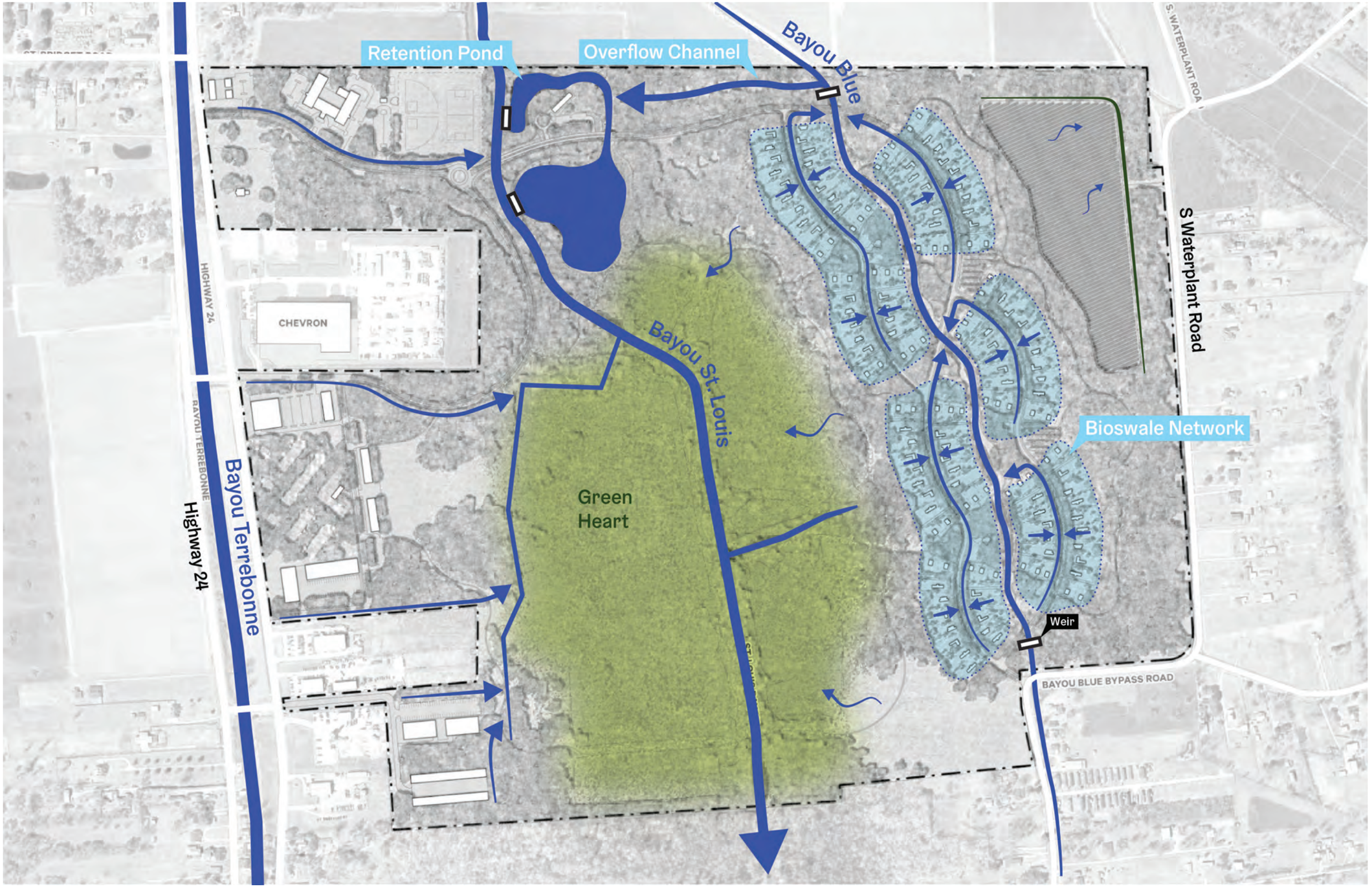




WETLAND PLANTS WILL BE A NATURAL BUFFER BETWEEN ECONOMIC AND RESIDENTIAL AREAS.

