SEWERAGE & WATER BOARD OF NEW ORLEANS

STRATEGY COMMITTEE MEETING
WEDNESDAY, APRIL 14, 2021
10:00 AM

APRIL 2021 STRATEGY COMMITTEE LINK
+1 504-224-8698,,450417303# UNITED STATES, NEW ORLEANS
PHONE CONFERENCE ID: 450 417 303#

PUBLIC COMMENT WILL BE ACCEPTED VIA EMAIL TO BOARDRELATIONS@SWBNO.ORG. ALL PUBLIC COMMENTS MUST BE RECEIVED PRIOR TO 10:30 AM ON April 14, 2021. COMMENTS WILL BE READ VERBATIM INTO THE RECORD

Robin Barnes • Lynes Sloss
Maurice Sholas• Janet Howard • Tamika Duplessis

FINAL AGENDA

---

1. **ROLL CALL**
2. **PRESENTATION ITEMS**
   - **a.** Strategic Plan Procurement Process Update
3. **DISCUSSION ITEMS**
   - **b.** Master Plan Process Framework
4. **PUBLIC COMMENT**

   Public comments received until 30 minutes after the presentation of the Agenda will be read into the record.
5. **ADJOURNMENT**

This teleconference meeting is being held pursuant to and in accordance with the provisions of Section 4 of Proclamation Number JBE 2020-30, extended by Proclamation 67 JBE 2021, pursuant to Section 3 of Act 302 of 2020.

Strategy Committee Meeting

April 14, 2020

Tyler Antrup, Director of Planning + Strategy

Strategic Plan RFP

- Received 5 proposals from the following firms:
  - Raftelis
  - Baker Tilly
  - Schumaker and Co.
  - Westin Technology
  - Berhardt Capital Partners

- Selection will take place April 23rd
- Selection committee has asked for presentations from # firms, which will precede the scoring
- Strategy Committee members may attend the presentations and selection meeting as members of the public
- Selection Committee selects a firm and recommends approval to the Strategy Committee
- Strategy Committee recommends approval or denial
- Board of Directors approves or denies the selection through the normal Board process

Selection Process

- Selection Committee dictated by Policy 95: Professional Services Procurement
- Members Selected:
  - Kaitlin Tymrak (GSO designee)
  - Rene Gonzalez
  - Christy Harowski
  - Tyler Antrup
  - Elisa Speranza (External expert)

Proposals will be scored on the following:

Qualifications and Experience

(0 - 20 Points) Company experience, background and qualifications comply with minimum qualifications for the firm in providing services similar to those required as detailed in Attachment A;

(0 – 10 Points) Performance history including but without limitation, competency, responsiveness, cost control, work quality and the ability to meet schedules and deadlines;

Technical Criteria

(0 - 20 Points) Personnel Qualifications and Experience – complies with minimum qualifications and experience of the individuals in providing services similar to those required as detailed in Attachment A;

(0 - 20 Points) Approach/Methodology – Overall organization, completeness, and quality of proposal, including cohesiveness, clarity of response and demonstrated understanding of the scope of services described;

(0 – 20 Points) Innovative Approaches - demonstrates a full understanding of the needed services and clearly outlines an ability to deliver high quality, innovative, and cost-saving solutions that achieve the multiple stated project purposes and outcomes.

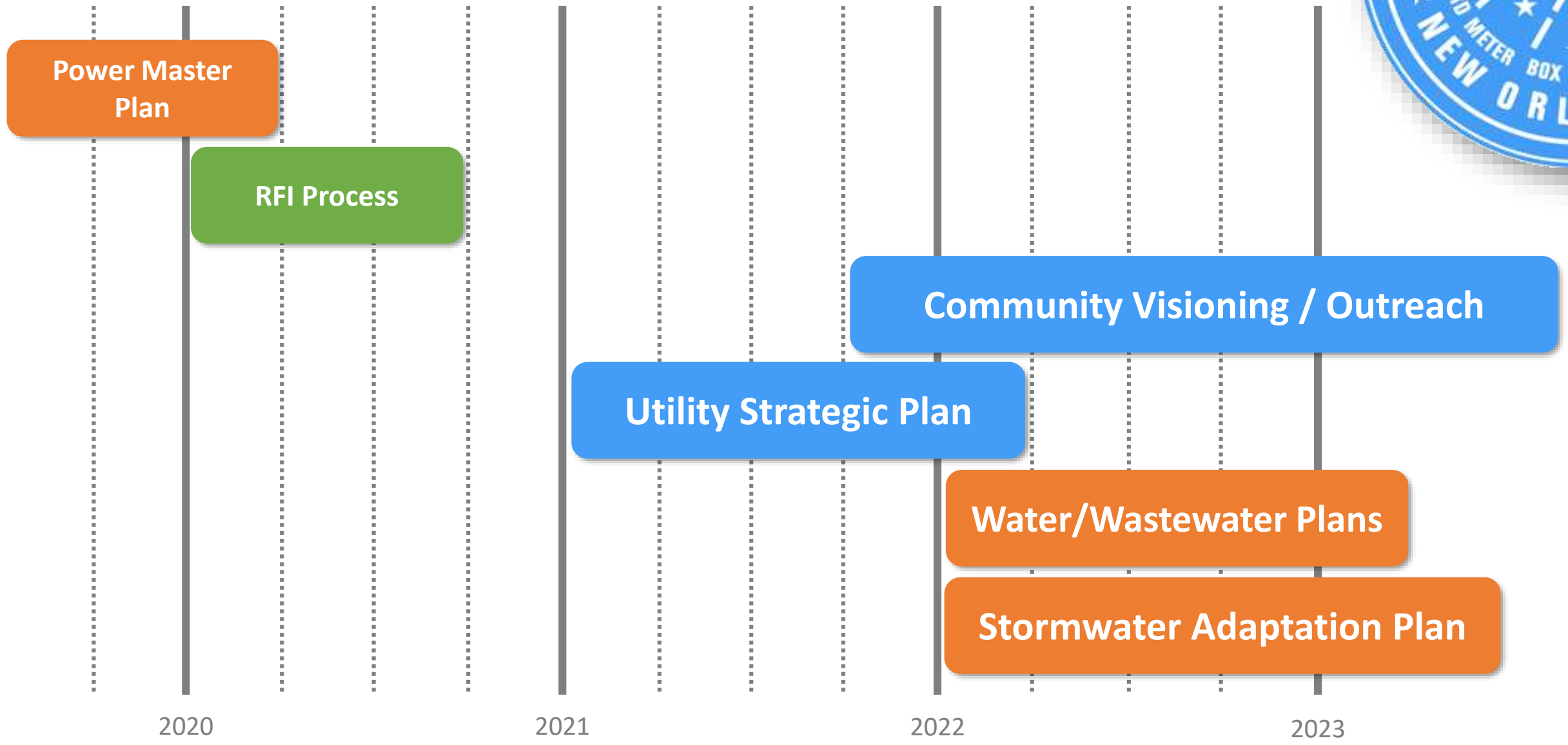
DBE Participation

(5 points) Proposal complies with contract DBE participation goal of **5%** or will conduct good faith efforts to do so.

(5 points) Proposal submitted a quality proposal for DBE Participation that includes innovative strategies and approaches to achieve and maintain compliance over the contract term, including firm's past performance on meeting DBE goals, technical assistance and supportive services designed to increase participation and build capacity in the DBE community.

Price Proposal

(0 – 10 Points) Cost


Power Master Plan
RFI Process
Community Visioning / Outreach
Utility Strategic Plan
Water/Wastewater Plans
Stormwater Adaptation Plan
2020
2021
2022
2023

Master Plan (Infrastructure)

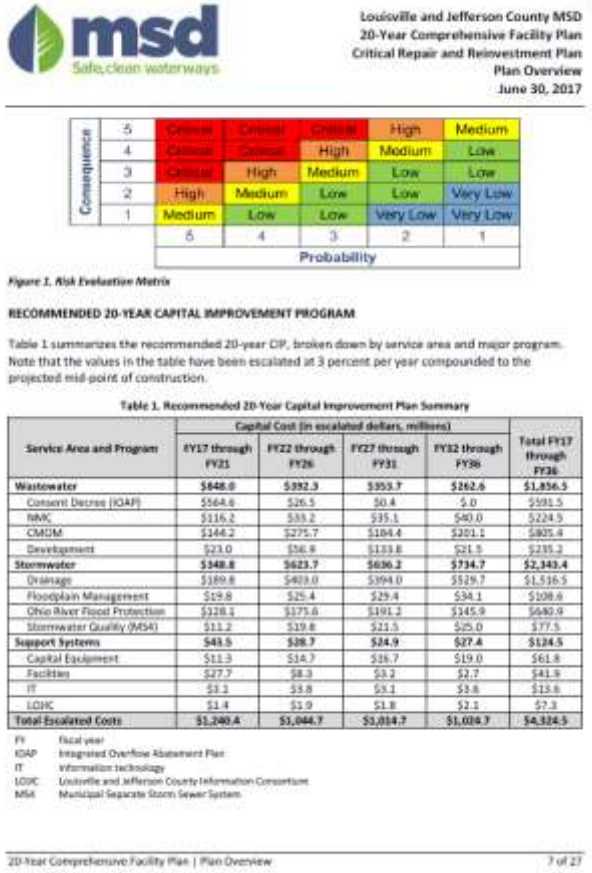
- Determine the capability of existing systems to provide needed level of service
- Identify efficient and cost-effective ways to meet expected needs and emerging issues
- Estimate the magnitude, cost, and timing of needed capital and operations related projects
- Generate institutional and community support for needed projects
- Create a capital improvement plan for needed improvements to infrastructure

Master Plan Case Study:
Philadelphia Drinking Water Master Plan

- 25-year planning period
- Assesses level of service over the planning period
- Details needed capital projects to provide required level of service
- Prioritizes projects based on need, cost, and other plan goals
- Financing plan and budget

Master Plan Case Study:
Louisville MSD Comprehensive Plan

- 20-year planning period
- Risk evaluation system for prioritizing projects
- Details needed capital projects to overhaul system
- Financing plan and budget
- Encompasses wastewater and drainage (CSO community)



msd
Safe, clean waterways

Louisville and Jefferson County MSD
20-Year Comprehensive Facility Plan
Critical Repair and Reinvestment Plan
Plan Overview
June 30, 2017

Consequence						
	5	Critical	Critical	Critical	High	Medium
	4	Critical	Critical	High	Medium	Low
	3	Critical	High	Medium	Low	Low
	2	High	Medium	Low	Low	Very Low
	1	Medium	Low	Low	Very Low	Very Low
		5	4	3	2	1
		Probability				

Figure 1. Risk Evaluation Matrix

RECOMMENDED 20-YEAR CAPITAL IMPROVEMENT PROGRAM

Table 1 summarizes the recommended 20-year CIP, broken down by service area and major program. Note that the values in the table have been escalated at 3 percent per year compounded to the projected mid-point of construction.

Table 1. Recommended 20-Year Capital Improvement Plan Summary

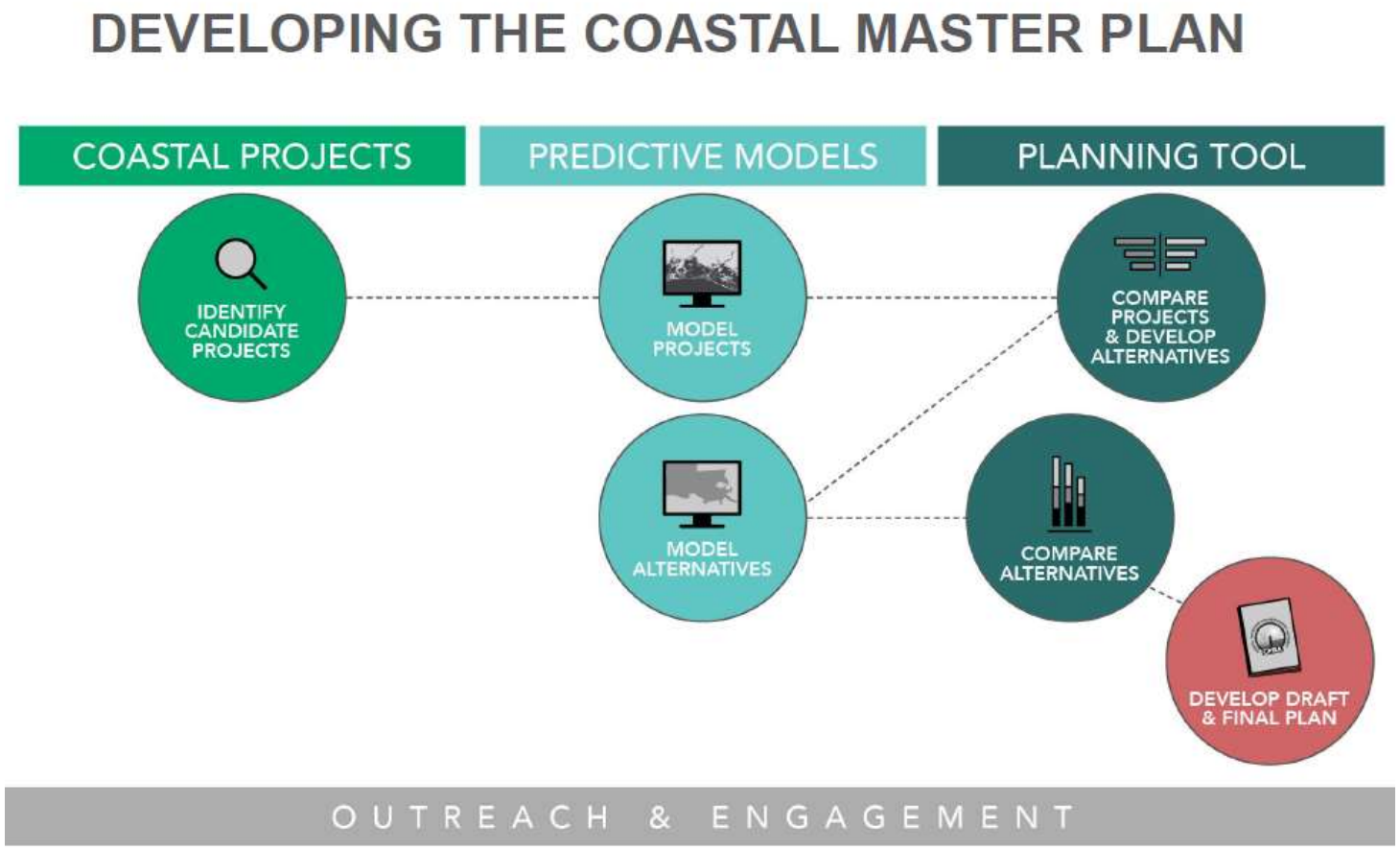
Service Area and Program	Capital Cost (in escalated dollars, millions)				Total FY17 through FY36
	FY17 through FY21	FY22 through FY26	FY27 through FY31	FY32 through FY36	
Wastewater	**$848.0**	**$392.3**	**$353.7**	**$262.6**	**$1,856.5**
Consent Decree (IOAP)	$564.6	$26.5	$0.4	$0	$591.5
NMC	$116.2	$53.2	$35.1	$40.0	$224.5
CMOM	$144.2	$275.7	$184.4	$201.1	$805.4
Development	$23.0	$36.9	$133.8	$21.5	$235.2
Stormwater	**$348.8**	**$623.7**	**$636.2**	**$734.7**	**$2,343.4**
Drainage	$189.8	$403.0	$394.0	$529.7	$1,516.5
Floodplain Management	$19.8	$25.4	$29.4	$34.1	$108.6
Ohio River Flood Protection	$128.1	$175.6	$191.2	$345.9	$840.9
Stormwater Quality (MS4)	$11.2	$19.8	$21.5	$25.0	$77.5
Support Systems	**$43.5**	**$28.7**	**$24.9**	**$27.4**	**$124.5**
Capital Equipment	$11.3	$14.7	$16.7	$19.0	$61.8
Facilities	$27.7	$8.3	$3.2	$2.7	$41.9
IT	$3.1	$3.8	$3.1	$3.6	$13.6
LOJIC	$1.4	$1.9	$1.8	$2.1	$7.3
Total Escalated Costs	**$1,240.4**	**$1,044.7**	**$1,014.7**	**$1,024.7**	**$4,324.5**

FY Fiscal year
IOAP Integrated Overflow Abatement Plan
IT Information technology
LOJIC Louisville and Jefferson County Information Consortium
MS4 Municipal Separate Storm Sewer System

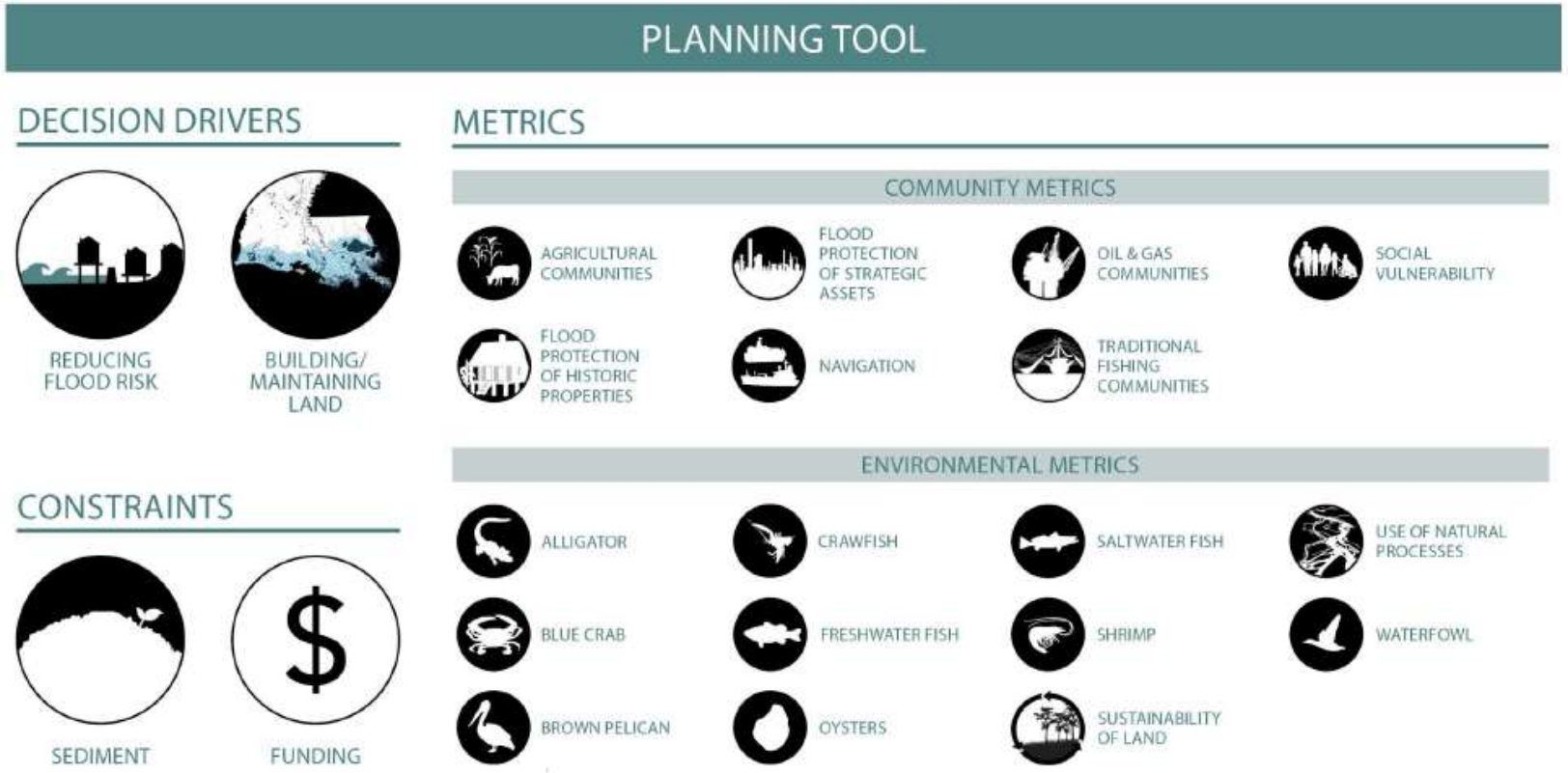
Master Plan Case Study:
Louisiana Coastal Master Plan

- Uses the best available science and engineering to focus the state's efforts on the actions needed to sustain Louisiana's coastal ecosystems, safeguard coastal populations, and protect vital economic and cultural resources today and in the future.
- Has a 50-year vision with implementation planned over the course of the planning period
- Includes a top-line cost estimate to inform long-term capital planning and fundraising

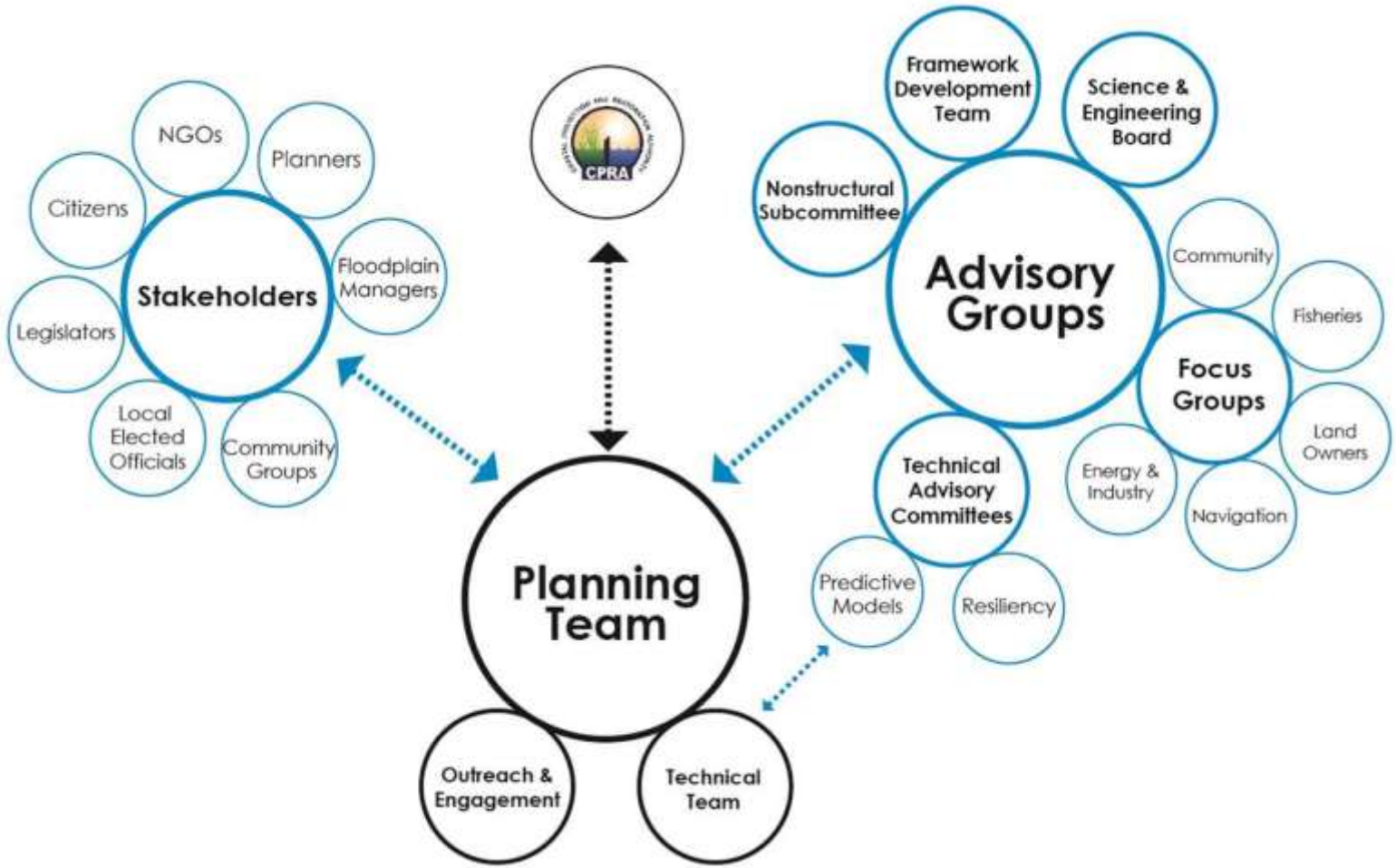
Master Plan Case Study:
Louisiana Coastal Master Plan



Master Plan Case Study:
Louisiana Coastal Master Plan



Master Plan Case Study:
Louisiana Coastal Master Plan



Master Planner Role
For Discussion

- Serves as “planning staff” to manage the overall framework of the program
- Assists in preparing RFPs and scope for technical plans
- Facilitates all community engagement and visioning
- Develops and facilitates overarching decision support framework to be applied to all three technical plans
- Provides third-party technical advisement and oversight
- Curates a distinct branding and consistent communications tools across all plans
- “Integrate” technical plans to achieve a “One-Water” approach

Master Plan Assistance
For Discussion

- Potential for philanthropically funded support to assist staff and Board to collaboratively develop a framework for master planning
- Deliverable could be a report that details our framework and guides procurement and future planning work

Next Steps

- Select Strategic Planning Consultant April 23rd
  - Negotiate contract and introduce them to the Committee in June to kickoff
- Continue discussion for potential Master Plan assistance

For More info:
Swbno.org/projects/masterplan
planning@swbno.org

Drinking Water

Master Plan Overview

March 2019

Building reliable infrastructure for today.
Investing for a resilient tomorrow.

PHILADELPHIA WATER DEPARTMENT

This plan addresses the drinking water component of our core services

The Drinking Water Master Plan is a comprehensive 25-year strategy for upgrading key facilities. It ensures **resilient**, **robust** and **dependable** infrastructure and continues our long tradition of future planning.

Increases Service Level

Decreases Risks

25 years

Focuses PWD drinking water facility capital spending

Philadelphia's History of Delivering Safe Drinking Water to Residents: the First in the Nation

1682

Philadelphia founded

1793–98

Yellow fever kills residents

1799–1822

Watering committee formed and Waterworks opened and expanded

1840s

City buys land upstream along Schuylkill River to protect water source

1860–1909

Population doubles; Typhoid kills 27,000

1900–12

Philadelphia builds five slow sand filtration plants

1914

Chlorination of water supply: Typhoid / Cholera eradicated

1957

New rapid sand filters and pump stations constructed

1996

Joined Partnership for Safe Water demonstrating optimized treatment process

2018

PWD develops a forward looking, 25-year Drinking Water Master Plan that provides a clear path to deliver safe, clean, affordable drinking water into the future.

Starting at the turn of the 19th century, Philadelphia was the first city in the country to make delivery of water a municipal responsibility. Since then, the City has focused on delivering safe, reliable, high-quality drinking water to its residents in the most affordable manner possible.

In the 1950s and 1960s, the City invested significantly in its drinking water system. The City has maintained these facilities over the last 70 years, but some of the facilities are reaching the end of their useful life.

The time is now to invest in upgrading these facilities.

Upgrades Needed to Continue Providing Clean Water Into the Future

The City is facing a challenge similar to other large cities across the country: the need to update its aging infrastructure.

Our facilities are showing their age and require significant investments to maintain a sufficient, safe supply of water to Philadelphia. These investments will come with an ever-increasing price tag. Without spending in the near term, PWD will likely experience more on the spot repairs, which can be costly and have a negative impact on city residents.

The City is taking proactive steps to meet federal water quality regulations now and in the future. We also need to improve our drinking water system's resiliency to provide a reliable supply to city residents for any range of possible events, such as contamination or natural disasters.

By strategically aligning several projects, on a 25-year timeline, we extend capital spending over decades, and will keep water rates affordable for our residents.

An original Pumping Station (top) highlights our history of providing clean drinking water to the City of Philadelphia. It will be preserved as part of larger work planned at the nearby Water Treatment Plant. Current construction projects (lower) focus on replacing aging facilities to better serve our customers.

PWD's drinking water quality consistently performs better than the drinking water standards developed by the EPA to maintain public health. Our commitment is to maintain the same level of quality in the future while also keeping rates affordable.

Master Planning Guidance

Six goals and criteria were established by a steering committee, comprised of members from across PWD.

Service Goals

Water quality
Achieve present and future regulatory requirements

Operability
Provide the appropriate system redundancy for a wide range of emergency conditions

Capital availability
Manage financial resources to make necessary investments in the water system while keeping rates affordable

Water quantity
Provide long-term water supply to the service area

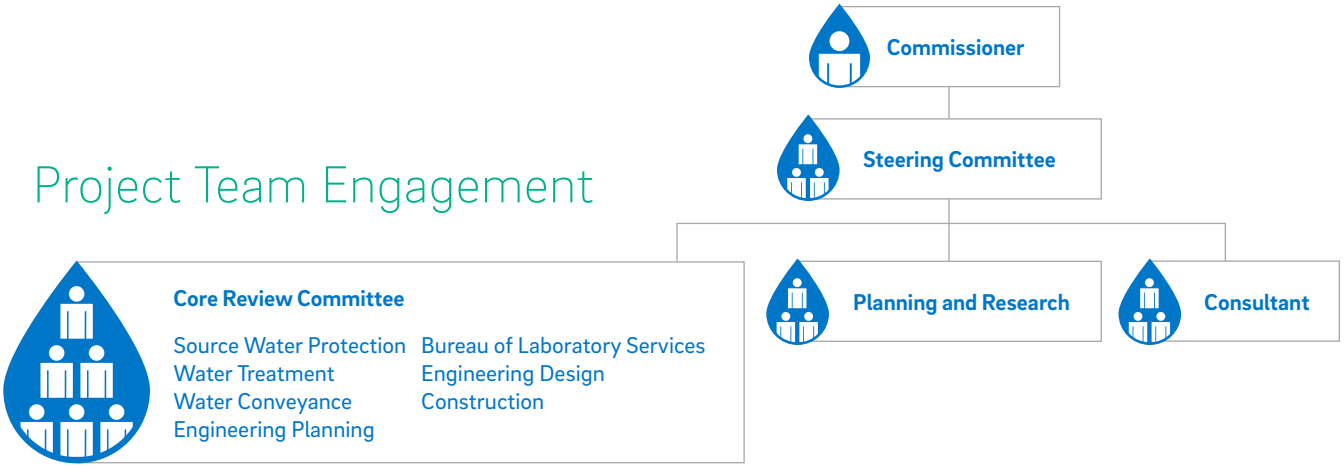
Service pressure
Provide adequate water pressure for system operation

Public perception
Seek public engagement to meet service goals

These criteria were used to evaluate each solution and helped us identify potential risks.

The collaborative committee brought together hands-on experience operating PWD facilities and lessons learned working with similar utilities across the nation.

Project Team Engagement



Our Planning Process

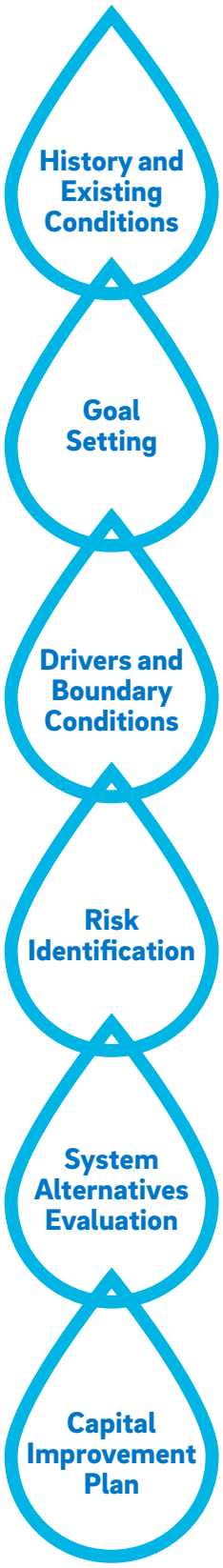
The project team followed a comprehensive planning process to develop the final recommendations in the Drinking Water Master Plan.

The first step in the planning process was establishing the historical context of the water system and existing system characteristics. At the same time, the Steering Committee established the service goals for the 25-year planning horizon. This was followed by a detailed condition assessment of the existing water supply facilities to document the current condition of these assets and identify repair, replacement, or improvement needs.

The planning team also studied other planning drivers including water demand projections, regulatory requirements, and environmental factors. Based on the service goals, the team developed a detailed risk assessment for each of the service goals, determining the likelihood and consequence of each risk occurring. This analysis guided the identification of the highest risks for the Drinking Water Master Plan.

The team developed and evaluated a wide range of alternatives to determine their effectiveness in addressing the identified risks. These alternatives addressed risks at water treatment plants, water pumping stations, water storage facilities, and large water transmission mains. Each alternative was evaluated based on performance and estimated construction costs. This enabled the Steering Committee to review the alternatives and select the alternative that reduced the risks to the service goals in the most cost-effective manner.

The selected alternative was a group of projects that collectively reduced or removed the identified risks. The Steering Committee recommended these projects for financial and constructibility analysis. These recommended projects were assembled into a feasible construction schedule based on the projects' dependencies and sequencing. This schedule determined the capital requirements for each year of the 25-year planning horizon, which were balanced with the need to keep rates affordable. The plan is a living document that will continue to be updated throughout the 25-year implementation period to address any changes that arise.



The Drinking Water Master Plan identified approximately 400 projects focused on the rehabilitation of some existing facilities and construction of several new facilities.

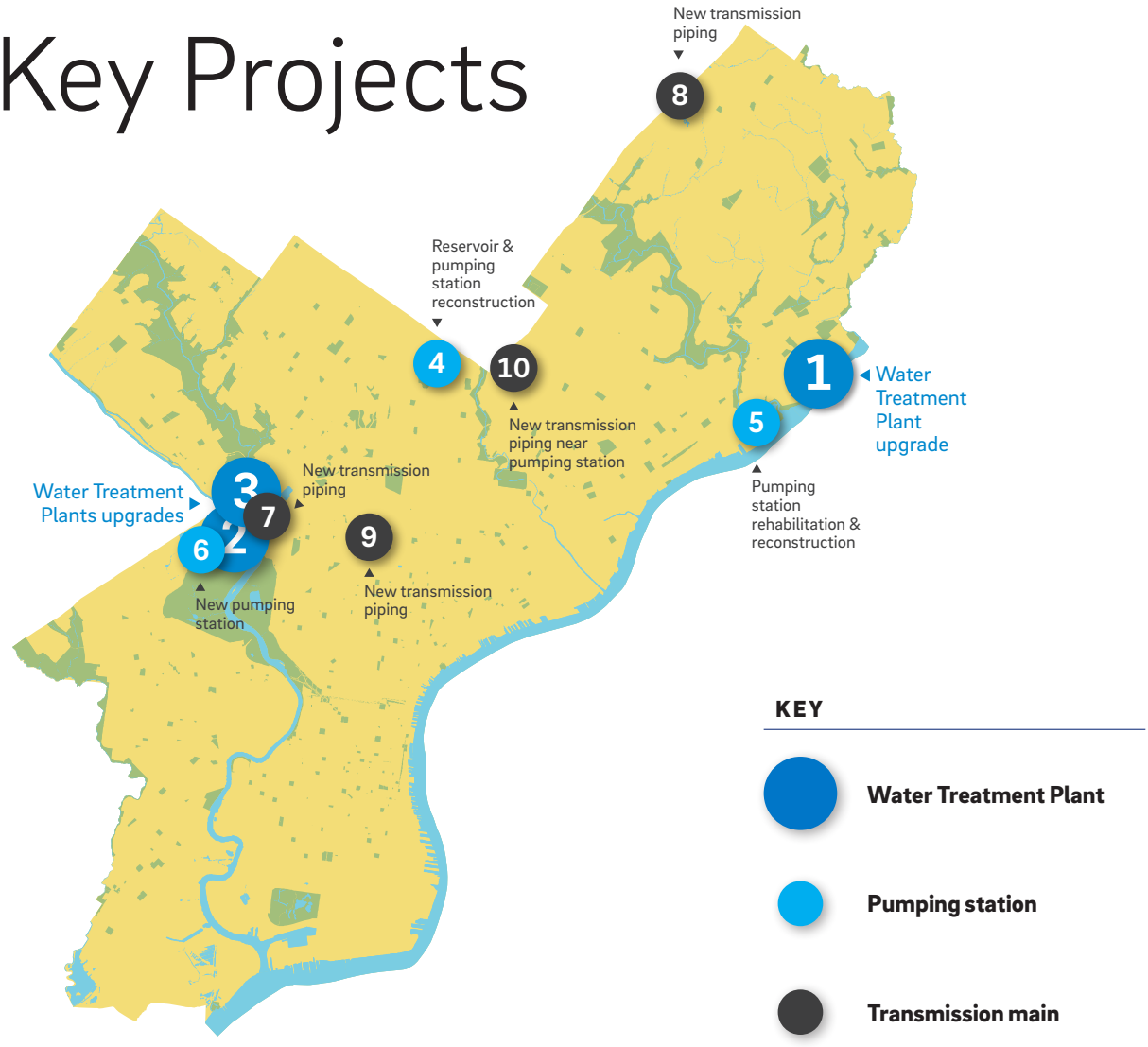
The combined estimate of these projects, to be completed over the next 25 years, is $2.5 billion, half of which is already currently budgeted. The 10 key projects are highlighted in the graphic below and to the right.

400 individual projects

$2.5B combined estimate

10 key projects

10 Key Projects

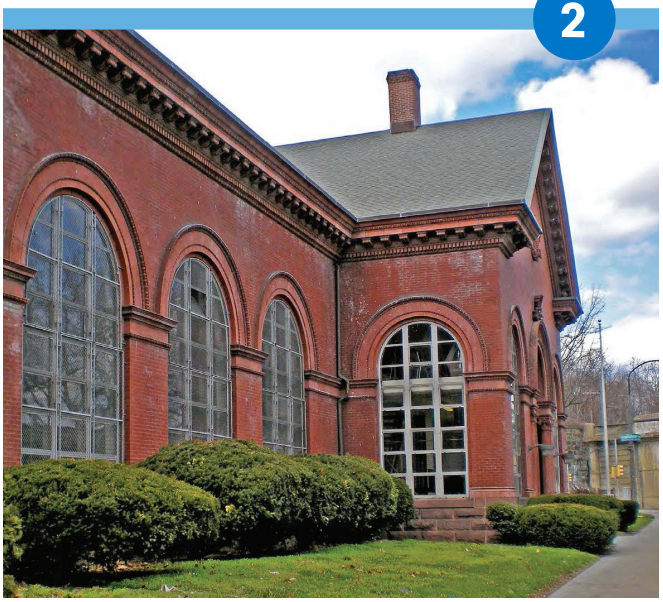


1

Water Treatment Plant

- **Key component: ultraviolet** (UV) treatment addition
- **Benefit:** long-term regulatory compliance and drinking water quality

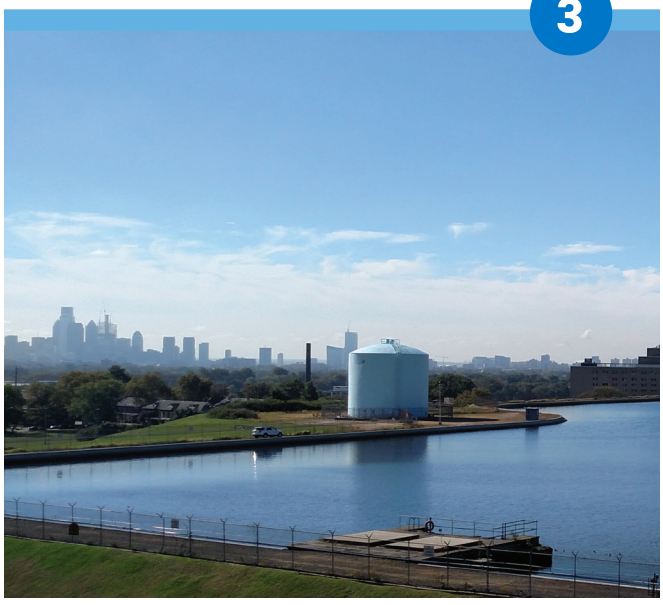
2



Water Treatment Plant

- **Key component:** additional treatment capacity and UV treatment addition
- **Benefit:** long-term regulatory compliance, drinking water quality, and supply redundancy

3



Water Treatment Plant

- **Key component:** reconstruction of entire plant with additional treatment capacity and UV treatment
- **Benefit:** increased reliability and modularity and supply redundancy

4

Reservoir & Pumping Station

- **Key component:** reservoir & pumping station reconstruction, transmission piping and automated valve
- **Benefit:** drinking water quality and increased reliability

The 25-year implementation schedule was developed to consistently provide quality drinking water to residents throughout program implementation.

The sequencing is critical because the projects work together to maintain this reliable service. This implementation timeline also provides a clear road map of the timing of the projects for stakeholders across the city. These projects will provide comprehensive water supply benefits to the city.

Funding the Program

The implementation of the Drinking Water Master Plan has been scheduled to maintain the affordability of safe, clean drinking water for all Philadelphia residents—now and into the future.

This implementation plan was carefully developed based on the capital requirements for each large project and the impact on customer rates.

To maintain affordability for all residents of Philadelphia, PWD's Tiered Assistance Program (TAP) will continue along with affordable rate increases. The rate increases will be consistent with water rates in Philadelphia's peer cities and will reduce the likelihood of sudden rate increases that could arise from future emergency infrastructure repairs.

The funding for the Drinking Water Master Plan implementation has also been coordinated with PWD's other infrastructure requirements for wastewater and stormwater improvements to avoid significant capital needs from occurring at the same time.

Similar to the current East Park Reservoir tank construction project, the Drinking Water Master Plan will provide construction jobs in the City over the next 25 years.

"The Drinking Water Master Plan has been developed with the full engagement of the Philadelphia Water Department and provides a comprehensive roadmap to continuing our service of safe, clean, drinking water for all residents of Philadelphia now and for future generations. I endorse this plan and look forward to the implementation of infrastructure that enables our city to continue to grow and prosper."

—**Debra A. McCarty**, Commissioner

Sequencing Schedule *(refers to map on page 5)*

Project	25-Year Implementation
#5 - Pumping stations rehabilitation & reconstruction	
#7 & #9 - New transmission piping	
#1 - Water Treatment Plant upgrade	
#2 - Water Treatment Plant upgrade (Phase 1)	
#3 - Water Treatment Plant upgrade	
#2 - Water Treatment Plant upgrade (Phase 2)	
#4 - Reservoir & pumping station reconstruction	
#8 - New transmission piping	
#6 - New pumping station	
#10 - New transmission piping near pumping station	

Plus, on-going facility rehabilitation projects at Water Treatment Plants, Pumping Stations, and Storage Facilities

Benefits to City Residents

The Drinking Water Master Plan is a long-term plan with the goal of updating the City's aging water treatment system infrastructure in the most efficient and affordable manner possible.

This plan required a comprehensive understanding of the needs of the City's drinking water infrastructure today and in the future. It includes a series of projects that have been carefully planned and sequenced to minimize impacts on the communities around the water treatment plants during construction and to result in no disruptions to service or water quality.

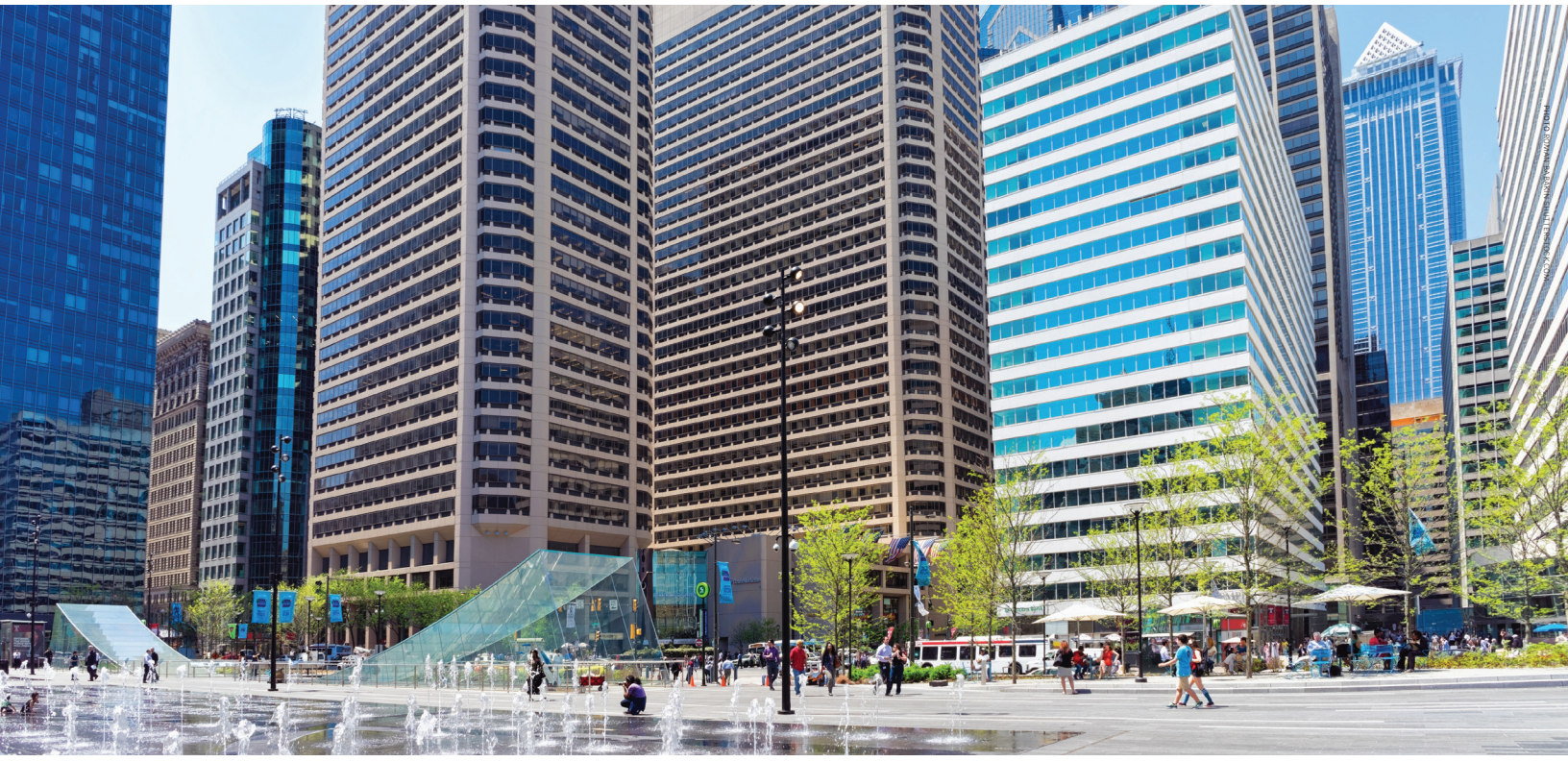
The City has a proud history of delivering high-quality water with some of the most affordable rates in the country. This plan provides a clear path to continue to deliver safe, reliable drinking water for our community into the future.

As the Drinking Water Master Plan is implemented, it will provide numerous benefits to the city for years to come:

- Upgraded facilities to deliver safe, reliable drinking water supply for the next 50 years and beyond
- Nationally recognized leadership due to proactively addressing aging infrastructure issues
- Construction jobs in the City over the next 25 years
- Improved water service due to resiliency and reliability of the system
- Updated water treatment plants to meet modern code compliance requirements
- Fiscally responsible investment in the system by balancing spending to match customer rates at the right time
- Continued partnership with regulators to maintain, or exceed compliance requirements
- Clear understanding for the Water Rate Board and bond rating agencies of PWD's capital needs for the long term

New ways to mitigate impacts for neighborhoods

New rules for construction sites ensure safe and clean worksites and set hours to minimize disturbances. Residents will have clear channels to report and resolve quality of life impacts.



The Dilworth Plaza water feature points to the history of public water supply in Philadelphia and the future of safe, clean, affordable water for the whole city.

Upgraded facilities to deliver a safe, reliable drinking water supply for the next 50 years and beyond.

Some of the nation's most affordable rates and robust assistance for seniors and others in need.

Improved water service due to resiliency and reliability of the system.

Nationally recognized leadership due to proactively addressing aging infrastructure issues

Fiscally responsible investment in the system by balancing spending to match customer rates at the right time

Construction jobs in the City over the next 25 years

Debra McCarty
Commissioner

Melissa LaBuda
Deputy Commissioner of Finance

Donna Schwartz
Deputy Commissioner and Director of Operations

Marc Cammarata
Deputy Commissioner of Planning and Environmental Services

Stephen Furtek
General Manager of Engineering and Construction

Philadelphia Water Department
1101 Market Street
Philadelphia, PA 19107
215.685.6300
www.phila.gov/water

20-Year Comprehensive Facility Plan

Critical Repair and Reinvestment Plan

Volume 1: Programmatic and Integrating Information

msd
Safe, clean waterways

ch2m SM

HDR

Jacobi,Toombs&Lanz

SA STRAND ASSOCIATES®

In Association with:

NAC | K.S. Ware & Associates | RKX | Powers Engineering

June 2017

20-Year Comprehensive Facility Plan

Critical Repair and Reinvestment Plan

Volume 1: Programmatic and Integrating Information

In Association with:
NAC | K.S. Ware & Associates | RKX | Powers Engineering

June 2017

CH2M
One Riverfront Plaza
401 West Main Street
Suite 800
Louisville, KY 40202
O +1 502-584-6052
www.ch2m.com

Angela L. Akridge, PE, Chief Engineer
Louisville and Jefferson County Metropolitan Sewer District
700 West Liberty Street
Louisville, KY 40203

June 30, 2017

Subject: 20-Year Comprehensive Facility Plan—Critical Repair and Reinvestment Plan

Dear Ms. Akridge,

The attached 20-Year Comprehensive Facility Plan, also referred to as the Louisville and Jefferson County Metropolitan Sewer District (MSD) Critical Repair and Reinvestment Plan, represents MSD's most ambitious planning effort in a decade. The 2-year effort reviewed the challenges our community faces now and in the future, identified practical solutions, and developed a roadmap to protect the health, economic vitality, and environment of our city. The recommendations in this Facility Plan are the result of careful evaluation by the Facility Plan Team, which includes some of the most experienced engineers in Louisville Metro. We believe that the recommendations presented in this Facility Plan are essential to maintaining reliable facilities that will allow MSD to fulfill its responsibility for safe, clean waterways and help preserve and promote our competitiveness as a city.