New Isle Plan

New Isle Hydrology



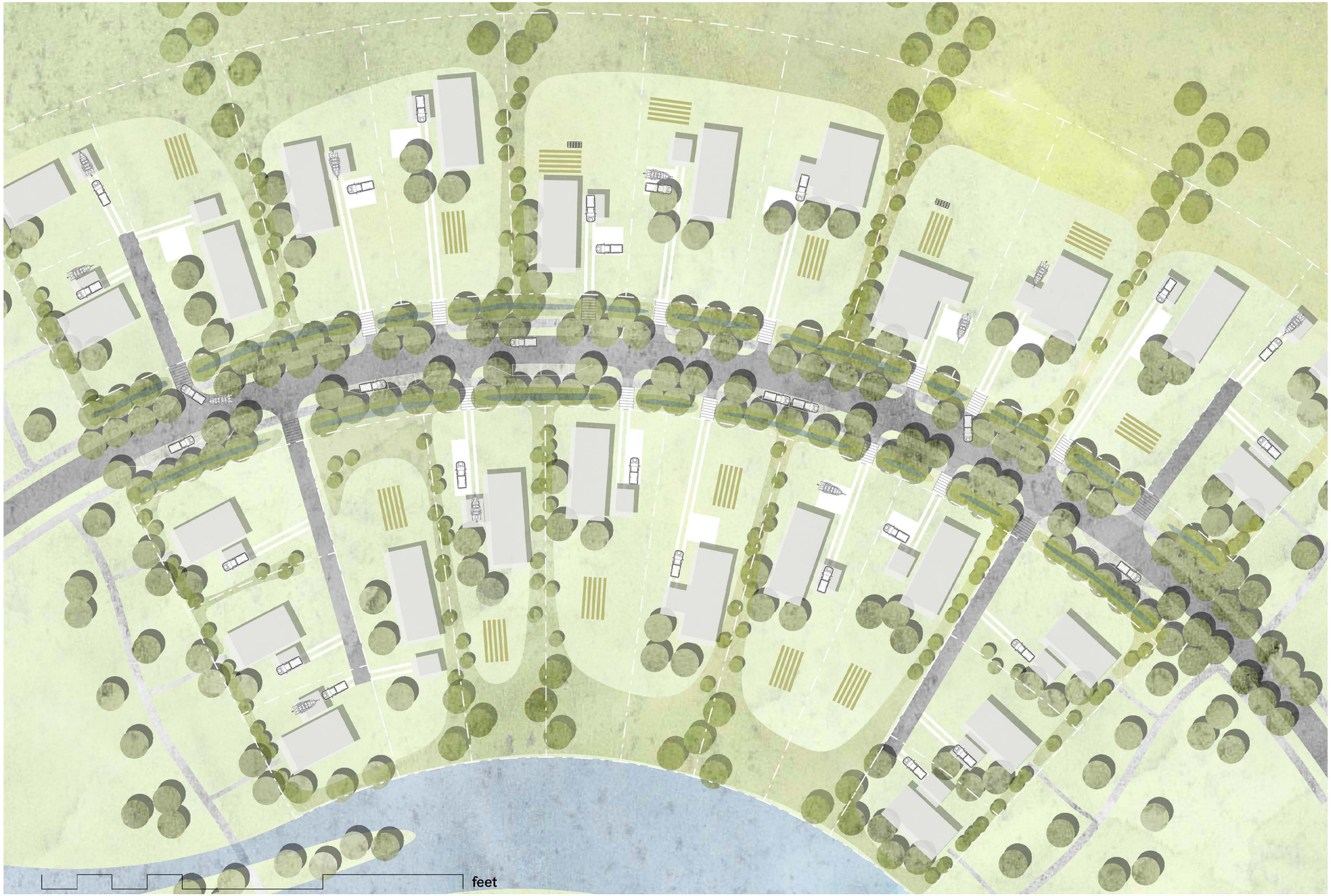
Commercial Buildings

Community Building

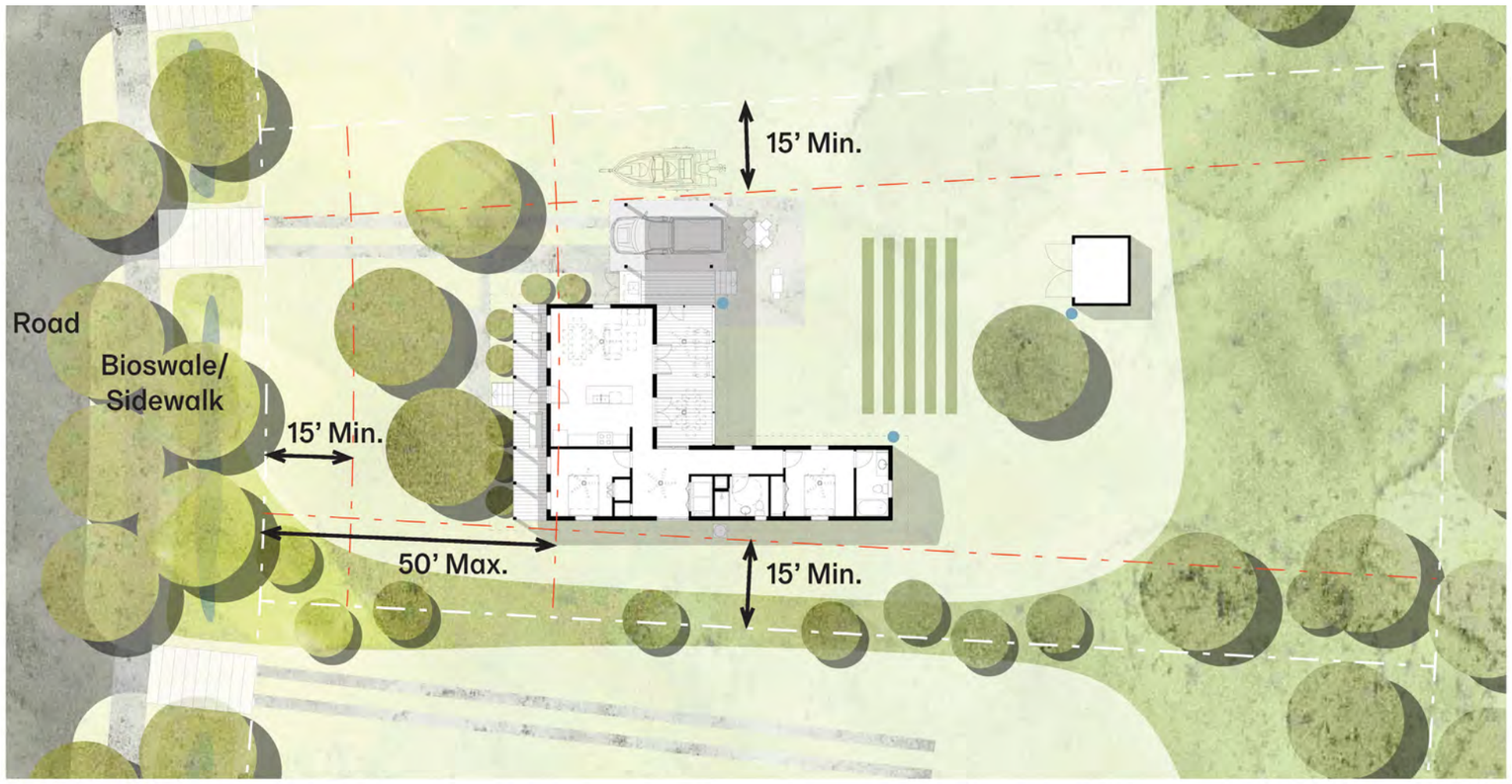
Community Building

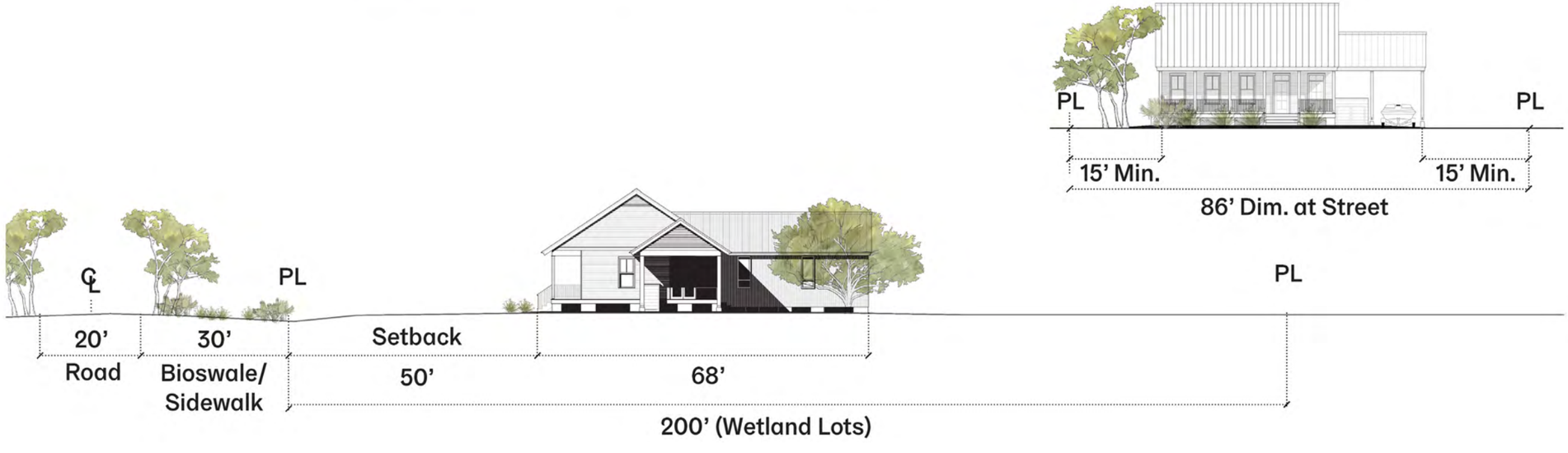

EXIT

Residential Petal Plan

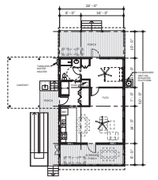
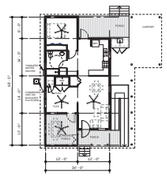