One driver that led to Facility Plan development was a recognition that—for the past 10 years—MSD has focused much of its resources and investments on tackling the federally mandated undertaking to reduce sewer overflows. Major investments in other infrastructure rehabilitation, renewal, and replacement were limited by the community's desire to keep rates at or below industry averages, even as capital and operating spending ramped up to meet Consent Decree requirements. In the face of limited resources, MSD staff still continued its excellent record of regulatory compliance in areas not related to sewer overflow control by focusing on the day-to-day operation and maintenance of wastewater, stormwater, and flood protection facilities.

The result of deferred investment on infrastructure renewal and replacement is that Louisville's aging system of pipes, pumps, treatment plants, and flood control systems is now in urgent need of rehabilitation if it is to continue reliably protecting public health and safety. The Facility Plan recommends taking immediate action to begin implementing critical improvements to the wastewater, stormwater management, and flood protection systems.

Acting in accordance with the recommended schedule of improvements will require a significant investment from the community. Starting on these critical projects while still only halfway through the Consent Decree response will require a step-change increase in wastewater and drainage rates. If the community is unwilling to accept the rate increases necessary to fund the project schedules recommended, then many important projects will need to be deferred until the major Consent Decree spending is complete. The data indicate that *not* implementing necessary investments in a timely manner is almost certain to result in more infrastructure failures, an increase in the overall Facility Plan implementation cost, and an ever more rapidly increasing likelihood of a failure that could have serious consequences for the residents and business that make Louisville Metro their home.

Following the release of the December 2016 draft of the Facility Plan, MSD undertook a wide-reaching public outreach initiative, aimed at bringing many perspectives to the table for constructive dialogue about the needs and timing of implementing the Facility Plan recommendations. Community input confirms that Louisville supports restoring its vital wastewater, flood protection, and stormwater management facilities. Following are responses from those who engaged in the community conversation:

- Ninety percent of respondents understand and agree with the need for investing in the community's wastewater, stormwater, and flood protection systems to reduce risks to public health and safety rather than continuing to defer critical repairs and reinvestment.
- Eighty-nine percent of respondents believe beginning to address the public health and safety risks as quickly as possible is important.
- Seventy-one percent of respondents support increasing residential rates of up to $10 per month (with a proportional increase in industrial and commercial rates) to immediately begin funding critical wastewater, stormwater, and flood protection needs that address public health and safety risks.
- Seventy-eight percent of respondents support expanding MSD's existing Rate Relief Program to assist customers who meet federal criteria established for other utility rate assistance programs.

Working with MSD on this important planning assignment that addresses critical infrastructure issues impacting the future quality of life in our community has been an honor and privilege for the entire Facility Plan Team. The undersigned leaders of the Facility Plan Team, as representatives of our respective firms, proudly submit this final Facility Plan for your consideration.

Respectfully Submitted,

Gary J. Swanson, PE
CH2M HILL Engineers, Inc.
Project Manager

Paul G. Maron, PE
Strand Associates, Inc.
Deputy Project Manager

Matthew Newman, PE
HDR Engineering, Inc.
Task Lead—Stormwater and Drainage

Michael C. Harris, PE
Jacobi, Toombs & Lanz, Inc.
Task Lead—Property

Mark A. Sneve, PE, BCEE
Strand Associates, Inc.
Task Lead—Wastewater Collection and Treatment

Charles R. Anderson, PE
Strand Associates, Inc.
Task Lead—Ohio River Flood Protection System

MAJOR CONTRIBUTORS

Name	Firm	Project Role
Gary Swanson, PE	CH2M	Project Manager, all volumes
Paul Maron, PE	Strand Associates	Deputy Project Manager, all volumes
Daniel Thewes, PE	CH2M	Assistant Project Manager, all volumes
Mark Sneve, PE	Strand Associates	Principal Author, Volume 2
Matt Newman, PE	HDR	Principal Author, Volume 3
Chuck Anderson, PE	Strand Associates	Principal Author, Volume 4
Mike Harris, PE	Jacobi, Toombs & Lanz, Inc.	Principal Author, Volume 5
Janet Kelly	Urban Studies Institute	Contributing Author, Volume 1
David Green	CH2M	Contributing Author, Volume 1
Michael Matichich	CH2M	Contributing Author, Volume 1
Keith Bishton	CH2M	Contributing Author, Volume 1
Kyle Guthrie, PE	HDR	Contributing Author, Volume 2
Mark Lacy	Jacobi, Toombs & Lanz, Inc.	Contributing Author, Volume 2
Rachel Sills	HDR	Contributing Author, Volume 2
Laura Ratajczak	Strand Associates	Contributing Author, Volume 2
Craig Miller	Powers Engineering	Contributing Author, Volume 2
John Lyons, PE	Strand Associates	Contributing Author, Volume 3
Stephanie Glossner, PE	Strand Associates	Contributing Author, Volume 3
Steve Cummings, PE	Jacobi, Toombs & Lanz, Inc.	Contributing Author, Volume 3
Steve McKinley, PE	HDR	Contributing Author, Volume 3
Norman Barker, PE	HDR	Contributing Author, Volume 3
Ryan Tinsley, PE	Strand Associates	Contributing Author, Volume 4
Gary Boblitt, PE	HDR	Contributing Author, Volume 4
Heidi Wilbarger, PE	K.S. Ware & Associates	Contributing Author, Volume 4
Abbe Michalski, PE	Strand Associates	Contributing Author, Volume 4
Shelly Wakefield	Jacobi, Toombs & Lanz, Inc.	Contributing Author, Volume 5
Thomas Cucura	Jacobi, Toombs & Lanz, Inc.	Contributing Author, Volume 5
Crystal Kent	Jacobi, Toombs & Lanz, Inc.	Contributing Author, Volume 5
Jennifer Moore	CH2M	Lead Editor, all volumes
Tawana Bain	NAC	Document production, all volumes
Christy Fowler	NAC	Document production, all volumes
Rosanne Kruzich	RKX	Data management, all volumes
Julia Muller	RKX	Data management, all volumes

20-YEAR COMPREHENSIVE FACILITY PLAN – PLAN OVERVIEW

PURPOSE

In January 2014, the Louisville and Jefferson County Metropolitan Sewer District (MSD) Board adopted a new Strategic Business Plan that defined a change agenda for MSD. The intent of the Strategic Business Plan is to dramatically improve customer care and service; make appropriate investments in technology, infrastructure, and employees; and improve the quality of life in Louisville and Jefferson County, while maintaining the financial viability of the utility. A key part of MSD's plan to implement the Strategic Business Plan is to develop this 20-Year Comprehensive Facility Plan—Critical Repair and Reinvestment Plan (Facility Plan). The purpose of this Facility Plan is to accomplish the following:

- Consolidate MSD's planning and prioritization for facility rehabilitation, renewal, replacement, upgrade, and expansion across all its service areas.
- Recommend and prioritize projects and programs to achieve the following objectives:
  - Protect the public health and safety of the community.
  - Protect our aquatic and terrestrial environment.
  - Meet customer expectations for a consistent level of service.
  - Comply with all federal and state laws, regulations, orders, and standards.

This Plan Overview presents a high-level summary of the Facility Plan and discusses the compelling need for implementing the recommendations presented herein.

BACKGROUND

From 1985 to 2003, MSD spent close to $1 billion on improvements to the wastewater collection and treatment system to address high-priority public health and safety issues. During this same period, a $134 million program for managing intermittent wet-weather sewer overflows was also underway to study the system behavior and subsequently design and construct several important sewer overflow abatement facilities. However, the investment made to tackle sewer overflows was not deemed sufficient to meet water quality goals within timeframes established by federal and state regulators, and in 2003, MSD received a request for information from the U.S. Environmental Protection Agency (EPA) in accordance with Section 308 of the Clean Water Act. This request for information was the first step in a process that eventually led to a notice of alleged Clean Water Act violations from EPA and the Kentucky Department for Environmental Protection (KDEP); this notice resulted in a negotiated settlement between these parties most commonly referred to as the Consent Decree.[1] One requirement of the

[1] The Commonwealth of Kentucky, Plaintiff, and the United States of American, Plaintiff-Intervener, v. Louisville and Jefferson County Metropolitan Sewer District, Defendant, in the United States District Court, Western District of Kentucky, Louisville Division. Amended Consent Decree, Case 3-08-cv-00608-CRS. Filed April 15, 2009. Available at http://www.msdprojectwin.org/Portals/0/Library/Consent%20Decree/Agreement/ Commonwealth%20of%20KY%20vs%20MSD%20%20Amended%20Consent%20Decree.pdf.

Consent Decree was for MSD to develop overflow abatement plans to address combined sewer overflows (CSOs), separate sewer overflows (SSOs), and unauthorized discharges. In response to this requirement, MSD consolidated the required overflow abatement plans into the Integrated Overflow Abatement Plan (IOAP), a long-term plan to control CSOs and eliminate SSOs and other unauthorized discharges in MSD's sewer system. Submitted December 2008 and approved by regulatory agencies in August, 2009, the IOAP identified $850 million in capital improvements, associated incremental operating costs, and a high-level financial plan that included cash-flow projections, projected borrowing schedules, and projected rate increases through the year 2024.

With the filing of the enforcement action, sewer overflows became the top priority, and MSD shifted resources and investments agency-wide to tackle this massive federally mandated undertaking. Spending in areas other than sewer overflow control was focused on the day-to-day operation and upkeep of wastewater, stormwater, and flood protection facilities. Major investments in infrastructure rehabilitation, renewal, and replacement were limited by a desire to keep rates at or below industry averages, even as capital and operating spending ramped up to meet the Consent Decree requirements. This shift was especially significant given that portions of the stormwater and flood protection system were already in decline due to exceeding their expected design life prior to MSD assuming responsibility for these facilities in 1987; and the initial funding source that had been established to address this deferred renewal and replacement was insufficient to address all the improvement needs identified.

The result of this deferred investment over the past 10 to 15 years is that Louisville's aging system of pipes, pumps, treatment plants, and flood gates are now in urgent need of rehabilitation so they can continue to reliably protect public health and community safety. While iconic landmarks and prominent structures garner more attention, Louisville is also home to a less visible system of facilities that serve a higher calling behind the scenes every day—facilities that keep Ohio River floodwaters at bay, prevent harmful bacteria from entering homes and local waterways through sewer overflows, and reduce the likelihood of disease outbreaks such as Zika virus spawned by poor drainage. When pipes fail and structures in the system collapse into sinkholes, and when inland flooding blocks roadways, access to emergency services and critical care is denied. A properly functioning sanitary sewer, stormwater, and drainage system is needed to support the community's economic engine, protect jobs, and sustain the local tax base.

Neglecting this essential system is no longer an option—serious failures are occurring at an increasingly rapid pace. The ability to successfully apply temporary repairs rather than permanent fixes diminishes significantly with each passing day. Rainfall totals that once could be managed by the system now overwhelm it. This risk is heightened by the increased frequency of extreme storm events. The back-to-back storm events experienced in 2015 flooded homes, leaving families without shelter. Cars were washed away, streets were impassable, schools and businesses shut down, and public safety was threatened in proportions not seen in decades. Citizens demanded that measures be taken to prevent similar occurrences from happening again.

Despite the public call to action, MSD recognized that there would likely be concern about the costs to complete the Consent Decree IOAP projects and meet the public expectation of improved levels of service provided by the wastewater and stormwater services. To help identify appropriate levels of investment and priorities, MSD developed this 20-year Comprehensive Facility Plan that consolidates

MSD's planning for facility rehabilitation, renewal, replacement, upgrade, and expansion across all its service areas. Projects listed in the Facility Plan were determined by the Facility Plan Team to address critical needs requiring correction over the next 20 years to protect the community health and safety, provide environmental protection, meet customer expectations for level of service, and move closer to the goal of our local waterways achieving federal and state water quality standards. This Facility Plan will also consider the long-term operating needs to accommodate operation and maintenance (O&M) of new facilities coming on line under the IOAP and other critical infrastructure investments.

Maintaining consistency in levels of service and protecting ratepayers across the entire Louisville community are also key objectives of this Facility Plan. The aim is to provide protection from drainage problems to a consistent 10-percent probability storm (also commonly referred to as a 10-year storm). Currently, the most recently constructed areas in the community are designed to protect against drainage problems due to the 10-percent probability storm as defined by MSD's current Design Manual (a 4.5-inch rainstorm occurring in 24 hours; MSD, 2015). Many older neighborhoods in the service area, constructed before MSD assumed responsibility for stormwater management, begin to experience localized drainage problems in a 3-inch rainstorm occurring in 24 hours. The implication is that MSD's current level of protection is not consistent across the service area.

Based on the analyses of this 20-Year Comprehensive Facility Plan, meeting the critical needs of the community is estimated to cost $4.3 billion over the next two decades. The reality is that the original Consent Decree resulted in large part from a similar pattern of deferred rehabilitation and reinvestment in critical wastewater infrastructure. The Facility Plan Team believes the community should not risk burdening our children and grandchildren with future federal mandates because of an unwillingness to dedicate adequate resources to the challenges of today.

MSD strongly believes that the Louisville community deserves to be informed on matters of public health and safety, and likewise, should have a voice in the conversation about the timing of necessary infrastructure investments. MSD committed to facilitating discussions with customers, business leaders, elected officials, and others. With this overall goal, after the draft report was submitted in December 2016, MSD undertook the wide-reaching "Community Conversation" initiative described in Volume 1 Section 2, aimed at bringing many perspectives to a constructive dialogue. This dialogue did not center around *if* the risks to the public health and safety of families and business owners will be addressed, but rather *how soon should the work begin*.

Community input confirms that Louisville supports restoring its vital wastewater, flood protection, and stormwater management facilities. Responses from those who engaged in the community conversation are as follows:

- Ninety percent of the respondents understand and agree with the need for investing in the community's wastewater, stormwater and flood protection systems to reduce risks to public health and safety rather than continuing to defer critical repairs and reinvestment.
- Eight-nine percent of the respondents believe it is important to begin addressing the public health and safety risks as quickly as possible.
- Seventy-one percent of the respondents support an increase in residential rates of up to $10 per month (with a proportional increase in industrial and commercial rates), to immediately begin to

fund critical wastewater, stormwater, and flood protection needs to address public health and safety risks.

- Seventy eight percent of the respondents support expanding MSD's Rate Relief Program, to assist customers who meet federal criteria established for other utility rate assistance programs.

This input echoes the priorities identified by local citizens at the 100 Resilient Cities Workshop hosted by Louisville Metro in early 2017, including the risks of severe or catastrophic weather, infrastructure vulnerability, and aging infrastructure.

SCOPE OF PLAN

As noted previously, the following are the purposes of this Facility Plan:

- Consolidate MSD's planning and prioritization for facility rehabilitation, renewal, replacement, upgrade, and expansion across all its service areas.
- Recommend and prioritize projects and programs to achieve the following objectives:
  - Protect the public health and safety of the community.
  - Protect our aquatic and terrestrial environment.
  - Meet customer expectations for a consistent level of service.
  - Comply with all federal and state laws, regulations, orders and standards.

This Facility Plan has identified overall financial needs for future facility rehabilitation, renewal, replacement, upgrade, and expansion. The projects are those recommended by the Facility Plan Team as needed to achieve MSD's mission, vision, and goals. All projects have been assigned recommended schedule dates and durations based on the Facility Plan Team's assessment of their relative priority and needs. The project schedules will be further refined by MSD staff as part of the annual budgeting process. In addition, this Facility Plan, like all long-term plans, should be revisited on a recommended 5-year cycle to make adjustments as changing conditions develop.

For projects directly affected by precipitation events, the Facility Plan includes projected rainfall intensity, duration, and frequency (IDF) curves for year 2035. These projections consider both statistical trends going back 60 years, along with state-of-the art global circulation models that project future precipitation conditions. These models reflect the observed increased frequency of extreme storm events that we have experienced, presumably related to the impacts of global climate change.

This Facility Plan recommends that MSD's current design criteria for facilities (based on published storm recurrence intervals) will apply to new facilities planned as appropriate, with revised precipitation projections applied to the recurrence intervals in the criteria. For example, stormwater culverts under secondary roadways will continue to be designed to the 10-percent probability storm (commonly known as the 10-year storm), but the 24-hour rainfall value used in the calculations reflects precipitation projections for the end of the 20-year planning period (2035). The Facility Plan recommends that MSD's design standards be modified to incorporate the projected 2035 precipitation projections in the requirements for new construction. For example, the 10-percent probability storm projected for 2035 is

5.2 inches of rain occurring in 24 hours, as compared with the current MSD Design Manual value (2015) of 4.5 inches of rain occurring in 24 hours.

This Facility Plan considers the operating costs, including staff increases, to accommodate O&M of new facilities coming online under the IOAP and this Facility Plan. In addition, shortfalls in current O&M budgets and staffing levels for facility maintenance have been evaluated, and a program to adjust both budgets and staffing over time has been recommended. The recommended budgets and staffing levels are intended to allow predictive and preventive maintenance to occur in accordance with current industry best practices for asset management.

A key part of the Facility Plan is a recommended 20-year capital improvement program (CIP). Projects in the recommended 20-year CIP were determined by the Facility Plan Team to address critical needs requiring correction over the next 20 years. Another key objective of the Facility Plan is consistent service for ratepayers across the entire Louisville community. The aim is to provide wastewater, drainage, and flood protection services to a 10-percent probability storm (10-year storm) for all customers within the MSD service area by the end of the 20-year planning period.

PROJECT DEVELOPMENT

The Facility Plan Team identified projects through a number of pathways. MSD's current CIP contains more than 100 projects related to wastewater systems. If these projects were already in design or construction, then these existing projects were included in the recommended 20-year CIP without change. If the projects were not in design or construction, then project needs were identified, project justification reviewed, and costs verified. These projects were then subject to prioritization along with all the other projects.

The IOAP has a number of very large projects still to construct. These projects are required to be completed on the schedule presented in the approved IOAP. No changes were made to the IOAP projects or their schedules.

MSD has a number of existing planning studies related to wastewater that have not been fully implemented, primarily because of funding limitations. The Facility Plan Team evaluated existing studies and found a number of worthwhile projects that have not been included in the CIP yet. These projects were evaluated and are included in the project mix for prioritization.

Finally, the Facility Plan Team looked for gaps in previous planning. This included reviewing population projections, assessing regulatory changes that might occur during the 20-year planning period, and conducting a facility condition assessment that included staff interviews, visual inspections, and in some cases diagnostic measurements. The projects resulting from regulatory changes will be mandatory to complete in the timeframe dictated by the adoption of new regulations. The anticipated timeframes for new regulations and new regulatory enforcement priorities have been identified by the Facility Plan Team, understanding that regulatory issues are not totally predictable and not within MSD's complete control. The facility condition assessment identified a number of projects that were critically needed to correct the past under-investment in asset renewal and replacement. A review of maintenance trends confirmed that the number of infrastructure failures (for example, sewer collapse, pump station capacity shortfalls) is directly related to the asset's age. This implies a system-wide deficiency in

effective preventive maintenance, which impacts both the reliability and the overall cost of ownership of those assets.

PROJECT EVALUATION AND PRIORITIZATION

Project evaluation and prioritization requires a rigorous and transparent approach. The approach used to develop the IOAP was very successful in this regard and, to the extent possible, was replicated in developing this Facility Plan.

Given the variety of ways that projects were identified and developed, capital and operating cost-estimating used a variety of sources. The IOAP Cost Tool was used to develop project costs where applicable (new projects with standard components like sewers and pump stations). Where the standard cost tool could not be applied, the team used industry-standard cost references such as RS Means. When similar MSD projects were available, the estimating was conducted using unit prices from those projects.

Prioritizing projects followed the values-based benefit/cost evaluation used successfully in the development of the IOAP. The Wet Weather Team (WWT) Stakeholder Group was rechartered to continue to assist with IOAP implementation and also to serve a role in helping guide Facility Plan development. Many original members chose to continue serving on this team. Recognizing the broader scope of the Facility Plan, a number of new members representing different interest groups and demographics were added to the WWT Stakeholder Group.

A values-based benefit/cost evaluation assisted with developing scoring scales to grade projects on their effectiveness at protecting the community in the following values:

- Environmental Protection
- Public Health Protection
- Regulatory Compliance
- Sustainability
- Property Protection
- Economic Vitality

The values-based benefit scores were coupled with life-cycle cost information to develop a benefit/cost score used for the first round of project prioritization. This approach was then supplemented with an evaluation of the effectiveness of the project in mitigating risk. Risk mitigation effectiveness was valuated based on the change in either the probability of an event happening or the consequence of that event occurring. As Figure 1 indicates, the combination of a high probability and a serious consequence result in a risk that is considered to be “critical.” The anticipated change in risk resulting from implementing a project resulted in a risk reduction factor that was used in conjunction with the benefit/cost score to prioritize projects.

Consequence						
	5	Critical	Critical	Critical	High	Medium
	4	Critical	Critical	High	Medium	Low
	3	Critical	High	Medium	Low	Low
	2	High	Medium	Low	Low	Very Low
	1	Medium	Low	Low	Very Low	Very Low
		5	4	3	2	1
		Probability				

Figure 1. Risk Evaluation Matrix

RECOMMENDED 20-YEAR CAPITAL IMPROVEMENT PROGRAM

Table 1 summarizes the recommended 20-year CIP, broken down by service area and major program. Note that the values in the table have been escalated at 3 percent per year compounded to the projected mid-point of construction.

Table 1. Recommended 20-Year Capital Improvement Plan Summary

Service Area and Program	Capital Cost (in escalated dollars, millions)				Total FY17 through FY36
	FY17 through FY21	FY22 through FY26	FY27 through FY31	FY32 through FY36	
Wastewater	**$848.0**	**$392.3**	**$353.7**	**$262.6**	**$1,856.5**
Consent Decree (IOAP)	$564.6	$26.5	$0.4	$.0	$591.5
NMC	$116.2	$33.2	$35.1	$40.0	$224.5
CMOM	$144.2	$275.7	$184.4	$201.1	$805.4
Development	$23.0	$56.9	$133.8	$21.5	$235.2
Stormwater	**$348.8**	**$623.7**	**$636.2**	**$734.7**	**$2,343.4**
Drainage	$189.8	$403.0	$394.0	$529.7	$1,516.5
Floodplain Management	$19.8	$25.4	$29.4	$34.1	$108.6
Ohio River Flood Protection	$128.1	$175.6	$191.2	$145.9	$640.9
Stormwater Quality (MS4)	$11.2	$19.8	$21.5	$25.0	$77.5
Support Systems	**$43.5**	**$28.7**	**$24.9**	**$27.4**	**$124.5**
Capital Equipment	$11.3	$14.7	$16.7	$19.0	$61.8
Facilities	$27.7	$8.3	$3.2	$2.7	$41.9
IT	$3.1	$3.8	$3.1	$3.6	$13.6
LOJIC	$1.4	$1.9	$1.8	$2.1	$7.3
Total Escalated Costs	**$1,240.4**	**$1,044.7**	**$1,014.7**	**$1,024.7**	**$4,324.5**

FY fiscal year
IOAP Integrated Overflow Abatement Plan
IT information technology
LOJIC Louisville and Jefferson County Information Consortium
MS4 Municipal Separate Storm Sewer System

Table 2 summarizes the first 5 years of the recommended 20-year CIP, broken down by year, service area and major program. Note that the values in the table have been escalated at 3 percent per year compounded to the projected midpoint of construction. MSD's Fiscal Year (FY) 2017 approved CIP did not fully fund the Facility Plan recommendations for that fiscal year due to revenue limitations caused by a cap on the rate increases that the MSD Board can approve without receiving approval from Louisville Metro Council. MSD staff prioritized CIP spending based on the funding available, resulting from the FY2017 CIP budget that was approved by the MSD Board. The net effect is that the projects not funded in accordance with the Facility Plan recommendations will need to be reconsidered at a later date, and when sufficient funding becomes available.

Table 2. Recommended 5-Year CIP Summary

	Capital Cost (in escalated dollars, millions)					
Service Area and Program	**FY2017**	**FY2018**	**FY2019**	**FY2020**	**FY2021**	**Total FY2017 through FY2021**
Wastewater	**$150.8**	**$188.1**	**$210.0**	**$161.1**	**$138.0**	**$848.0**
Consent Decree (IOAP)	$109.9	$139.5	$154.4	$89.7	$71.1	$564.6
NMC	$19.7	$21.3	$25.9	$26.7	$22.6	$116.2
CMOM	$18.6	$25.1	$24.1	$35.7	$40.7	$144.2
Development	$2.6	$2.2	$5.6	$9.0	$3.6	$23.0
Stormwater	**$19.1**	**$40.8**	**$63.7**	**$93.0**	**$132.3**	**$348.8**
Drainage	$4.2	$16.2	$31.8	$59.7	$77.9	$189.8
Floodplain Management	$1.6	$4.6	$4.4	$4.5	$4.6	$19.8
Ohio River Flood Protection	$11.4	$18.3	$25.6	$26.8	$46.0	$128.1
Stormwater Quality (MS4)	$1.9	$1.7	$1.9	$1.9	$3.7	$11.2
Support Systems	**$12.5**	**$5.5**	**$7.0**	**$7.4**	**$11.2**	**$43.5**
Capital Equipment	$.6	$1.4	$1.9	$2.4	$5.0	$11.3
Facilities	$10.2	$3.1	$4.7	$4.2	$5.7	$27.7
IT	$1.6	$.7	$.3	$.3	$.3	$3.1
LOJIC	$.1	$.4	$.1	$.5	$.3	$1.4
Total Escalated Costs	**$182.4**	**$234.5**	**$280.7**	**$261.4**	**$281.5**	**$1,240.4**

SIGNIFICANT SERVICE AREA PROJECTS AND PROGRAMS

The following sections will address each of the MSD service areas, along with support services, describing specific assumptions that drove project development.

WASTEWATER COLLECTION AND TREATMENT

For the past 10 years much of MSD's focus has been ensuring compliance with the Consent Decree requirements. Due to limited resources and a desire to maintain sewer and drainage rates at or below the national average, developing and implementing the IOAP has taken the focus off infrastructure renewal and repair for facilities not related to sewer overflow control. In addition, the weak economy from 2008 to 2012 also reduced the pressure to provide new wastewater service to developing areas. While IOAP implementation is only half finished, the consequences of deferred rehabilitation and reinvestment are beginning to show in increased numbers of sewer collapses, including multiple problems with the Broadway Interceptor and its connecting lines. With the local economy strengthening, MSD is seeing much more interest from the development community to provide sewer service to growth areas across the county. This Facility Plan addresses all these issues, as described in the following sections.

CONSENT DECREE AND INTEGRATED OVERFLOW ABATEMENT PLAN

The IOAP is a major part of MSD's Consent Decree compliance program. The IOAP is a long-term plan to control CSOs and eliminate SSOs and other unauthorized discharges from MSD's sewerage system. The IOAP is expected to improve water quality in both Beargrass Creek and the Ohio River through and downstream of Jefferson County. The expected water quality benefits of the IOAP include reductions in the peak levels of bacteria in the Ohio River and Beargrass Creek and in the amount of time that average bacteria levels exceed water quality standards. In addition, the IOAP program will enhance public health and safety by reducing the potential for the public to come in contact with untreated SSOs, in the basements of their homes or in the streets and ground surfaces where SSOs currently discharge.

Long-Term Control Plan Benefits

The suite of projects selected for the Final CSO Long-Term Control Plan (LTCP) part of the IOAP will result in approximately 98 percent capture and treatment of wet-weather combined sewage during an average year. This benefit represents an 89 percent reduction in CSO volume compared with conditions in 2008. As a point of reference, the presumptive approach for compliance with water quality standards in EPA's CSO Control Policy (EPA, 1994) is based on a minimum of 85 percent capture and treatment of wet-weather combined sewage.

Sanitary Sewer Discharge Plan Benefits

The suite of projects selected for the Final Sanitary Sewer Discharge Plan (SSDP) part of the IOAP will eliminate capacity-related SSOs up to the site-specific level of protection. The SSO projects are anticipated to eliminate an average of 145 SSO events per year (290 million gallons [MG] of overflow volume), based on 2005 to 2007 data normalized for rainfall. In terms of water quality, SSO projects will eliminate 100 tons of 5-day biochemical oxygen demand (BOD_5) and approximately 200 tons of total suspended solids (TSS) annually.

Sustainable Performance

MSD's IOAP is based on a "demonstration approach" to achieving compliance with the Consent Decree and the Clean Water Act requirements. While MSD is required to certify compliance with the CSO management requirements after completing the full suite of CSO projects in 2020, MSD's CSO management performance will continue to be monitored through the Morris Forman Water Quality Treatment Center (WQTC) Kentucky Pollutant Discharge Elimination System (KPDES) permit with performance standards consistent with the commitments of the IOAP. Similarly, the SSO elimination projects are required to be completed by the end of 2024. MSD's certification that the performance objectives have been met will mean that MSD's obligations under the Consent Decree have been discharged, but the requirements for continued operation of collection and treatment facilities in the system to avoid further SSOs will continue through the KPDES permits. The Consent Decree requirements do not go away with the completion of the IOAP projects—the enforcement mechanism for sewer overflow and control changes from the Consent Decree to the respective KPDES permits.

Integrated Overflow Abatement Plan Impacts on the Recommended Capital Improvement Program

Over the first 5 to 9 years of the planning period, the wastewater service area CIP is dominated by completing the remaining major IOAP projects. The major CSO storage basins are all scheduled to be completed by the end of FY2021, with the remainder of the SSO elimination projects scheduled to be completed by the end of FY2025. Completing the entire suite of CSO and SSO projects in accordance with the IOAP schedule is required by the Consent Decree. Any failure to complete a project on schedule could be considered a violation of the Consent Decree, with consequences including stipulated penalties that could total more than $1 million for a 1-year delay in completion.

The next section of the Plan Overview addresses the balance of the CIP. These projects address needs in wastewater, stormwater, flood protection and asset management infrastructure that have been deferred for the past 10 to 15 years as MSD's limited resources were focused on meeting Consent Decree requirements.

NINE MINIMUM CONTROLS

The EPA Nine Minimum Controls (NMC) were initially developed as part of the Clean Water Act CSO Policy to address combined sewer system (CSS) best management practices (BMPs) that do not require significant construction. In a continued focus on protection of public health and safety, the BMPs required by the NMCs will be integrated into MSD's KPDES permits to ensure protection of public health, safety, and the environment. Maximizing storage in the conveyance system, maintaining WQTC capacity, and ensuring effective public notification of sewer overflows are examples of the BMPs that will remain in place in perpetuity as conditions of the Morris Forman WQTC KPDES permit.

The recommended 20-year CIP includes funding for the formal NMC program that is reported quarterly as part of the Consent Decree requirements. Capital projects that help to sustain the intent of the NMC requirements are included in the preliminary CIP through the end of the planning period.

The most significant long-term NMC activities are the real-time control (RTC) system in the CSS and the Morris Forman WQTC improvements, which are also a major component of the IOAP. The 20-year CIP recommendation provides annual funding for ongoing RTC rehabilitation and renewal to ensure proper RTC system operation system. By using the storage capacity of MSD's large-diameter CSS, MSD can cost-effectively mitigate sewer overflows during smaller storms of concern in CSO control. The cost of providing storage in the pipes is typically a small fraction of the cost to provide that same storage in a stand-alone tank. The long-term operation of an effective RTC system is one of the cornerstones of the IOAP, which is necessary for long-term sustained compliance with the Clean Water Act CSO Policy, CSO Long-Term Control Plan, and NMC requirements.

Sustaining reliable treatment capability and capacity at the Morris Forman WQTC is critical to ensure proper wastewater treatment for Ohio River water quality protection. This treatment is a significant endeavor that has been underfunded since the most recent overall plant rehabilitation was completed in the early 2000s. A detailed facility condition assessment has been prepared for the Morris Forman WQTC liquid process treatment facilities. Periodic equipment replacements and major plant renovations are scheduled in 5-year intervals for financial planning. Overall, the proposed 20-year CIP recommendations include almost $200 million in rehabilitation and renewal projects over the planning period. To protect public health, these rehabilitation and renewal projects are essential to maintaining reliable operation of the largest WQTC in MSD's system. Unfortunately, the 2015 failure of the Morris Forman WQTC high-voltage electrical distribution center provided a catastrophic view of the consequences of deferring facility renewal and replacement. As power was lost to the main electrical system for the WQTC, inadequate backup power resulted in flooding and extensive damage to the facility. Wastewater was discharged that had not been treated to the State of Kentucky's KPDES discharge standards, creating a potential public health risk to the community. Ironically, the capital project to provide backup power supply for the WQTC had been deferred and, therefore, was not in place to avoid the costly damage to the facility.

This Facility Plan assumes there will be no major changes in the Morris Forman WQTC discharge requirements during the planning period, and therefore, the existing plant will continue to operate as-is for the duration of the planning period, except for initial construction of facilities required for nutrient removal late in the planning period, described herein.

For many years, MSD has produced a high-quality soil conditioner called Louisville Green from the biosolids generated by the WQTC. The condition of the Louisville Green production equipment (primarily the biosolids dryers and pellet processing equipment) is rapidly degrading due to the severe duty conditions experienced in processing the highly abrasive dried biosolids product. MSD has, in the past, been able to sell all Louisville Green it could produce, thereby offsetting system operating costs. The current degraded condition of the equipment requires MSD to landfill dewatered biosolids when the drying system capacity is overwhelmed. MSD, under a separate initiative, is investigating short-term biosolids management solutions that may include increasing the amount of dewatered biosolids disposed of by landfill (by negotiating better prices in return for the commitment of guaranteed minimum amounts of dewatered biosolids being sent to the landfill), turning over management of the dewatered biosolids to a third-party vendor and/or replacing the drying system with an alternate technology approach. Recognizing that implementing a new biosolids management approach may take several years to implement, the recommended 20-year CIP includes short-term fixes for the dryer

system, as well as expansion of the dewatered cake-handling system to allow increased landfilling as continued operation of the dryers becomes impractical. Other approaches to biosolids handling are currently under consideration, because a short-term solution may include designing and constructing a biosolids handling system by a third-party vendor, similar to how the high-purity oxygen generation system is currently being procured. If this procurement model is followed, then MSD will not directly incur capital cost, and the project will have more impact on the annual operating budget than the CIP.

A 50-year look at continued operations of the Morris Forman WQTC at the current site has concluded that there will not be any major changes in discharge standards, including adding nutrient removal or considering microconstituents such as residual antibiotics, hormones, or other pharmaceuticals and residual personal care products, within the current 20-year planning horizon. If major discharge standards changes occur, then they will likely require changes to both the liquid treatment and biosolids-handling approaches. Given the severe constraints of the existing site, locating new facilities on property not part of the current Morris Forman WQTC site will be necessary. The long-term plan has been developed, and a phasing roadmap for systematic facilities expansion is included. Some level of nutrient removal may be required toward the end of the 20-year planning period. The proposed 20-year CIP recommendation includes funds for purchasing land and starting facility construction to address nutrient removal during years 15 to 20 of the planning period. Treatment for microconstituents is not envisioned in the recommended 20-year CIP, but it will represent a significant capital expense when required by new regulations. If and when the discharge requirements change to include advanced nutrient removal and increased removal of BOD_5 and TSS from wet-weather flow, then the costs to expand and upgrade the Morris Forman WQTC could exceed $1.2 billion (2016 dollars).

CAPACITY, MANAGEMENT, OPERATIONS, AND MAINTENANCE

The next largest program within the wastewater service area is the Capacity, Management, Operations, and Maintenance (CMOM) program. EPA Region 4 developed the initial program that became CMOM, and MSD's Consent Decree specifically requires developing and implementing a CMOM program. The intent of the CMOM program is to ensure that BMPs are implemented across all aspects of the utility, thereby increasing the ability of the utility to meet its obligations under the Clean Water Act. CMOM activities represent BMPs for wastewater utilities and will be sustained for the entire 20-year planning period.

Major components of the CMOM program include projects for major renewal and replacement projects at the Hite Creek, Floyds Fork, Cedar Creek, and Derek R. Guthrie WQTCs. These renewal and replacement projects are scheduled at 5-year intervals for each center to ensure that MSD can maintain efficient and effective wastewater treatment, a critical aspect of public health protection. The budget established for each center is the result of an asset inventory and facility condition assessment of each WQTC. The actual scope of each project will be established during detailed design.

The CMOM program provides proactive asset management of pipes and pump stations that make up most of MSD's collection system. Clearwater intrusion of surface water and groundwater during rain events overloads the conveyance and treatment systems. This clearwater intrusion, referred to as infiltration and inflow (I/I), is a main cause of sewer overflows. Budgets are recommended to provide inventory of critical parts for pump stations, rehabilitate and replace sewers that are leaking or in

danger of structural failure, and provide stand-by generators in more locations to improve reliability during power outages. Studies suggest that approximately 50 percent of the I/I entering MSD's sewer system during a rain event may be coming from private property sources outside of MSD's direct control. To achieve and sustain the required overflow abatement levels, a substantial portion of this I/I must be removed from the system. A project with "seed money" to initiate a private property I/I reduction program is also recommended in the CMOM budget. The private property I/I program is expected to become self-sustaining through new fees after initial start-up.

A significant addition to the CMOM program is the recommended expansion of the sewer rehabilitation and replacement activities to encompass major interceptors. In the past, MSD deferred major rehabilitation of these major interceptors due to the cost and difficulty in completing construction on these pipes. An increasing frequency of major interceptor failures indicates a critical need to proactively inspect and rehabilitate or replace these high-risk very old assets. When a major interceptor fails, a ripple effect is created across a much broader area due to road closures, traffic impacts, and other factors that directly impact the community. Since major interceptor rehabilitation projects have not been specifically identified at this time, an allowance has been recommended to begin the process of inspection, project development and early-action remediation of high-risk defects over the next five years. By the end of five years, the recommended allowance is increased to $10 million per year, totally focused on major interceptor rehabilitation and replacement. At this sustained funding level, MSD will be able to renew these critical assets on a prioritized basis. Preemptive rehabilitation is much less expensive than making emergency repairs, such as those MSD had to complete in response to a collapsed section of the Broadway Interceptor in 2015. This one repair interrupted businesses, severely impacted traffic flow on a main arterial roadway, and impeded access to a nearby hospital.

DEVELOPMENT

To assist in providing the proper level of sewer service for growing areas, the recommended 20-year CIP budget also includes treatment capacity expansions for the Hite Creek, Floyds Fork, and Cedar Creek WQTCs. The timing of these expansion projects has been based on population projections for each service area. Ensuring that capacity is available in advance of development supports growth and development for the community by avoiding moratoriums due to the rated capacity of the WQTCs being exceeded. This expansion is in accordance with KDEP regulations. The Derek R. Guthrie and Morris Forman WQTCs are not anticipated to need a growth-related capacity expansion within the 20-year planning period, however, they will require investment to continue operating properly.

In addition to WQTC capacity, the recommended 20-year CIP also addresses conveyance system capacity needs. Projects are recommended to address areas anticipated to have significant growth in the Floyds Fork WQTC and Cedar Creek WQTC service areas due in part to the development of the Parklands of Floyds Fork. Growth is also provided for in the Hite Creek WQTC and Derek R. Guthrie WQTC service areas. The Morris Forman WQTC service area is essentially built out, meaning growth will result from customers coming online through infill of existing developed areas. In addition to expansion of the sewer system, capacity issues with pump stations have also been identified and addressed. Several pump stations have been identified that do not have adequate capacity to meet projected peak flows due to future growth. To avoid creating new SSOs, these pump stations must be expanded in advance of

the upstream collection system expansions that will bring them additional flow. The intent is to provide the needed reliable capacity in both the gravity and pumped portions of the collection system so that new connection moratoriums can be avoided.

REGULATIONS

The recommended CIP budget also includes future projects in anticipation of regulatory changes. Increased levels of treatment for nutrients (nitrogen and phosphorus) could be imposed before the end of the planning period, which would seriously impact MSD's WQTCs. Projects to begin addressing nutrient removal requirements at all WQTCs are included in the latter years of the planning period. The timing of nutrient removal regulations will govern when these projects are actually implemented.

Microconstituent removal has also been identified as a potential future regulatory requirement. While the imposition of standards requiring microconstituents removal is not anticipated with the 20-year planning window, preliminary concepts have been developed and placeholder budgets recommended to address this potential future need. These placeholder budgets are not in the recommended 20-year CIP. The timing of microconstituent removal regulations will govern when these projects are actually implemented.

STORMWATER MANAGEMENT

Stormwater management is a vital component of MSD's system, because it directly impacts the health and safety of all Louisville and Jefferson County residents. The recommended 20-year CIP includes a number of programs related to drainage and internal floodplain management. In 1987, MSD took over stormwater management and Ohio River flood protection through a Memorandum of Agreement with the City of Louisville (pre-merger with Jefferson County), and most of the small cities within Jefferson County. In 1988, MSD completed a *Stormwater Drainage Master Plan* (URS Corporation et al., 1988) that addressed the backlog of known drainage and flooding problems and planned for improvements in overall drainage and flood protection for the service area. MSD began implementing the recommendations of the *Stormwater Drainage Master Plan* on a prioritized basis, within the budget limitations imposed by the insufficient revenue generated through drainage fees. The flood of 1997 diverted the focus of stormwater management to deal with specific vulnerabilities exposed by that severe flooding event.

PROJECT DRAINAGE RESPONSE INITIATIVE

Drainage problems create health and safety impacts for citizens directly at their homes, schools, businesses, and transportation routes. Beginning in 2003, MSD initiated an aggressive program to address a wide variety of drainage issues that were pointed out by customers. This Drainage Response Initiative program, dubbed Project DRI, assigned experienced project managers, contractors, and inspectors to address drainage problems on a "grade-to-drain" basis. Efforts under this program address problems ranging from structural flooding to alleviating minor standing water problems. Since 2003, most funds available through drainage fees have been allocated to Project DRI, with more than $125 million in capital drainage improvements completed through this program. While MSD originally

thought that Project DRI would be phased out as the backlog of customer drainage issues were resolved, customer drainage requests continue to be among the most common communication received by MSD's Customer Relations Department. These requests are likely due to drainage impacts of land use changes, the increase in the amount of impervious surfaces across Jefferson County, the increased frequency of extreme storm events, and the degradation of drainage facilities due to aging. MSD's experience has proven that having the ability to respond quickly to individual property owner's drainage concerns is a vital part of providing quality service and building customer satisfaction. Project DRI has proven to be a very valuable program for MSD's customers, and the recommended 20-year CIP includes an annual allocation of $2.8 million to $5 million per year to sustain it.

STORMWATER DRAINAGE MASTER PLAN

Given the public concern over the effects of the increased frequency of extreme storm events, the localized drainage solutions offered by Project DRI need to be supplemented with a program to address issues of stormwater management and flood protection on a countywide or watershed basis. To increase the public health and safety protection and provide a consistent level of protection for the entire service area, a significant increase in spending for drainage and flood protection is required.

Subsequent to the 1988 *Stormwater Drainage Master Plan,* the primary countywide stormwater planning completed by MSD has related to internal (that is, not related to the Ohio River) floodplain management. MSD and the Kentucky Division of Water have completed studies in most watersheds to update the Federal Emergency Management Agency (FEMA) Special Flood Hazard Areas and Local Regulatory Floodplains. These studies rely on rainfall IDF information that reflect historical observations. The Facility Plan Team has projected IDF information out to 2035 for long-range planning. Because the conditions projected for 2035 are not based on observed data, the updated floodplain information should not be used for regulatory purposes, but it can be used to inform potential property owners of the risks associated with potential future extreme storm events.

While MSD requires plans for new development to document no adverse impacts on downstream flooding, the cumulative effects of land use changes within the existing developed areas prior to MSD assuming responsibility for stormwater management may not have been subject to the same level of scrutiny. While the hydrologic and hydraulic models used for drainage planning have been updated to reflect recent land use changes, most have not been analyzed comprehensively for drainage issues outside of the Special Flood Hazard Areas or Local Floodplains to allow potential downstream impacts of new projects to be identified.

An update to the comprehensive countywide stormwater master plan is recommended to be initiated as one of the first recommendations from the stormwater portion of this Facility Plan. While current development standards require mitigating drainage impacts of land use changes, analysis of historical trends shows a significant reduction in natural green space and an increase in impervious surfaces within Jefferson County. In addition to addressing the potential impact of the increased frequency of extreme storms, the master plan should also consider a strategy to restore some of these surfaces to natural pervious conditions, which can have a significant impact on the amount of infrastructure that will be needed to address future needs. This plan should address floodplain management definition and

non-floodplain related drainage problems in an integrated approach to deal with this highly visible MSD service.

EARLY ACTION PROJECTS

While the comprehensive stormwater master plan is being updated, MSD's customers expect immediate action to begin addressing stormwater issues. MSD and the Facility Plan Team have identified several areas across Jefferson County with a history of drainage problems primarily related to localized drainage, not directly related to floodplain management issues.

PROPOSED COMPREHENSIVE STORMWATER MASTER PLAN IMPLEMENTATION

Allowances have been established in the recommended 20-year CIP to provide for implementing the proposed stormwater master plan. The recommended budgeted amounts were identified through extrapolation of the Early Action Plan projects described previously to the entire county. The intent is to provide the entire county with updated and expanded stormwater management facilities to consistently meet the level of protection of a 10-year storm, using stormwater IDF targets projected for the end of the planning period. Based on an extrapolation of project costs developed for the Early Action Plan projects, the funding required for these projects is anticipated to exceed $600 million over the 20-year planning period. The Facility Plan Team deemed it critical to establish reasonable placeholder numbers in the long-range financial plan to be developed as part of this Facility Plan.

VIADUCT FLOODING

MSD is responsible for managing drainage from 32 viaducts that are subject to flooding during storm events. Some viaducts become completely impassable in relatively minor storms. Viaduct flooding disrupts transportation routes and creates potentially hazardous conditions when flooded roads are not barricaded in a timely manner or when drivers ignore the barricades and drive under the viaducts anyway. The Facility Plan Team has identified conceptual drainage solutions for each viaduct for which MSD is responsible. The projects were prioritized based on the team's understanding of traffic load and perceived risk to public health and safety. Note that viaducts are a shared responsibility with Louisville Metro Public Works and the Kentucky Transportation Cabinet. Before initiating a costly viaduct drainage solution, all parties should engage in determining the best approach to improving public safety at the viaduct locations.

STORMWATER QUALITY MUNICIPAL SEPARATE STORM SEWER SYSTEM

The Municipal Separate Storm Sewer System (MS4) Program is a drainage-related program to improve the quality of surface waters through controls on stormwater runoff quality in Jefferson County and to protect the public health, safety, and welfare by reducing the introduction of harmful materials into the MS4s that discharge into community streams. The MS4 Program permit outlines the regulatory requirements for discharging municipal stormwater into local water bodies. Major categories for program compliance include, but are not limited to, the following:

- Public education and outreach
- Management of industrial facilities
- Stormwater pollution prevention plan creation and oversight
- Administration of construction site management (erosion prevention and sediment control)
- Post-construction controls (green infrastructure)
- Maintenance and analysis of water quality monitoring equipment and data

The current 5-year MS4 Program permit cycle began on August 1, 2011, and it establishes the Maximum Extent Practicable (MEP) effort for MS4 programs to maintain MSD compliance with the Clean Water Act. MSD uses green infrastructure techniques—such as infiltration, rain gardens, and basin retrofits—to offset the need and costs on conventional facilities such as storage basins. Green infrastructure has proven to effectively reduce volume in the CSS, and for water quality improvements for treatment of runoff in MS4 areas. Requirements for new construction include these types of practices to control the 80th percentile event (0.6 inch of rain) in Louisville Metro. MSD funding is available for construction cost offsets in the CSS area and potential stormwater fee credits in the MS4 areas. Funding commitments for this program were defined in the IOAP and have been retained in the Facility Plan recommended CIP.

The Facility Plan identified several large stormwater retention basins with the potential for conversion of all or part of the basin to provide infiltration of stormwater. These projects are identified to be completed within the first 5 years of the CIP, providing very cost-effective green infrastructure solutions on a large scale.

FLOODPLAIN MANAGEMENT—FLOOD RESPONSE FUND

As of December 2016, MSD has purchased approximately 200 homes through federal grant programs since the 1997 flood and is currently working on 13 open grant projects to purchase additional homes located in flood prone areas. MSD also has 9 grant applications under review by FEMA. These grant applications include an additional 56 flood-prone properties that could be mitigated through acquisition.

Following a number of spring flooding events in 2015, the Mayor formed a multiagency Flood Mitigation Workgroup to address impacted residents who were unable, for a variety of reasons, to get back in their homes after the floodwaters receded. The Flood Mitigation Workgroup recommended several mitigation approaches, including establishment of a “quick-buy” program to allow property owners to sell flood-impacted property in a much shorter time than would typically be possible. The MSD Board approved allocation of $1.5 million from the FY2016 budget to fund this program. The Flood Mitigation Workgroup recommended an annual fund be established to provide timely relief to property owners impacted by future extreme storm events.