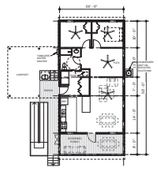
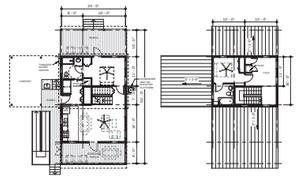
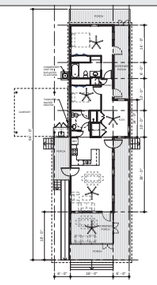
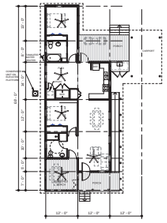
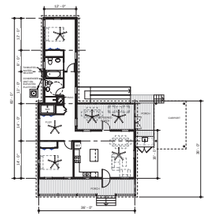
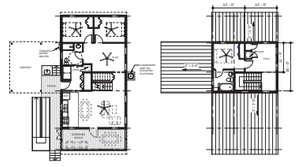
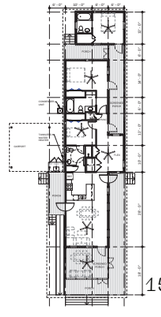
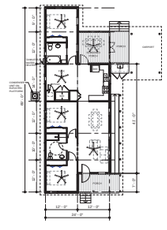
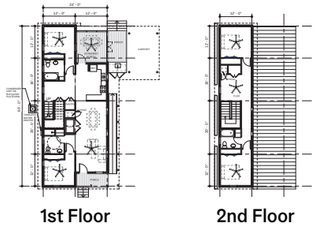
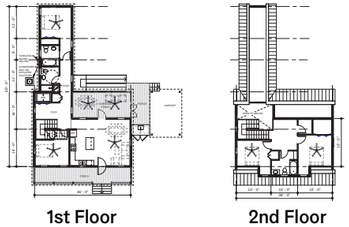


Residential Lot Design





Housing Matrix

Types / Size				
1-Bed	 818 SF			 898 SF
2-Bed	 1067 SF	 1st Floor 2nd Floor 1294 SF	 1271 SF	 1252 SF	 1216 SF
3-Bed		 1st Floor 2nd Floor 1552 SF	 1514 SF	 1401 SF	
4-Bed				 1st Floor 2nd Floor 2018 SF	 1st Floor 2nd Floor 1891 SF