The resulting Flood Response Fund proved to be a vital part of the community’s recovery after the 2015 floods. The recommended 20-year CIP includes an annual allocation of $4 million per year to the Flood Response Fund for various flood mitigation and response activities, including continuing the quick-buy program where appropriate, implementing small-scale flood protection projects, and applying for, administering, and providing local-share funding for FEMA and other flood relief grant programs.

OHIO RIVER FLOOD PROTECTION SYSTEM

In 1987, as part of the Memorandum of Agreement with the City of Louisville related to drainage and flood protection services, MSD assumed responsibility for the Ohio River Flood Protection System (ORFPS). The ORFPS is critical to protecting Louisville and Jefferson County from the type of devastating flooding experienced in New Orleans following Hurricane Katrina and all along the Mississippi River when similar flood levee and pump station systems failed during the extreme high-water conditions experienced in the past decade. Louisville's ORFPS was evaluated in a Levee Safety Evaluation (LSE) by the U.S. Army Corps of Engineers (USACE) in 2015 and found to be compliant with the level of protection required by FEMA. The level of Ohio River flood protection required by FEMA incorporates a "coincident frequency analysis" that statistically determines the probability of a rain event happening at the same time as high Ohio River levels. The coincident frequency analysis found the MSD ORFPS is adequately sized to handle a 1-percent probability (100-year storm) event. MSD's local drainage design criteria calls for conveyance (pumps and pipes) to be sized for at least the 10-percent event. While meeting the FEMA 1-percent criteria in a coincident frequency analysis, several flood pumping stations would require significant expansion to achieve a capacity equivalent to a 10-percent probability event, should MSD decide to apply drainage criteria to the flood pumping stations. The LSE contained a wealth of information about minor deficiencies that need to be corrected. These items have been included in the recommended 20-year CIP.

Flood Pumping Stations

Much of the ORFPS was constructed in the 1950s. Design criteria that could be located from records of this era usually indicated the flood pumping stations were intended to pump the 10-percent probability storm (10-year storm), as defined by 1950 land use patterns and pre-1950 rainfall statistics. Some design documents recommended the capacity requirements be updated at 10-year intervals to account for land use changes, among other things. To our knowledge, prior to the LSE evaluation (USACE, 2015), the capacity of these flood pumping stations has never been reassessed through comprehensive hydraulic and hydrologic modeling. As previously described, capacity assessment completed as part of the LSE study identified several flood pumping stations that do not meet the 10-percent probability storm, although their capacity is adequate to provide protection for a 1-percent probability event under a coincident frequency analysis.

In addition to capacity concerns, many flood pumping stations have original 1950's vintage electrical and mechanical equipment. For the most part, the stations are manually operated using control systems that cannot be repaired with off-the-shelf components. To assure the reliability and adequacy of the flood pumping station system, all pump stations were subject to a facility condition assessment (in addition to the USACE LSE evaluation) and hydraulic and hydrologic modeling using storm IDFs projected for 2035. The recommended 20-year CIP includes rehabilitating and/or expanding 15 of the 16 flood pumping stations in MSD's system. Given the size of these facilities, the costs are substantial, but the risks being addressed are vital to Louisville's protection against catastrophic flooding.

Levee and Floodwall System

MSD maintains a proactive maintenance program to assure the integrity of the levee and floodwall system. In addition, the USACE biannually inspects the levee and floodwall, resulting in a report on any deficiencies noted. The recommended 20-year CIP includes continuing a proactive preventive maintenance program, in addition to the corrective actions recommended by the LSE study. These efforts are critical to protect the Louisville community from flooding.

SUPPORT SYSTEMS

MSD owns a large inventory of rolling stock, information technology (IT) systems, and above-ground facilities that support MSD's operation of wastewater, stormwater drainage, and ORFPS services.

CAPITAL EQUIPMENT

MSD owns more than 600 vehicles and portable equipment, ranging from passenger vehicles and pick-up trucks to large excavators and sewer-cleaning trucks. MSD has started leasing the commonly available passenger cars and pick-up trucks, which moves these costs from capital to operating budgets. The specialty equipment used in MSD's O&M activities are not available for lease, and MSD must continue to own them to be certain they are available any time they are required. This equipment is critical to MSD's ability to complete the preventive and corrective maintenance activities required to provide sustainable and reliable wastewater, stormwater, and flood protection services. For example, a comprehensive sewer inspection activity requires a sewer flush truck to clean the sewer, a vactor truck to capture the material flushed from the line to prevent it from moving downstream to cause problems elsewhere, and a closed-circuit television truck to closely inspect the condition of the pipe. After the condition is established, either heavy construction equipment like excavators and loaders or specialty equipment to install cured-in-place sewer lining is used to correct deficiencies. The specialized equipment is very expensive to purchase and maintain, given the severe service conditions that this equipment is operated under. The recommended 20-year CIP includes an annual allowance for equipment repair and replacement.

FACILITIES

The Facility Plan Team completed a facility condition assessment of more than 200 buildings and recommended corrective actions where deficiencies were noted. The main areas of deficiency were in roofs; MSD has above-ground buildings with roofs all over Jefferson County, ranging from the massive roof system at the Central Maintenance Facility to the little roof over a 10-foot-by-10-foot pump station building. Roofs appear to be one area that MSD allows to "run to failure." Roofs are seldom replaced until a leak is detected inside the building. The Facility Plan recommends an extensive program of roof replacement in the first 5 years, using standardized roofing systems for different applications. After that, regular inspection and replacement before failure occurs is recommended to provide the minimum cost of ownership for the buildings protected by these roofs.

The facility condition assessments also identified a number of deficiencies in areas related to heating, ventilation, and air conditioning (HVAC), building egress, signage and ancillary equipment, and indications of conditions that could eventually cause structural issues and even structural failure. The recommended 20-year CIP includes projects to address the specific recommendations identified by the Facility Plan Team, with future budgets recommended to complete periodic facility condition assessments following deficiency correction.

INFORMATION TECHNOLOGY SYSTEMS AND LOUISVILLE AND JEFFERSON COUNTY INFORMATION CONSORTIUM SUPPORT

MSD maintains an extensive inventory of IT hardware and software that is essential to overall agency operations; this includes the MSD intranet system that is the backbone of MSD electronic communication and digital data generation, communication and storage, and regulatory compliance reporting. This hardware and software system is also responsible for supplying the internet connection to MSD's supervisory control and data acquisition (SCADA) system that controls more than 300 pump stations and control gates and serves as the platform for implementing the RTC system. This RTC system is used to optimize use of MSD's conveyance facilities to cost-effectively maximize the use of existing facilities to reduce sewer overflows. Without adequate and updated IT systems, public health and safety could be at risk. This inventory is subject to periodic upgrade and replacement like all MSD's other assets. In addition, MSD hosts the Louisville and Jefferson County Information Consortium (LOJIC) systems, which similarly require periodic upgrades and replacements to hardware and software. The recommended 20-year CIP includes annual allowances to account for these anticipated future costs.

FINANCE

To implement a $4.3 billion capital program and the associated costs to operate new facilities, MSD must have the funding to pay for it. Unlike the IOAP, which is required by the Consent Decree to be completed, most stormwater management and flood protection capacity projects developed in this Facility Plan are not specifically required by regulation. Providing for infrastructure renewal and replacement, and improving the consistent level of service in stormwater management and flood protection are local decisions driven by MSD's mission to provide safe, clean waterways for the community. MSD will implement this Facility Plan to the extent funding is provided through the rate-setting process. If sufficient funding is not provided to complete the recommended projects in the 20-year planning period, then projects will be deferred to the future, when funding comes available.

REVENUE REQUIREMENTS AND RATES

The MSD Board approves rates, rentals, and charges on an annual basis. The MSD Board has the authority to raise rates up to 6.9 percent per year without Metro Council approval. Rate increases higher than 6.9 percent require Metro Council approval. The CIP recommended by the Facility Plan totals approximately $4.3 billion over 20 years. The recommended CIP for FY2017 through FY2021 exceeds $1 billion. The revenue generated by current rates, increased at 6.9 percent per year or less, will not generate enough revenue to support $1 billion in capital spending over the next 5 years. If current rates are increased by no more than 6.9 percent per year for the next 5 years ($3.60 per month for a typical

customer in FY2018), then approximately $480 million in capital projects will need to be deferred. While 6.9 percent per year rate increases do provide enough revenue to implement the entire Facility Plan CIP over the 20-year planning period, the recommended schedule cannot be achieved, and completing critical public safety projects could be deferred by 3 to 5 years.

Completing the projects in the recommended CIP on the schedule recommended in the Facility Plan will require a 20-percent to 25-percent rate increase in FY2018 ($10.50 to $13.12 per month for a typical customer in FY2018), followed by rate increases up to 6.9 percent for the remaining years of the planning period. If a smaller rate increase is approved for FY2018, then the project schedule will need to be adjusted and recommended projects deferred to a later date based on MSD's resulting financial capabilities and project priorities identified by MSD staff. Projects directly related to the Consent Decree or other regulatory requirements, or those that address areas of high risk, will receive the highest immediate priority. Projects that do not address regulatory requirements or mitigation of high-risk issues will be deferred until the major IOAP projects have been completed and funds are available. The project prioritization system used to determine the recommended Facility Plan schedule is available for MSD staff to determine priorities based on information available at the time the budget revisions are made.

Table 3 presents the recommended project deferrals that could be anticipated for two alternative rate increase scenarios, based on the Facility Plan prioritization approach and information available at the time the Facility Plan was drafted. The alternative funding scenarios presented represent only two of the many rate approaches possible. Table 3 illustrates that if the funding scenario does not accommodate the recommended Facility Plan projects, the CIP implementation will be focused initially on completing the IOAP and other regulatory commitments. Even projects that deal with high-risk issues may be deferred due to funding shortfalls. Table 3 also illustrates the impact of deferred funding on the overall cost of Facility Plan implementation.

Under the most limited funding scenario presented (no rate increase over 6.9% per year) $480 million in capital projects must be deferred by 3 to 5 years. This has a ripple effect on the remainder of the 20-year cash flow, effectively pushing $480 million in projects to the end of the planning period. While Table 3 presents the Facility Plan recommendations for deferral, actual project deferrals will be established during the annual CIP budgeting process.

Table 3 – FY2018 – FY2020 CIP Project Deferrals Under Alternative FY2018 Rate Increases

Project Name	Baseline CIP Budget	Reduced CIP Budget ~$10/mo in FY18	Reduced CIP Budget ~$4/mo in FY18
Wastewater Projects			
CMOM			
Cedar Creek WQTC Asset Management Rehabilitation and Replace	$900,000	$900,000	$500,000
Cedar Creek WQTC Forcemain Extension	$177,000	$177,000	$0
Cedar Creek WQTC Sand Filter Replacement	$4,500,000	$4,500,000	$2,000,000

Project Name	Baseline CIP Budget	Reduced CIP Budget ~$10/mo in FY18	Reduced CIP Budget ~$4/mo in FY18
Cedar Creek WQTC Service Area Inventory for Critical Pump Station	$300,000	$300,000	$0
Collection System Spare Pump Inventory	$3,000,000	$3,000,000	$1,300,000
Derek R. Guthrie WQTC Service Area Inventory for Critical Pump Station	$300,000	$300,000	$0
Floyds Fork WQTC Service Area Inventory for Critical Pump Station	$300,000	$300,000	$0
FY18 PMP	$2,500,000	$2,500,000	$2,250,000
FY18-FY22 Operations Renewal and Replacement	$18,300,000	$18,300,000	$15,300,000
FY19 CMOM PM Assist	$225,000	$187,500	$187,500
FY19 PMP	$2,000,000	$2,000,000	$1,000,000
Hite Creek WQTC Solids Expansion	$6,800,000	$6,800,000	$1,500,000
Hite Creek WQTC Expansion	$19,553,703	$17,553,703	$3,623,703
Land Acquisition	$2,400,000	$2,400,000	$1,300,000
Lea Ann Way Pump Station Elimination	$8,000,000	$6,000,000	$0
Lea Ann Way West Rehab Quad 1	$400,000	$400,000	$500,000
Major Interceptor Rehabilitation	$5,500,000	$5,500,000	$3,000,000
Morris Forman Collection System Baffles	$624,000	$400,000	$0
Morris Forman WQTC Service Area Inventory for Critical Pump Stations	$900,000	$900,000	$0
Morris Forman WQTC Service Area MH and ARV Floodproofing for 100	$136,000	$136,000	$0
Morris Forman WQTC Service Area Pump Station Floodproof for 100-Year Storm	$328,000	$248,000	$0
Nightingale Rehab	$4,200,000	$4,200,000	$1,500,000
Slip Line JTWQTC	$1,398,000	$1,398,000	$0
Development			
Floyds Fork Zone B Sewers	$7,900,000	$7,900,000	$0
Floyds Fork Zone C Sewers	$4,000,000	$4,000,000	$0
KTC Greenwood Road Assessment	$525,000	$0	$0
NMC			
Morris Forman Central Business District CSO Cameras	$1,248,000	$1,248,000	$0
Morris Forman WQTC Draft Rehab and TWAS Piping Replacement	$1,500,000	$1,500,000	$0
Morris Forman WQTC Digester Lids and Mixers	$4,500,000	$4,500,000	$0

Project Name	Baseline CIP Budget	Reduced CIP Budget ~$10/mo in FY18	Reduced CIP Budget ~$4/mo in FY18
Morris Forman WQTC Equipment Renewal and Replacement in Year 5	$25,500,000	$15,000,000	$900,000
Morris Forman WQTC Sec Clarifiers and RAS/WAS Pumping	$6,500,000	$5,500,000	$0
Morris Forman WQTC Sedimentation Basin Rehabilitation	$12,500,000	$8,500,000	$500,000
Stormwater Projects			
Drainage			
Auburndale Early Action Project	$12,600,000	$4,200,000	$0
City of Hurstbourne Early Action Project	$6,000,000	$3,000,000	$0
Master Plan Implementation	$6,000,000	$5,000,000	$0
Newburg Early Action Project	$10,250,000	$3,000,000	$0
Pope Lick Early Action Project	$6,100,000	$1,220,000	$0
Prospect Early Action Project	$6,000,000	$1,500,000	$0
Seatonville Early Action Project	$3,400,000	$3,400,000	$0
Stormwater Master Plan	$4,000,000	$4,000,000	$0
Ten Broeck Early Action Project	$1,000,000	$1,000,000	$0
Valley Creek Early Action Project	$5,540,000	$3,000,000	$0
Via11 E Brandeis Ave and Brook Viaduct Flood Relief	$28,043,000	$2,000,000	$0
Via16 3rd and Eastern Pky Viaduct Flood Relief	$5,808,000	$0	$0
Whispering Hills Early Action Project	$2,560,000	$2,560,000	$0
Floodplain Management			
Flood Response-Buyouts Mitigation and Grants	$12,000,000	$10,000,000	$0
Ohio River Flood Protection			
10th Street Flood Pumping Station Reliability / Generator	$1,035,000	$0	$0
17th Street Flood Pumping Station Capacity / Reliability / Generator	$2,525,000	$2,525,000	$0
34th Street Flood Pumping Station to Los 5 - Improvements / Generator	$2,000,000	$0	$0
5th Street Flood Pumping Station to Los 5 - Improvements / Generator	$820,000	$0	$0
Allocation - Annual Flood Pumping Stations Equipment Renewal and Replacement	$3,000,000	$3,000,000	$2,500,000

Project Name	Baseline CIP Budget	Reduced CIP Budget ~$10/mo in FY18	Reduced CIP Budget ~$4/mo in FY18
Floodwall and Levee Risk Assessment	$750,000	$0	$0
Floodwall/Levee Repair and Toe Drains	$2,250,000	$2,250,000	$1,500,000
Levee and Floodwall Repair and Renewal Light	$1,875,000	$1,500,000	$750,000
Paddys Run Flood Pumping Station Reliability / Redundant Service	$31,575,000	$8,000,000	$0
Robert J. Starkey Flood Pumping Station Operational Improvements	$4,360,000	$2,180,000	$0
Western Parkway Flood Pumping Station –Capacity Improvements	$11,648,000	$4,648,000	$0
Western Parkway Flood Pumping Station - Reliability Improvements (Evaluation Repairs)	$3,334,000	$3,334,000	$0
Support Systems Projects			
Capital Equipment			
FY18 Vehicles & Equipment	$3,500,000	$3,500,000	$2,000,000
FY19 Vehicles & Equipment	$3,500,000	$3,500,000	$1,500,000
FY20 Vehicles & Equipment	$3,500,000	$3,500,000	$2,500,000
Systems Automation	$1,200,000	$750,000	$750,000
Facilities			
Admiral Pump Station Foundation Repairs	$246,936	$246,936	$246,936
Louisville Green Major Maintenance	$3,000,000	$3,000,000	$1,000,000
Morris Forman WQTC Elevator Repairs	$400,000	$400,000	$0
Miscellaneous Facility Repairs	$127,566	$127,566	$127,566
Roof Replacements	$3,230,458	$3,204,950	$3,200,000

RATE RELIEF

While increased spending on infrastructure is needed, the affordability of utility services is a serious concern for those in our community, especially those who are living at or near poverty levels. To avoid imposing additional stressors on the low-income population of our community, MSD is investigating the concept of meaningful rate relief for those in need. To provide the benefits of a significant wastewater rate reduction for low-income customers, a small incremental increase in costs (approximately $1.30 per month) would apply for a typical customer in 2018. These costs are passed on to customers who are better able to absorb it in their household budgets.

To implement this, MSD has partnered with the Metro Department of Community Services (Community Services). Community Services currently administers the Low-Income Home Energy Assistance Program

(LiHEAP). Community Services has agreed in principle to administer a rate relief program for MSD, based on the qualification standards used in the LiHEAP program. Subject to MSD Board approval, MSD is considering a rate relief subsidy proportional to annual rate increases, for customers who qualify. The current Low-Income Senior Citizens Discount Program is expected to be phased out, but seniors would be "grandfathered" into the new rate relief program regardless of LiHEAP qualification standards.

SUMMARY

The 20-year Comprehensive Facility Plan represents MSD's most ambitious planning effort in a decade. Working with the Wet Weather Team Stakeholder Group and MSD staff, the Facility Plan Team reviewed the challenges our community faces now and in the future and has developed a roadmap to protect the area's health, economic vitality, and environment. The recommendations in this plan are the result of well-vetted analyses from some of the most experienced engineers in Louisville Metro. The recommendations are essential to maintaining reliable and properly sized facilities that will allow MSD to fulfill its responsibility for safe, clean waterways and to help preserve and promote our competitiveness as a city.

Wastewater collection and treatment is MSD's largest service offering and was the original reason MSD was formed by state statute in 1946. Fully implementing the Facility Plan recommendations will accomplish the following wastewater service objectives:

- Fulfill the obligation of the Consent Decree, including completing all the projects contained in the IOAP on schedule
- Provide facilities that comply with the other environmental regulations MSD is governed by and provide a plan to remain in compliance with future regulations currently under development
- Renew and replace aging wastewater infrastructure to provide reliable service and the lowest overall cost using a best-practice asset management approach
- Position MSD to support the community's ability to grow responsibly as economic development opportunities become available

MSD assumed responsibility for stormwater management, including both drainage and interior floodplain management for most of Jefferson County in 1987. The drainage system at that time had a backlog of thousands of drainage complaints that MSD was expected to correct. While MSD has invested hundreds of millions of dollars in drainage infrastructure since 1987, drainage problems still are found across the entire county. In addition, the increased frequency of extreme storms that have been observed in Louisville Metro have raised customer concerns about the adequacy of our drainage and interior floodplain management systems. While current development standards require mitigation of the drainage impacts of land use changes, analysis of historical trends shows a significant reduction in natural green space and an increase in impervious services that do not allow stormwater to seep into the ground. Runoff from impervious surfaces also causes increased runoff volume and greatly increased runoff peak flows. Together, these factors exacerbate the observed deficiencies in the stormwater system that MSD now has responsibility for, impacting neighborhood drainage in addition to interior

floodplain inundation. Implementing the Facility Plan recommendations will accomplish the following stormwater management objectives:

- Improve the level of protection against public health and property risks caused by inadequate stormwater drainage systems
- Continue support for the Project DRI neighborhood drainage solutions
- Expand the efforts of the MS4 program to reduce stormwater contamination of our waterways, primarily through BMPs and continued proactive support of green infrastructure solutions to both quantity and quality concerns
- Recognize and respond to the impact of changing weather patterns including the increased frequency of extreme storms

The ORFPS was developed in response to the flood of 1937. The system of levees, floodwalls, and flood pumping stations have protected Louisville since it became operational in the 1950s. While the system has an outstanding record of reliability, much of the system is more than 60 years old and includes antiquated equipment that cannot be repaired with standard parts available today. In addition, the same changing precipitation and land use patterns that affect drainage and inland floodplain management also impact the flood pumping stations and related appurtenances. Implementing the Facility Plan recommendations will accomplish the following ORFPS objectives:

- Maintain protection from Ohio River floods entering Louisville by proactive preventive and predictive maintenance activities related to the levee, floodwall, and all gates and other penetration closures that keep floodwaters at bay
- Modernize the flood pumping stations with current mechanical and electrical equipment that can provide continued reliability and a predictable cost because parts will be more readily available at a more reasonable cost
- Expand the capacity of those flood pumping stations to enhance community protection in response to changing precipitation and land use patterns

Implementing the recommendations for all three service areas in accordance with the schedule presented will require a significant investment from the community, which may mean a step-change increase in wastewater and drainage rates. If the community is unwilling to accept the rate increases necessary to fund the recommended project schedules presented, then many important projects will not be able to be implemented in the near term. The data indicate that not implementing necessary investments is almost certain to result in more infrastructure failures, an increase in the overall cost of implementing the Facility Plan, and an ever more rapidly increasing likelihood of a failure that could have serious consequences for the residents and businesses that make Louisville Metro their home.

REFERENCES

Louisville and Jefferson County Metropolitan Sewer District (MSD). 2009. *Integrated Overflow Abatement Plan.* Volume 2, Chapter 5: History and Philosophy of Green Program. Available at http://msdprojectwin.org/About-Us/Integrated-Overflow-Abatement-Plan-IOAP.aspx.

Louisville and Jefferson County Metropolitan Sewer District (MSD). 2014. *MSD Strategic Business Plan 2014-18*. Available at http://www.msdlouky.org/pdfs/MSD-SBP-2014-18.pdf.

Louisville and Jefferson County Metropolitan Sewer District (MSD). 2015. *Design Manual*. Available at http://www.msdlouky.org/insidemsd/pdfs/MSD_Design_Manual_2009%20-%20REVISED%2010-22-2015.pdf. Published August 2, 2010. Last revised October 22, 2015.

U.S. Army Corps of Engineers (USACE). 2015. *Levee System Evaluation—National Flood Insurance Program*. Final Report, January 2015. Prepared for the Louisville-Metro Levee System, Louisville, Kentucky.

U.S. Environmental Protection Agency (EPA). 1994. *CSO Control Policy*. 59 *Federal Register* 18688. Available at https://cfpub.epa.gov/npdes/docs.cfm?document_type_id=1&view=Policy%20and%20Guidance%20Documents&program_id=5&sort=name. April 19.

URS Corporation, GRW Engineers, Inc. Daughtery and Trautwein, Inc. Skees Engineering, Inc. W.W. White and Associates, Inc. Presnell Associates, Inc. University of Louisville, Ed Caicedo, Inc. and PROTEC, Inc. (URS Corporation et al.) 1988. *Stormwater Drainage Master Plan*. Prepared for Louisville and Jefferson County Metropolitan Sewer District.

2017 COASTAL MASTER PLAN

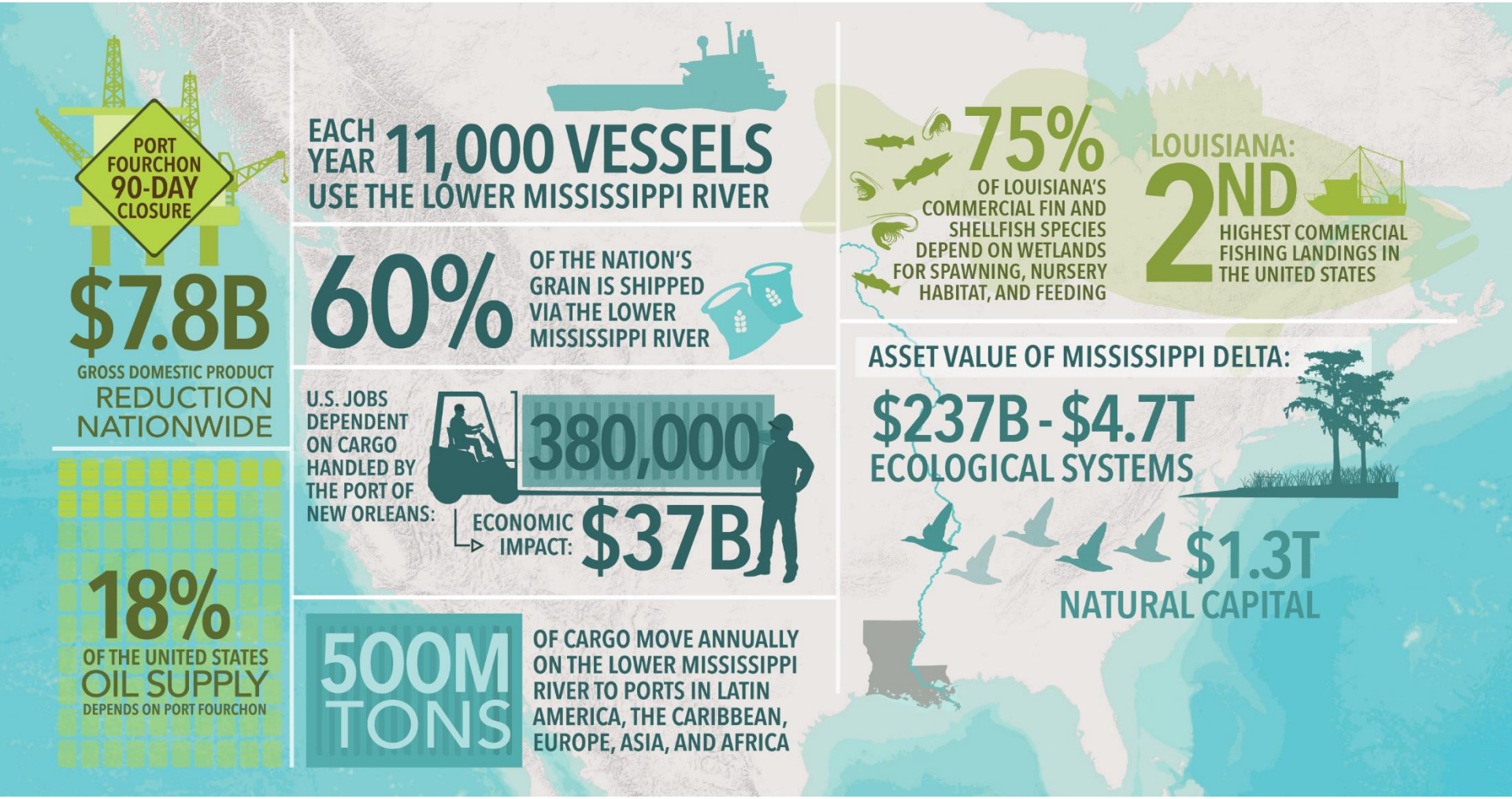
COMMITTED TO OUR COAST

Overview Presentation

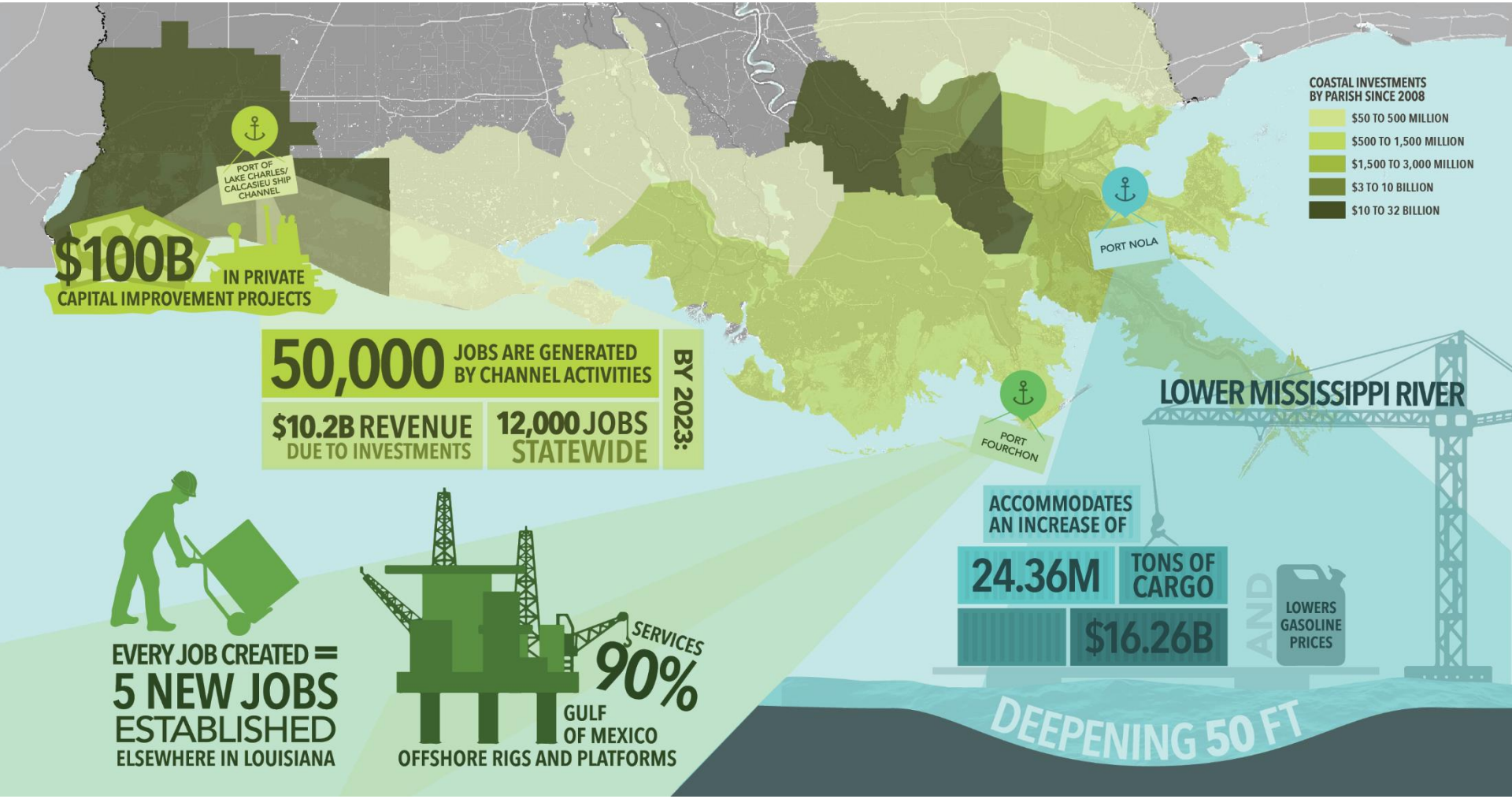
committed to **our coast**

LOUISIANA'S NATIONAL TREASURE

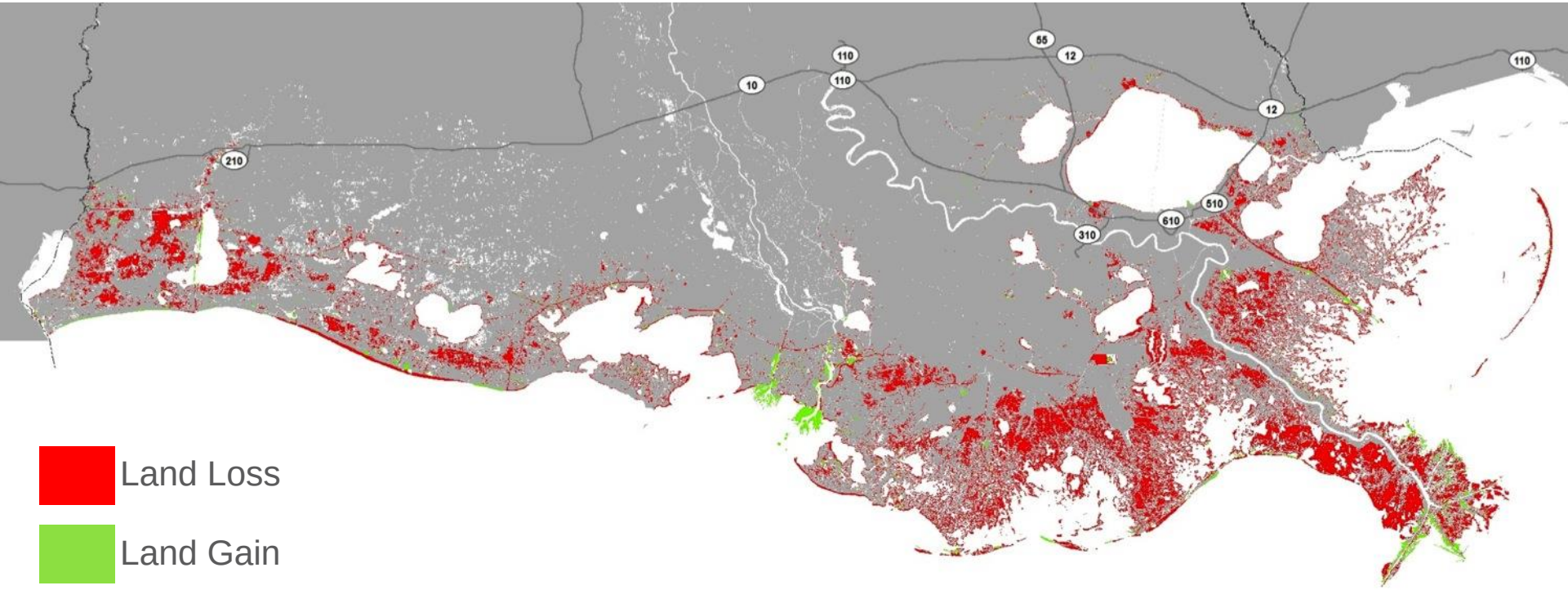
NATIONAL SIGNIFICANCE OF COASTAL LOUISIANA RESOURCES



INVESTING IN OUR COASTAL ECONOMY



LOUISIANA IS FACING A COASTAL CRISIS



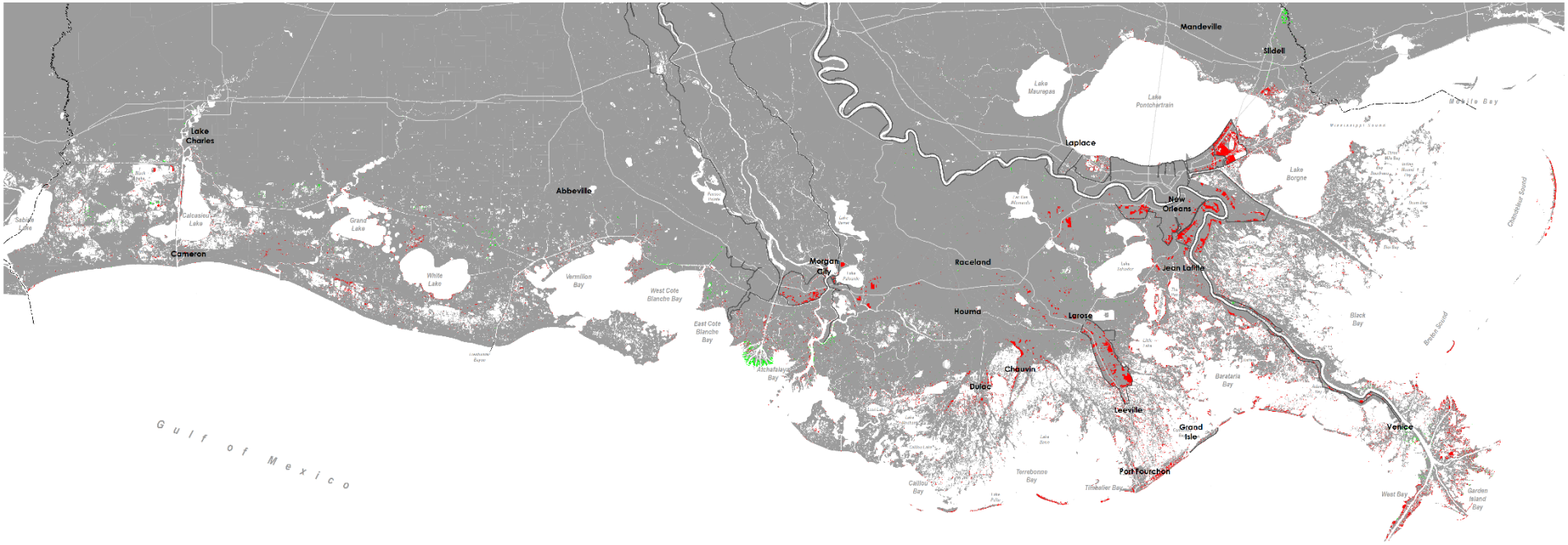
Historic Land-Water Change from 1932-2010

Approx. 1,900 sq. mi.

Couvillion et al (USGS), 2011

LOOKING FORWARD….

FUTURE WITHOUT ACTION - YEAR 10



Land Gain

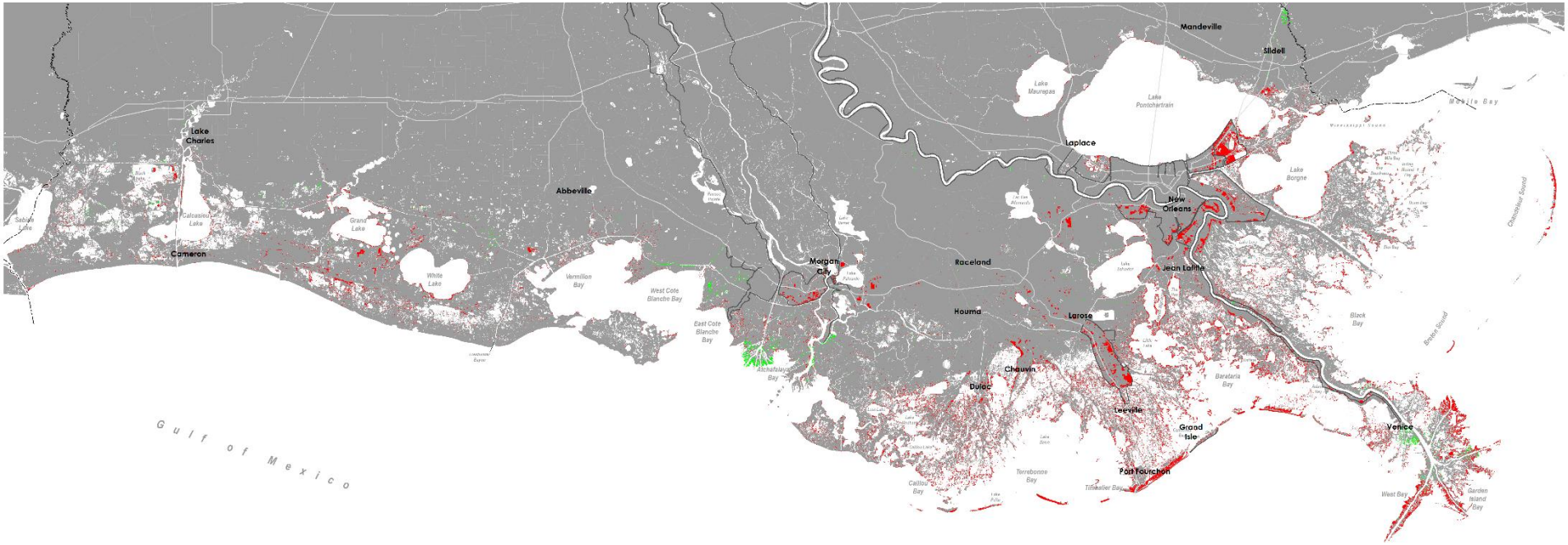
Land Loss

N

0 5 10 20 Miles

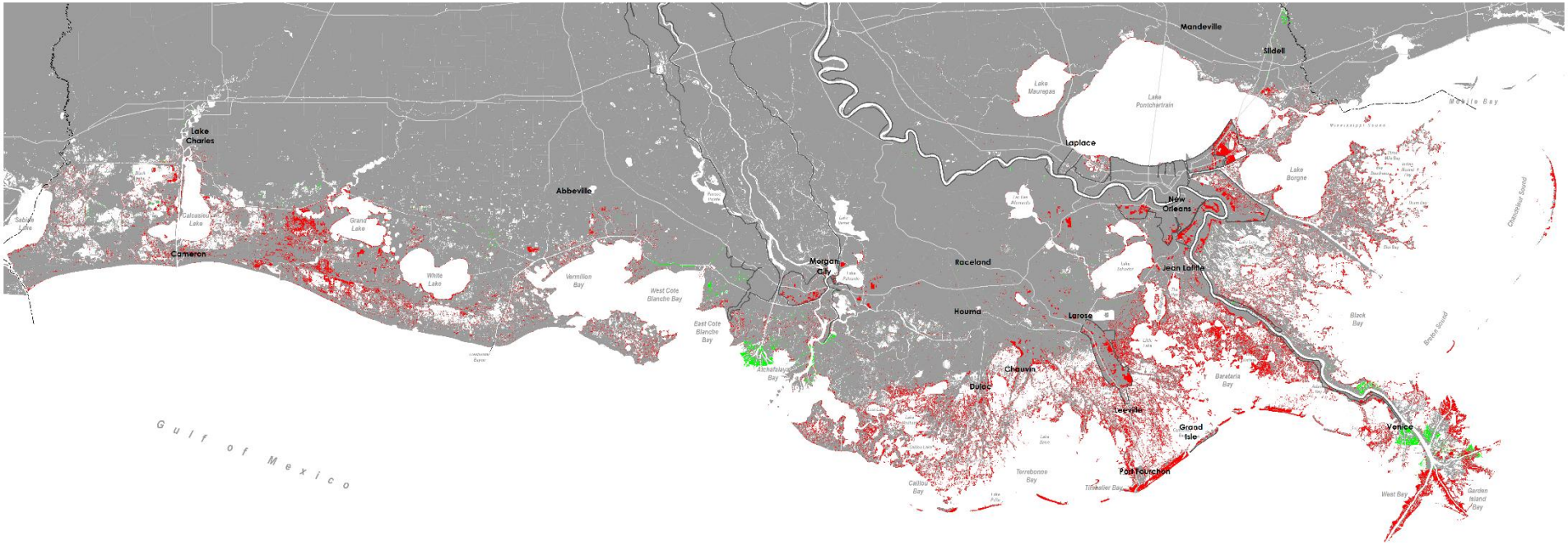
LOOKING FORWARD….

FUTURE WITHOUT ACTION - YEAR 20



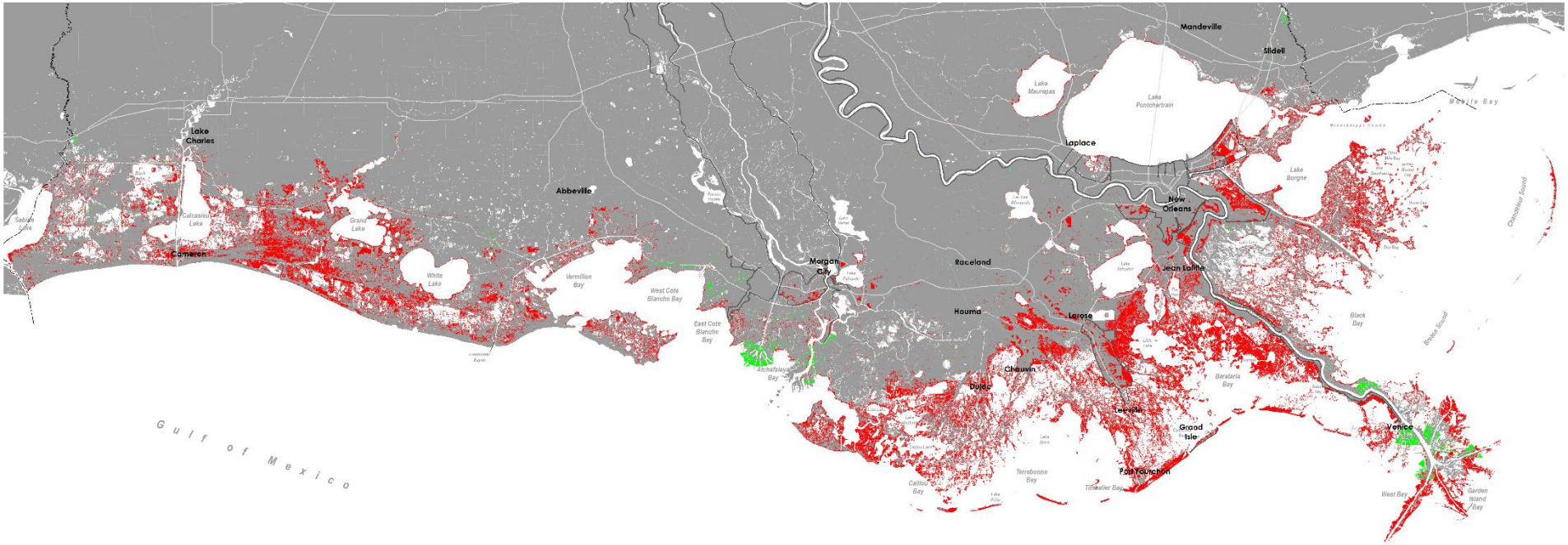
LOOKING FORWARD….

FUTURE WITHOUT ACTION - YEAR 30



LOOKING FORWARD….

FUTURE WITHOUT ACTION - YEAR 40



Land Gain

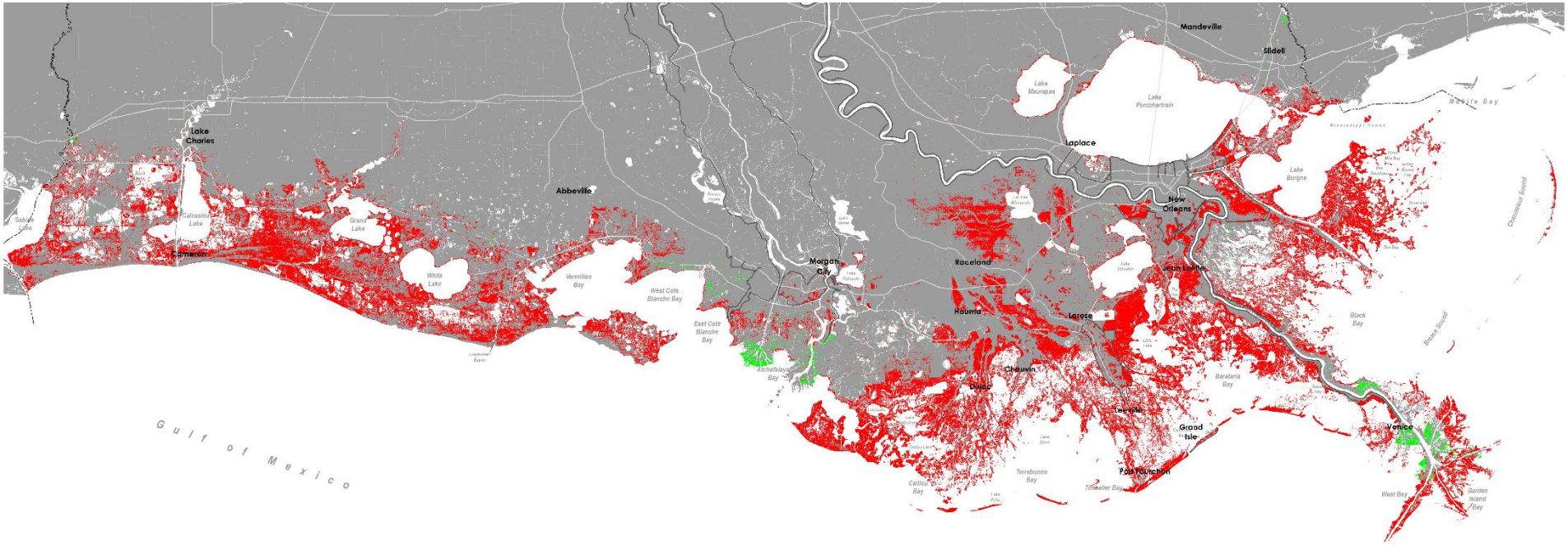
Land Loss

N

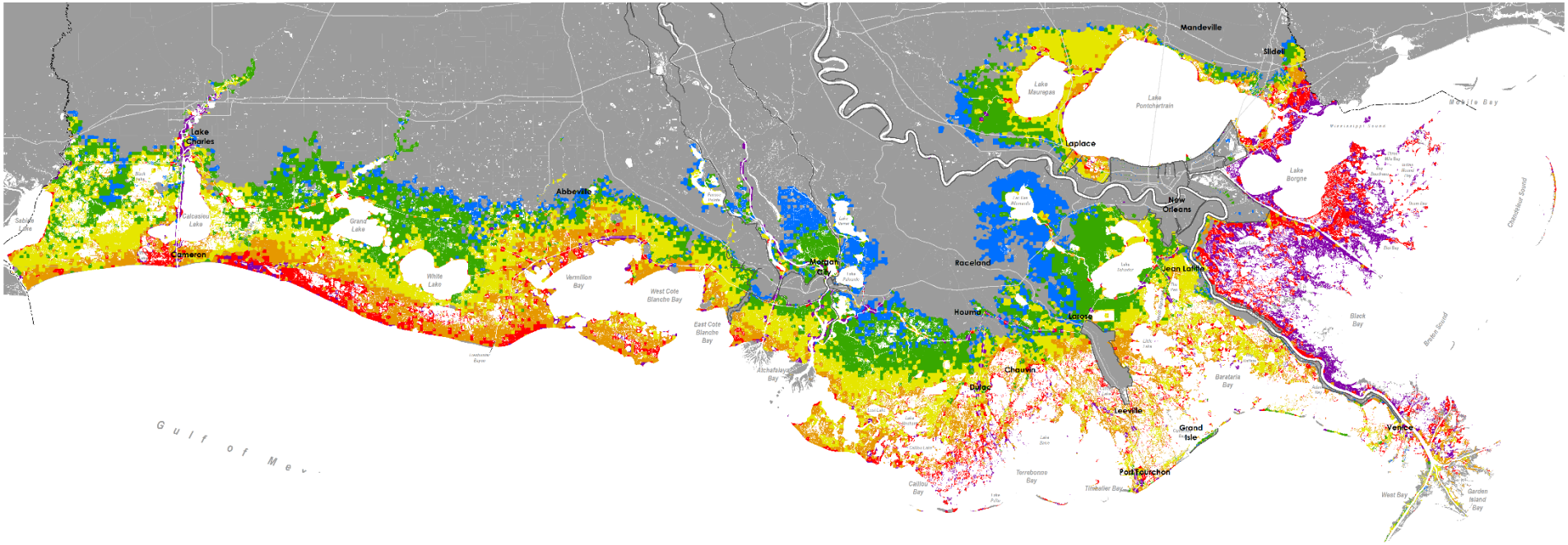
0 5 10 20 Miles

LOOKING FORWARD….