Community Parks

Porches

Residential Street

Site

Site

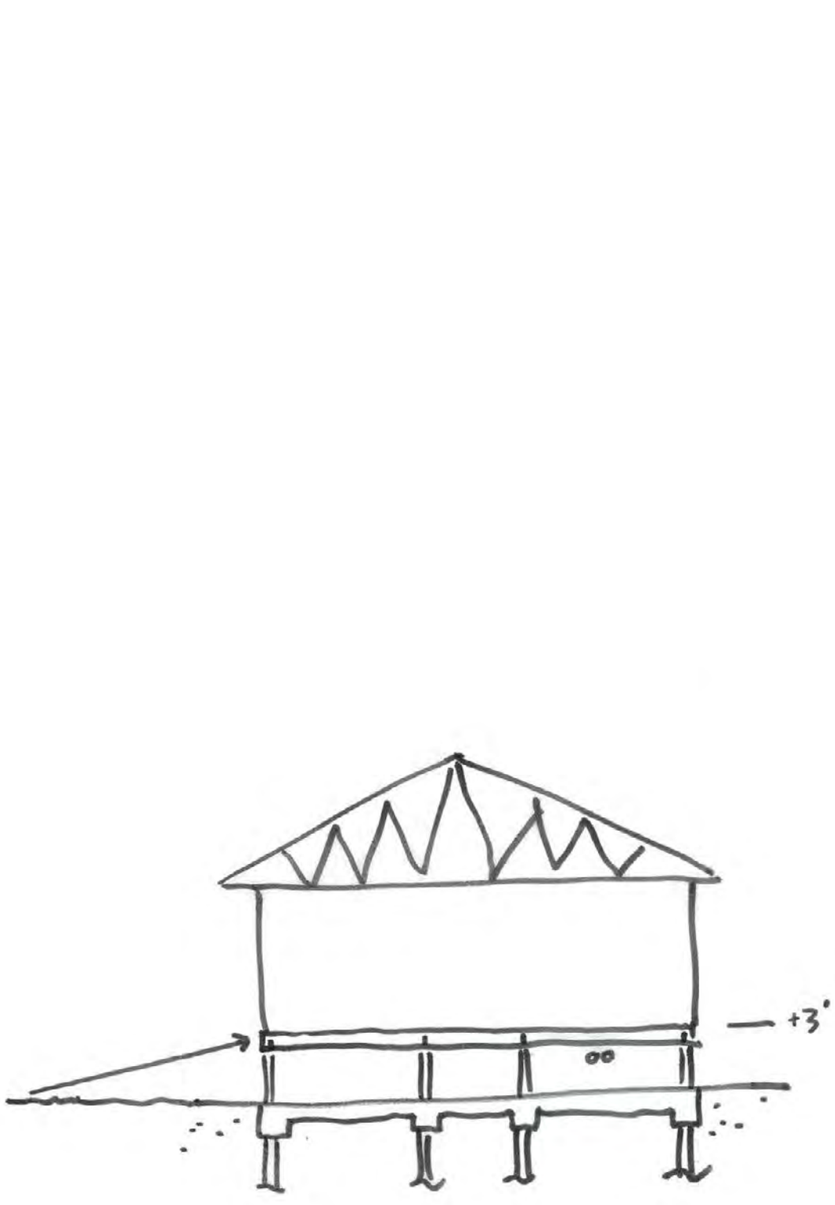
Existing Conditions

Existing Conditions

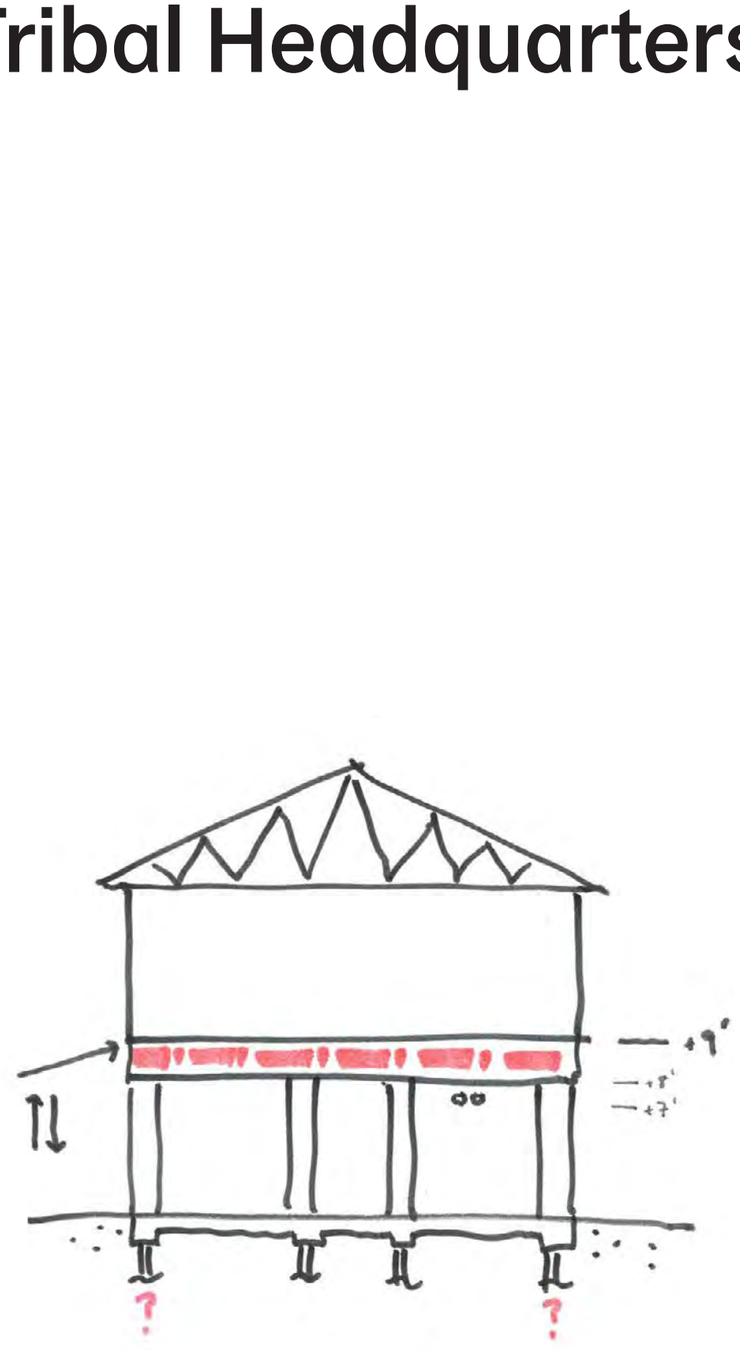
Existing Conditions

Existing Conditions

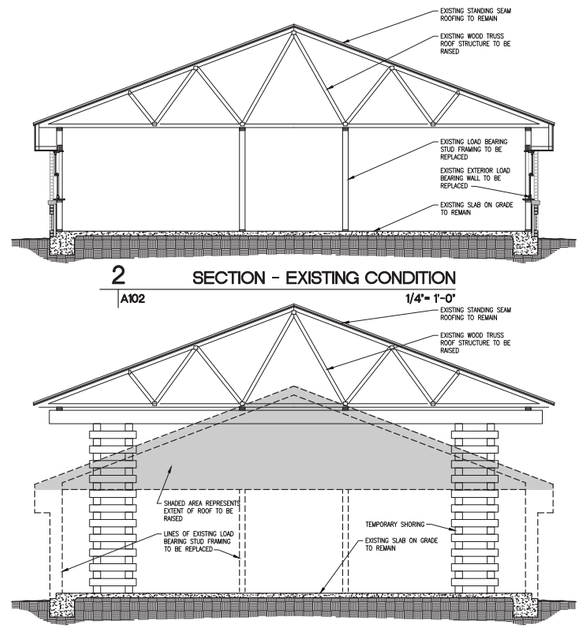
United Houma Nation Tribal Headquarters



- Residential construction
- Wide range of contractors
- Structure aligns with existing foundation
- Accessible by ramp (~ 50’ ramp)

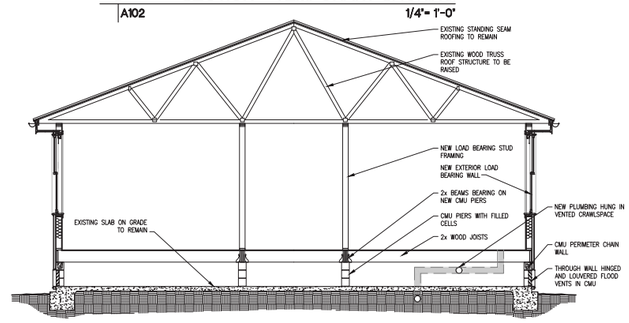


- Fire separated construction
- Commercial / Specialty contractors
- Foundation bearing points TBD
- Requires elevators / lifts (~ 200’ ramp)