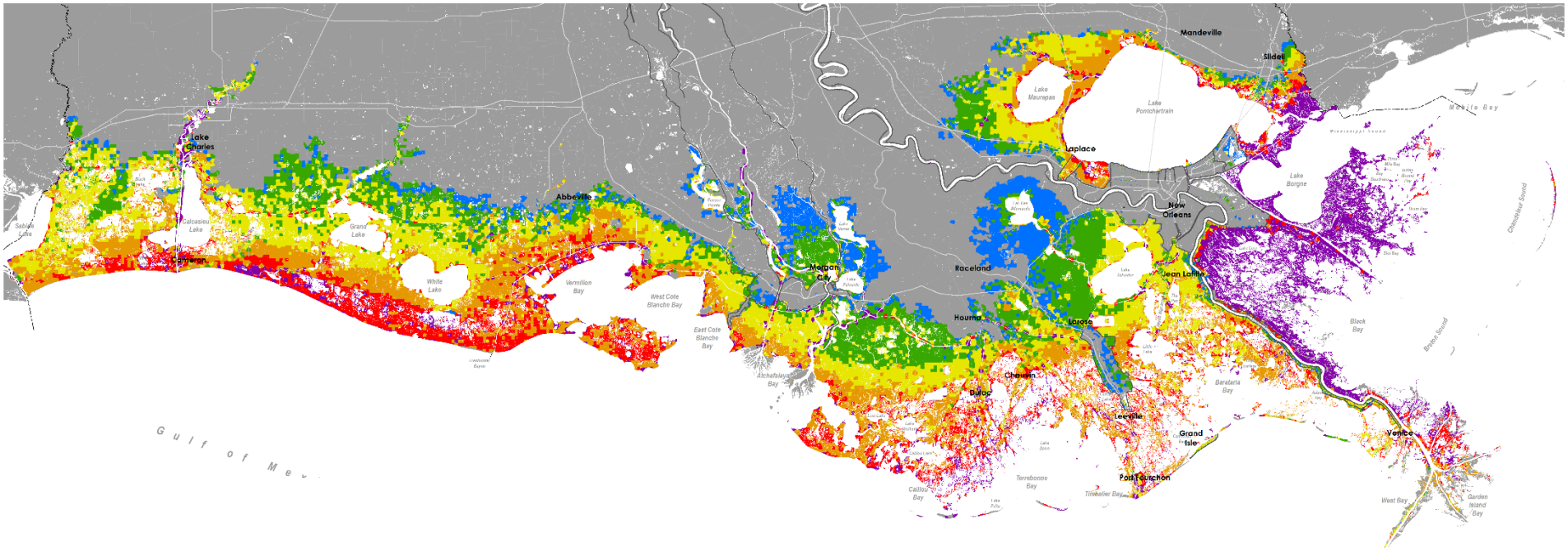
FUTURE WITHOUT ACTION - YEAR 50



PREDICTED FLOOD DEPTHS
INITIAL CONDITION
100-YEAR EVENT



PREDICTED FLOOD DEPTHS
FUTURE WITHOUT ACTION
YEAR 10, 100-YEAR EVENT



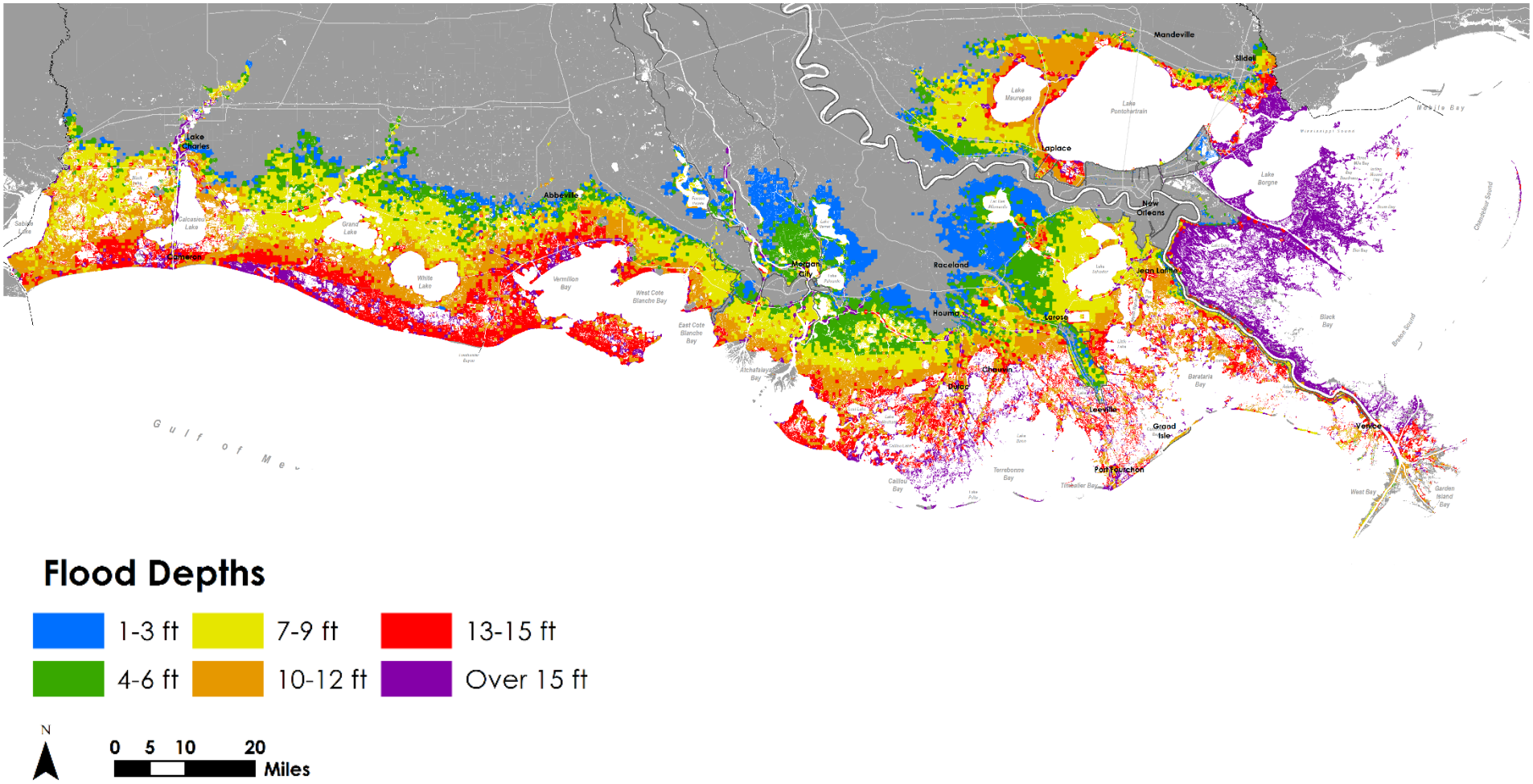
Flood Depths

1-3 ft	7-9 ft	13-15 ft
4-6 ft	10-12 ft	Over 15 ft

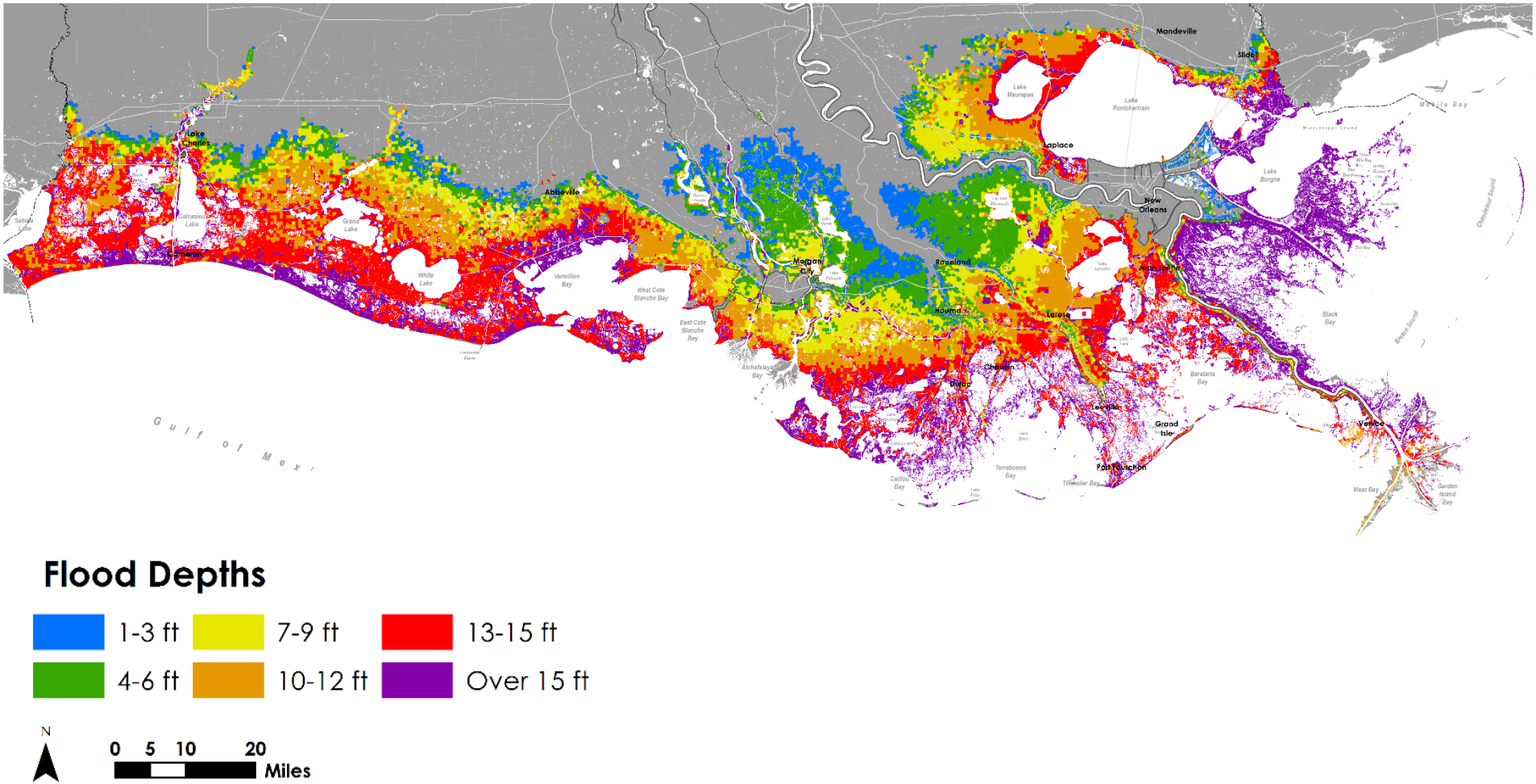
N

0 5 10 20 Miles

PREDICTED FLOOD DEPTHS
FUTURE WITHOUT ACTION
YEAR 25, 100-YEAR EVENT



PREDICTED FLOOD DEPTHS
FUTURE WITHOUT ACTION
YEAR 50, 100-YEAR EVENT

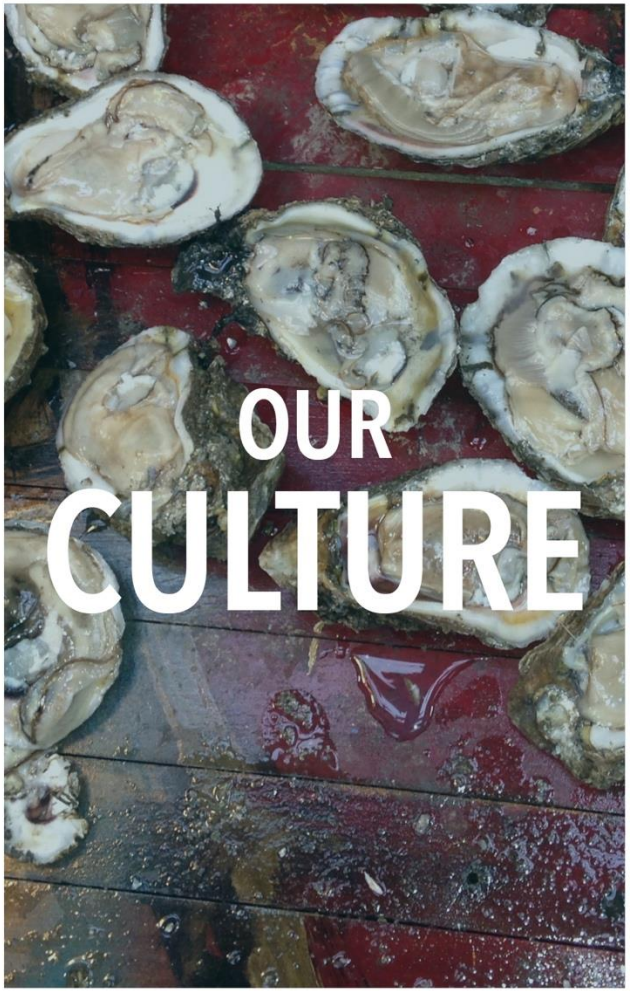


LOUISIANA IS FACING A COASTAL CRISIS

1,900 Square miles of land have been lost in the last 80 years

2,250 Square miles of additional land are at risk of being lost in the next 50 years

WHAT'S AT STAKE?



COASTAL PROTECTION AND RESTORATION AUTHORITY

Single state entity with authority to articulate a clear statement of priorities to achieve **comprehensive coastal protection and restoration** for Louisiana.

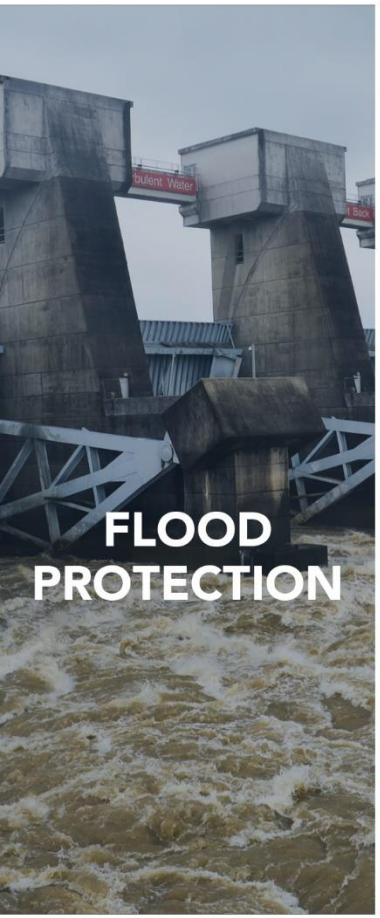
Mandate is to develop, implement, and enforce a comprehensive **coastal protection and restoration master plan**.

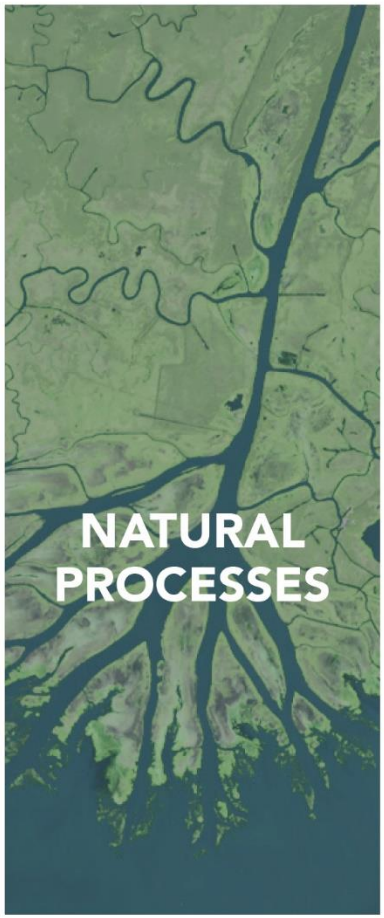
RESPONDING TO THE CRISIS: LOUISIANA'S COASTAL PROGRAM SINCE 2007

WE ARE TURNING DIRT TODAY…
AND THERE'S MORE IN THE PIPELINE

2017 Coastal Master Plan

OBJECTIVES OF THE COASTAL MASTER PLAN





SO WHY ANOTHER PLAN?

- It’s required by law to be updated every five years
- Allows the state to respond to changes on the ground and public input as well as innovations in science, engineering, and policy
- Advances a comprehensive and integrated approach to protecting and restoring the communities of coastal Louisiana

A FRAMEWORK TO MAKE DECISIONS

THE ANALYTICAL CHALLENGE

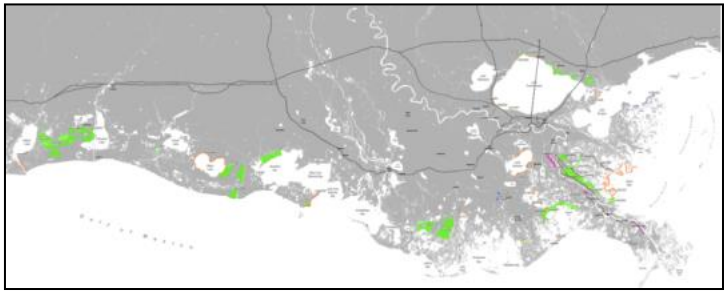
- Complex Coastal Environment
- 50 Year Planning Horizon
- Uncertain Future Scenarios
- Multiple Project Types
- Diverse Community Needs

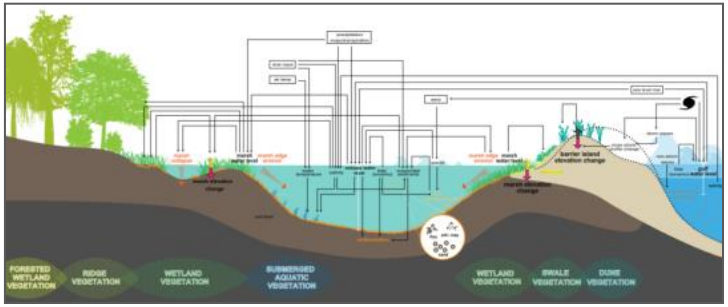
NO OPTIMAL SOLUTIONS

- Risk Reduction (Structural or Nonstructural) vs. Restoration
- Near-Term Benefits vs. Long-Term Sustainability
- Different Stakeholder Preferences

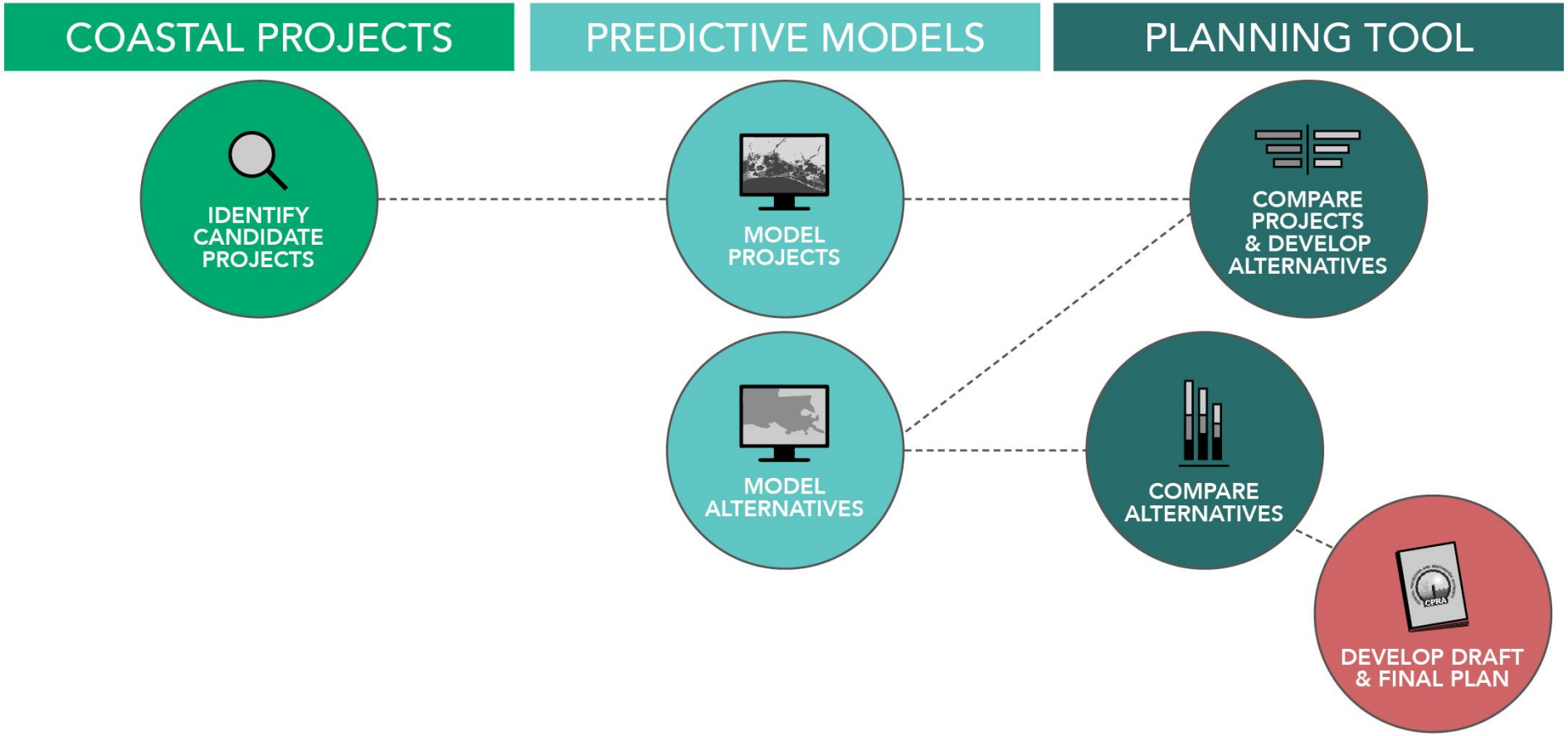
WHAT'S DIFFERENT ABOUT THE 2017 COASTAL MASTER PLAN?