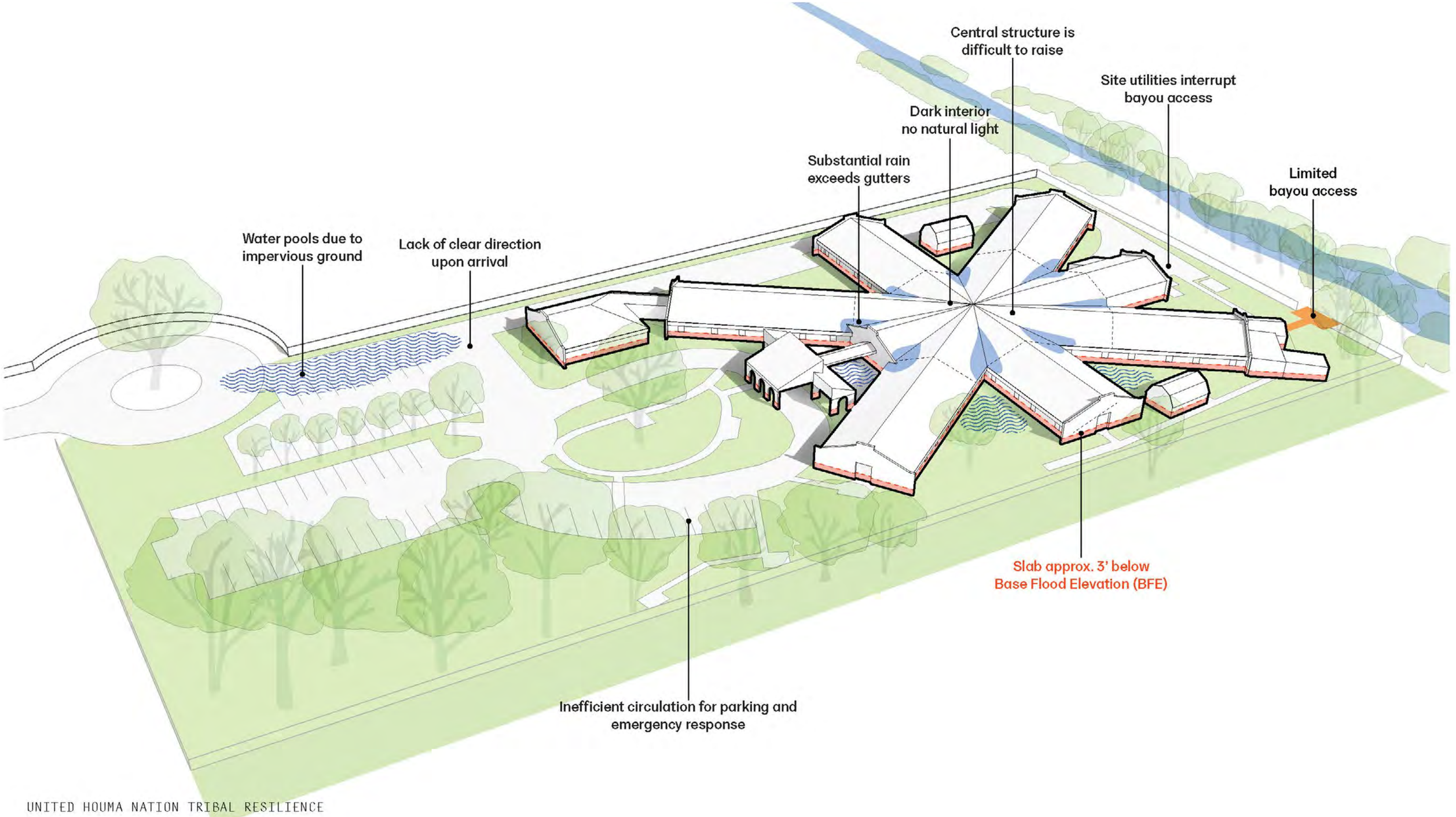


2 SECTION - EXISTING CONDITION
A102 1/4"= 1'-0"

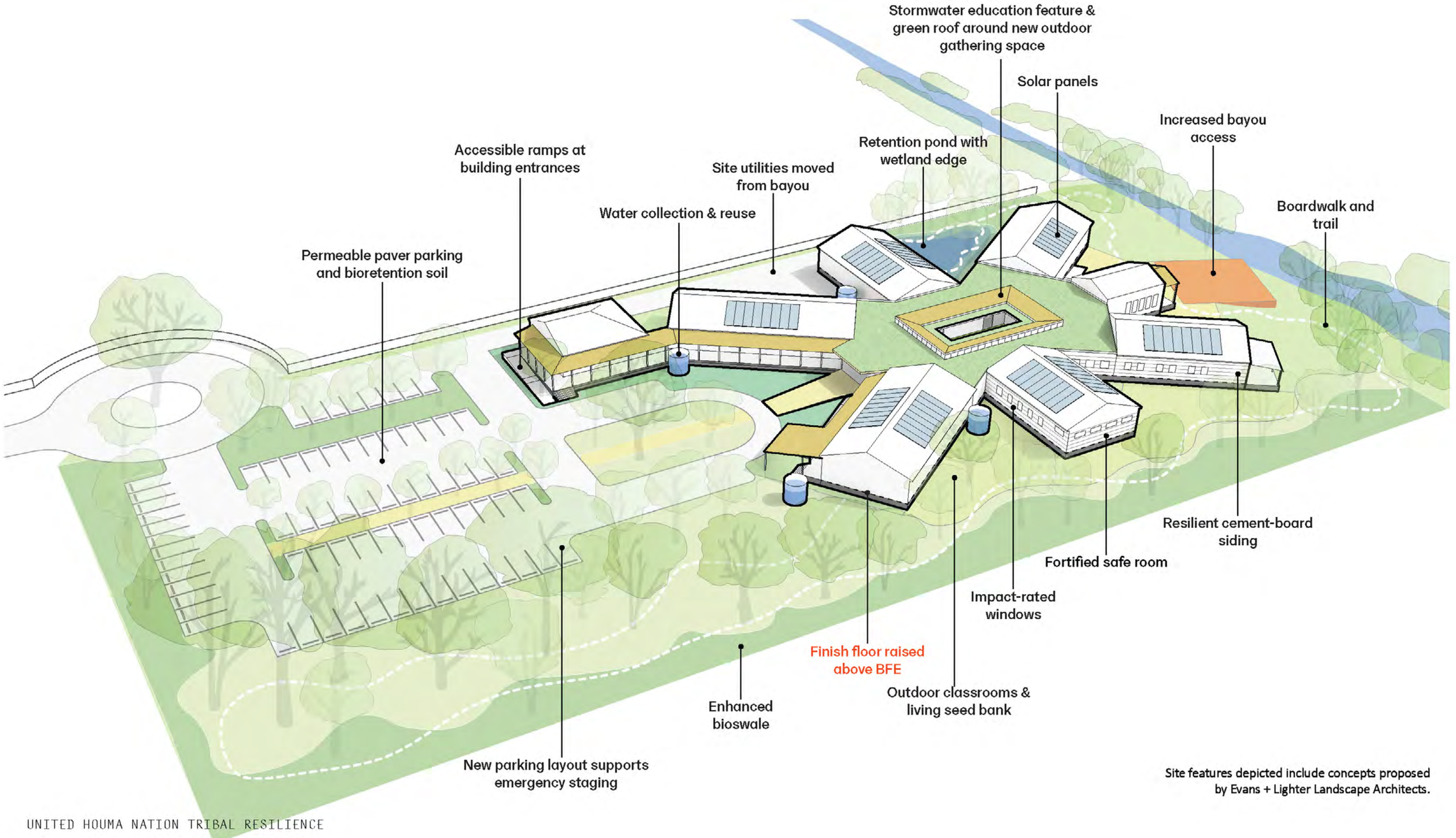
3 SECTION - TEMPORARY SHORING
A102 1/4"= 1'-0"



United Houma Nation Tribal Headquarters



United Houma Nation Tribal Headquarters



Site features depicted include concepts proposed by Evans + Lighter Landscape Architects.

Point of Contact

Rami Diaz
Waggonner & Ball
ramiro@wbae.com
504.524.5408

WAGGONNER
& BALL
A MOFFATT & NICHOL STUDIO