- Improved science and technical analysis
- New ideas and information
- Focus on flood risk reduction and resilience
- Emphasis on communities
- Expanded outreach and public engagement
- Earlier funding



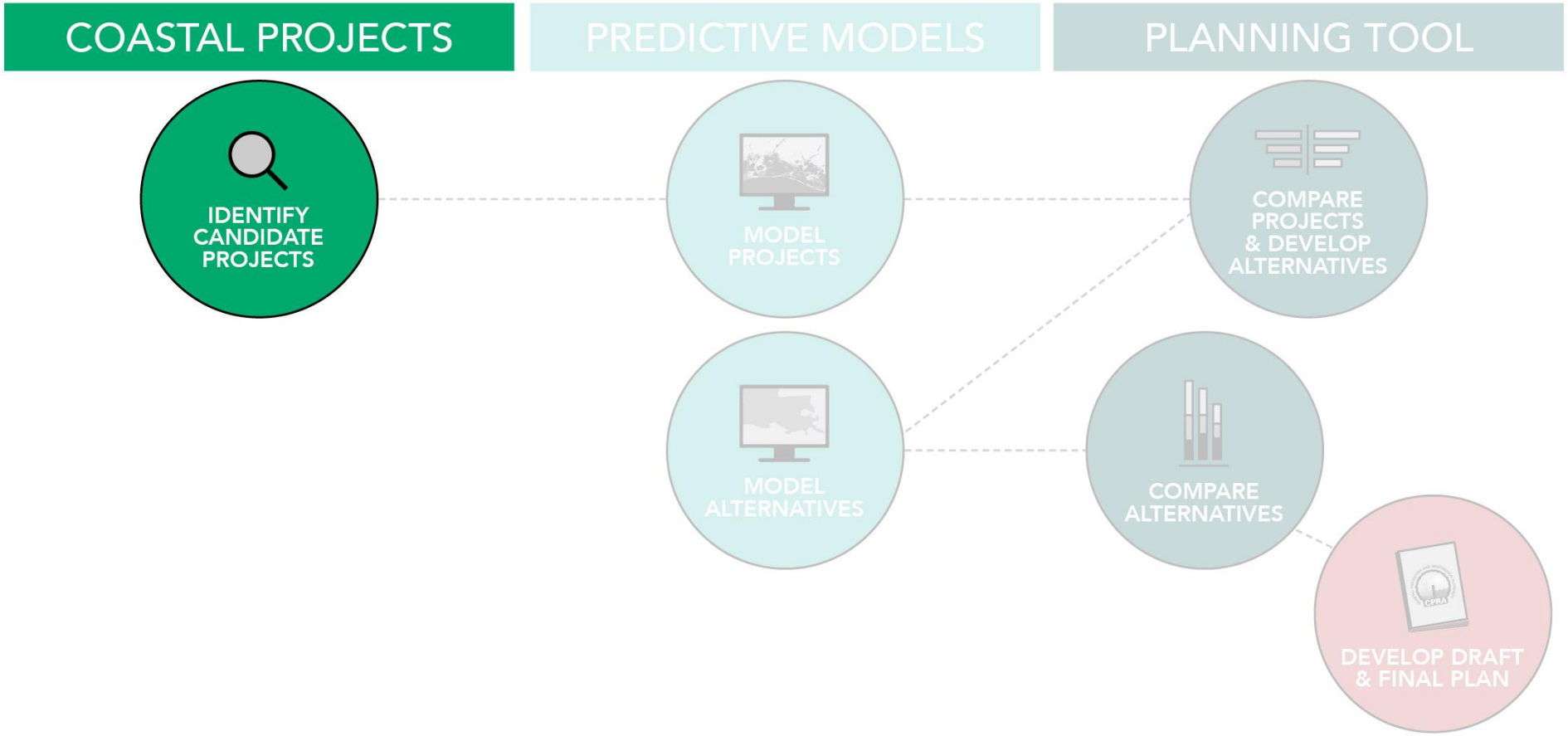


DEVELOPING THE COASTAL MASTER PLAN



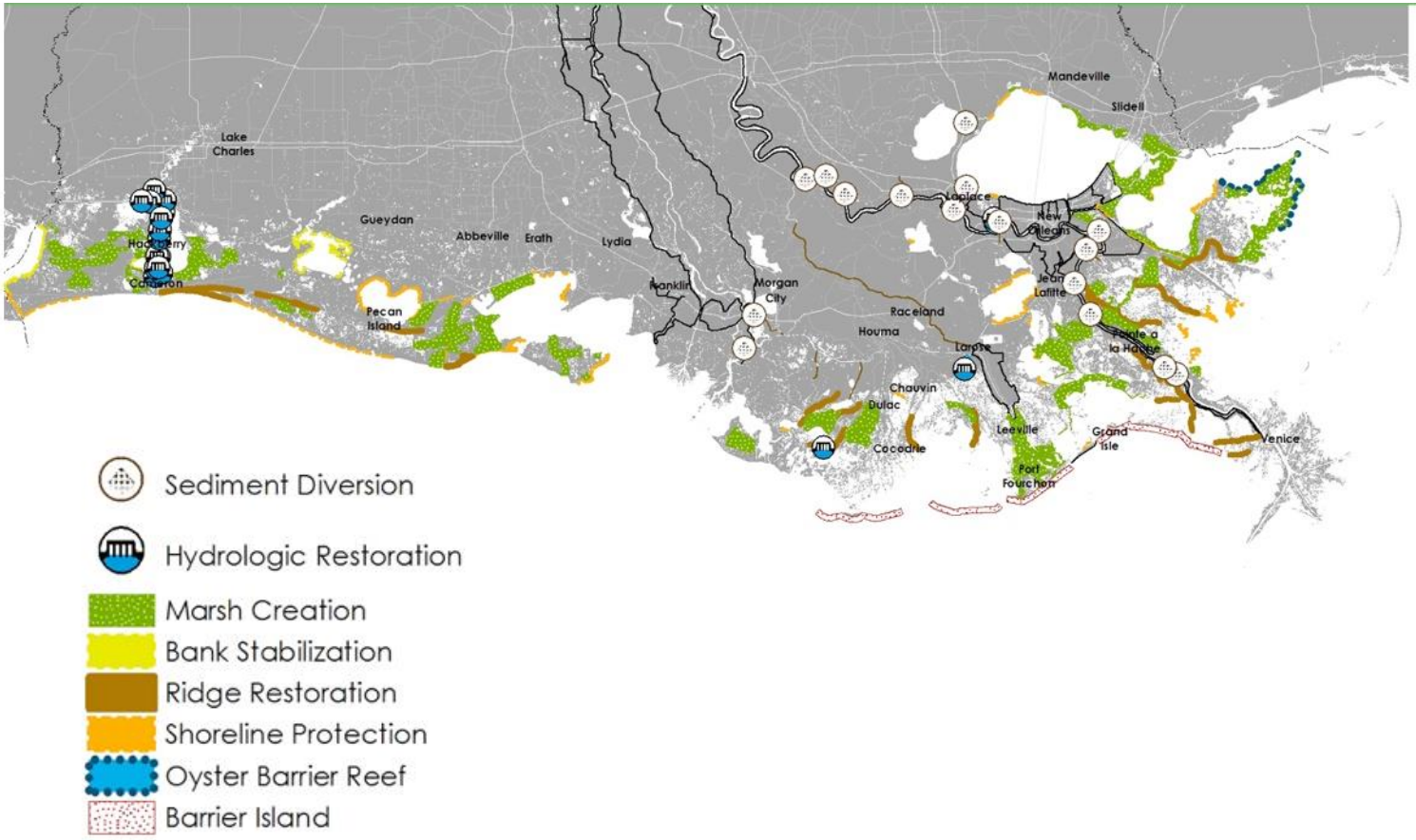
OUTREACH & ENGAGEMENT

DEVELOPING THE COASTAL MASTER PLAN



OVER $150 BILLION OF PROJECTS CONSIDERED

RESTORATION PROJECTS



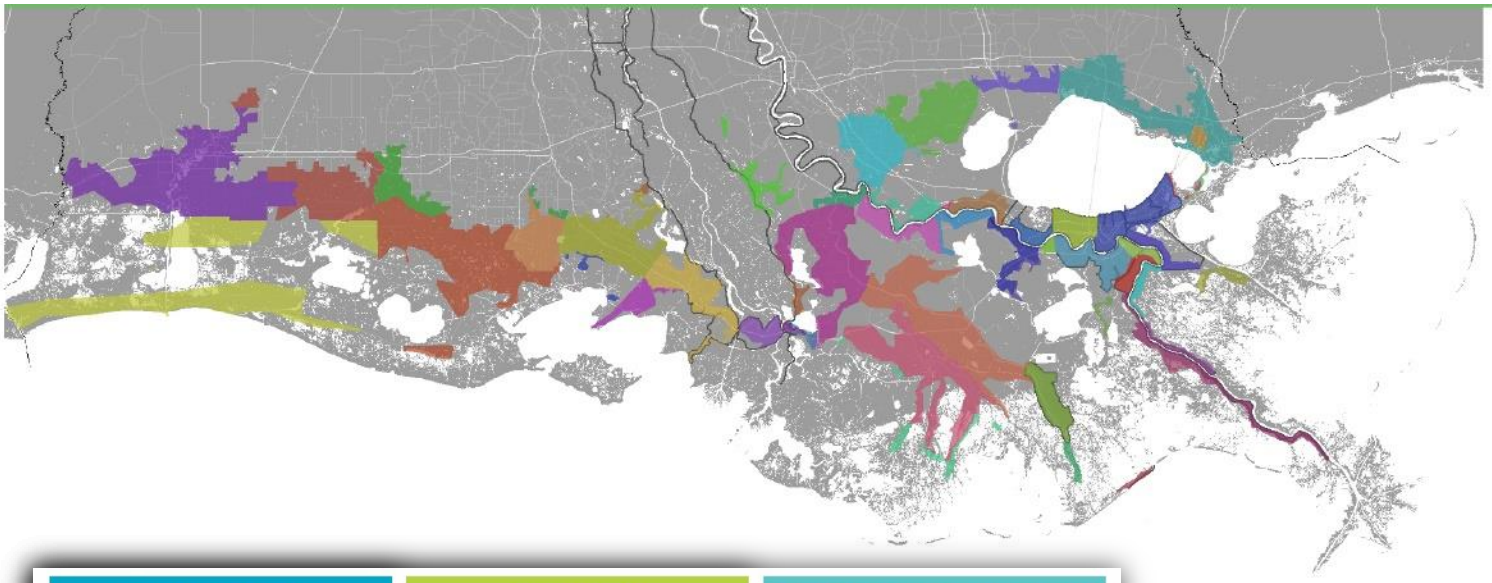
135
RESTORATION

54
NONSTRUCTURAL RISK REDUCTION

20
STRUCTURAL PROTECTION

OVER $150 BILLION OF PROJECTS CONSIDERED

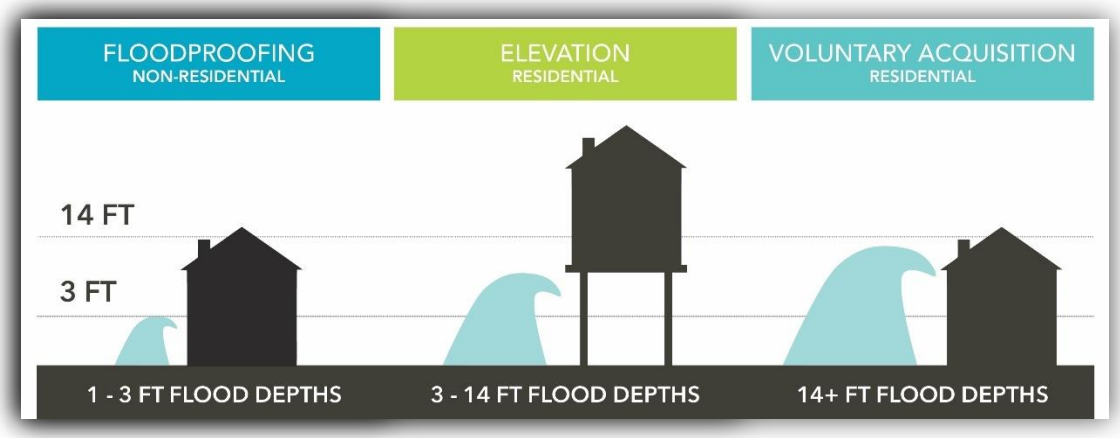
NONSTRUCTURAL RISK REDUCTION PROJECTS



135
RESTORATION

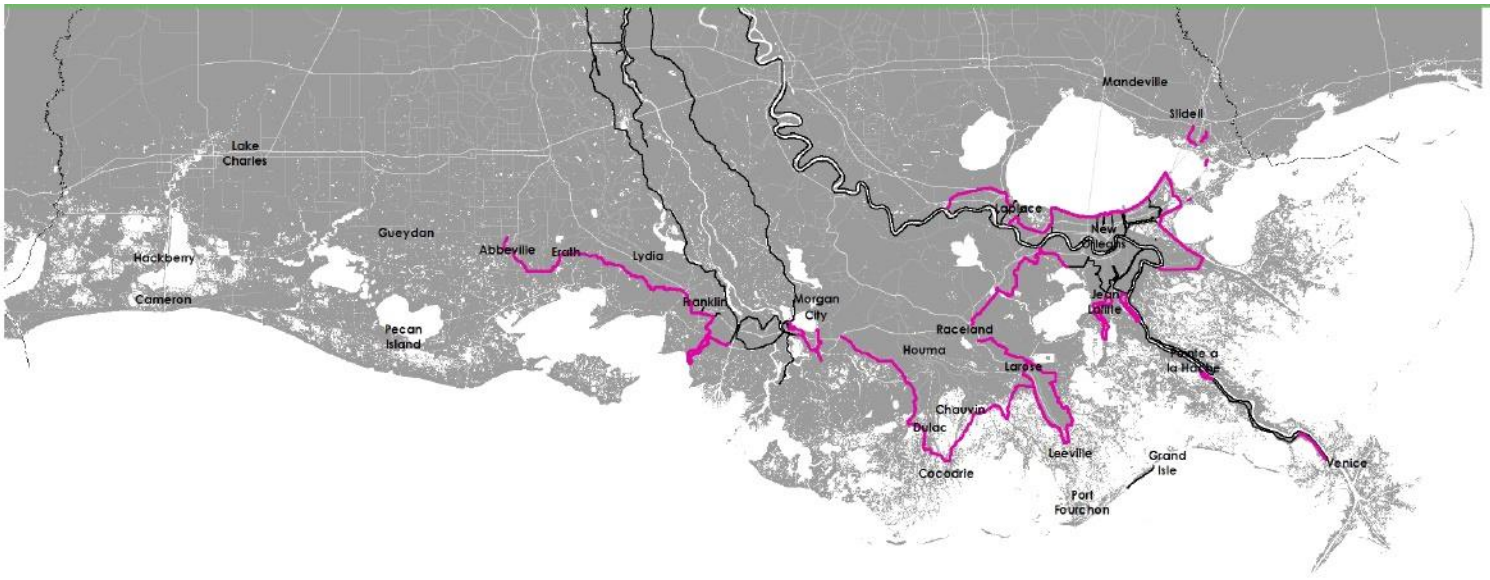
54
NONSTRUCTURAL
RISK REDUCTION

20
STRUCTURAL
PROTECTION



OVER $150 BILLION OF PROJECTS CONSIDERED

STRUCTURAL PROTECTION (LEVEES, FLOOD WALLS)

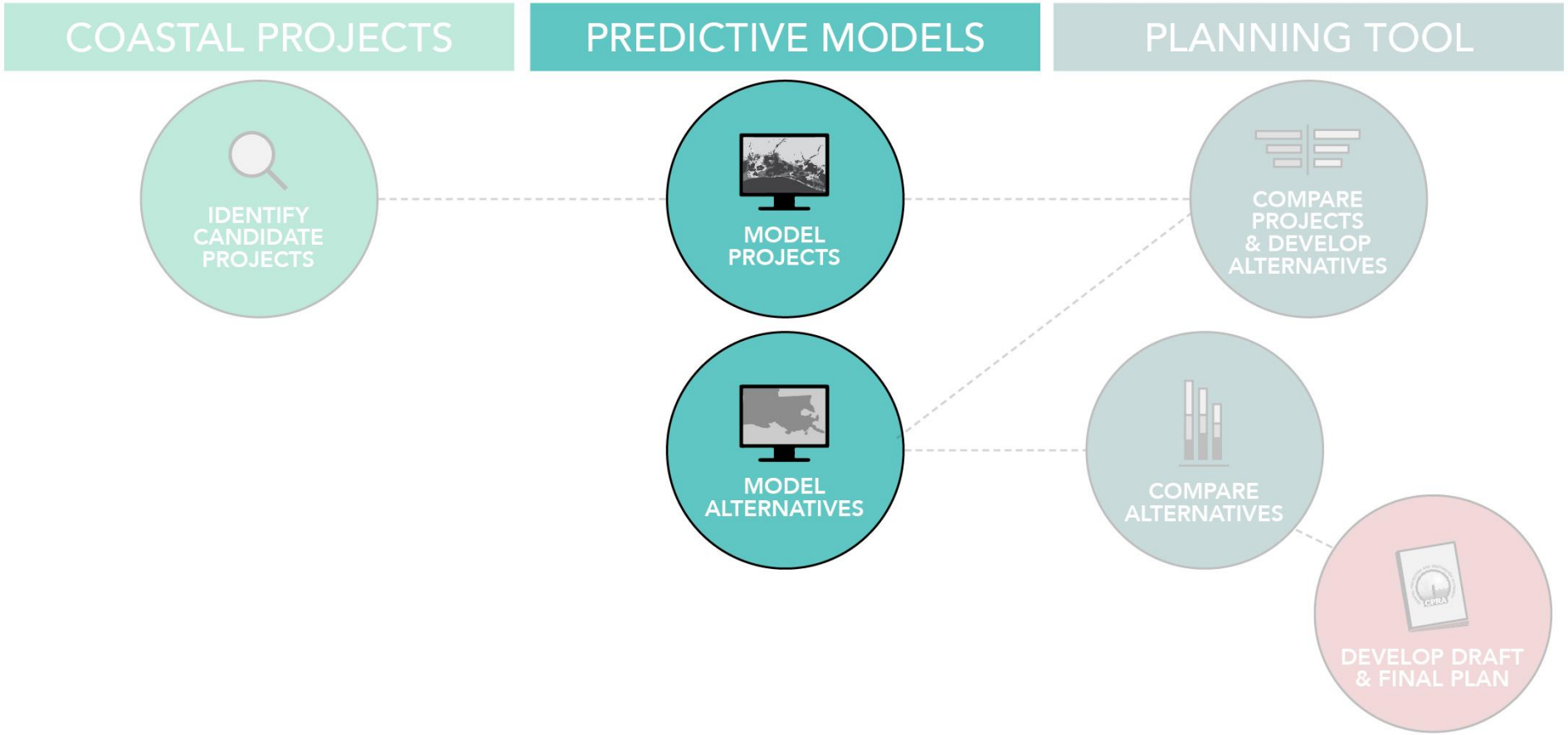


135
RESTORATION

54
NONSTRUCTURAL
RISK REDUCTION

20
STRUCTURAL
PROTECTION

DEVELOPING THE COASTAL MASTER PLAN

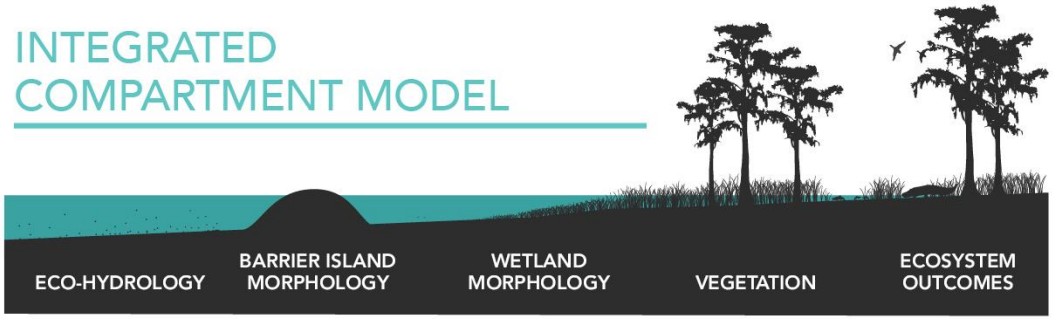


OUTREACH & ENGAGEMENT

ENVISIONING OUR FUTURE COAST

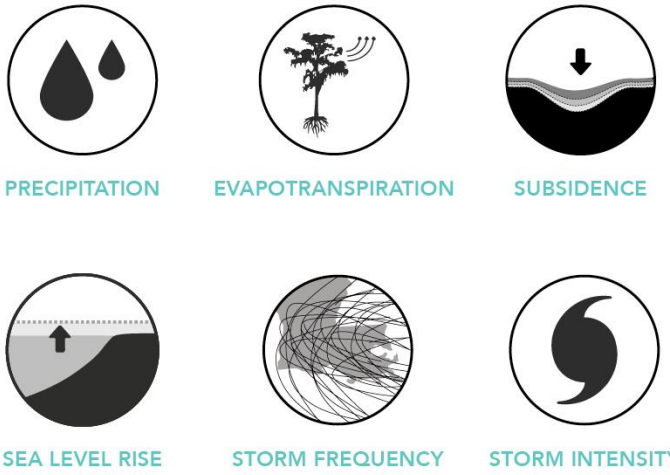
PREDICTIVE MODELS

INTEGRATED COMPARTMENT MODEL



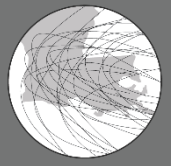
SURGE/WAVES AND RISK ASSESSMENT MODEL

ENVIRONMENTAL AND RISK SCENARIOS



PLANNING FOR AN UNCERTAIN FUTURE

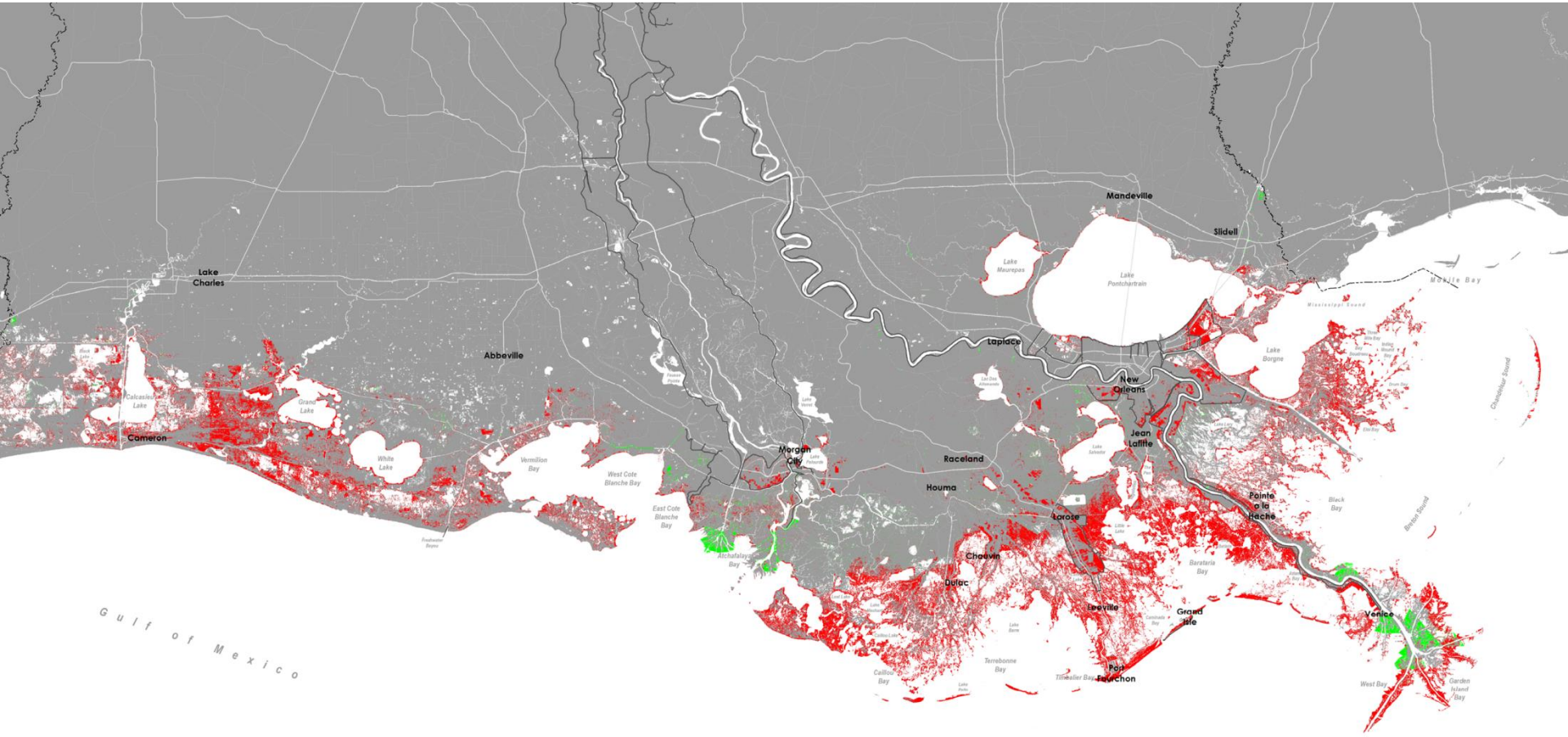
ENVIRONMENTAL SCENARIOS CONSIDERED

SCENARIO	 PRECIP	 ET	 SEA LEVEL RISE	 SUBSIDENCE	 STORM FREQUENCY	 AVG. STORM INTENSITY
2017 COASTAL MASTER PLAN						
LOW	>HISTORICAL	<HISTORICAL	1.41’	20% OF RANGE	-28%	+10.0%
MEDIUM	>HISTORICAL	HISTORICAL	2.07'	20% OF RANGE	-14%	+12.5%
HIGH	HISTORICAL	HISTORICAL	2.72’	50% OF RANGE	0%	+15.0%

(FEET/50 YEARS)

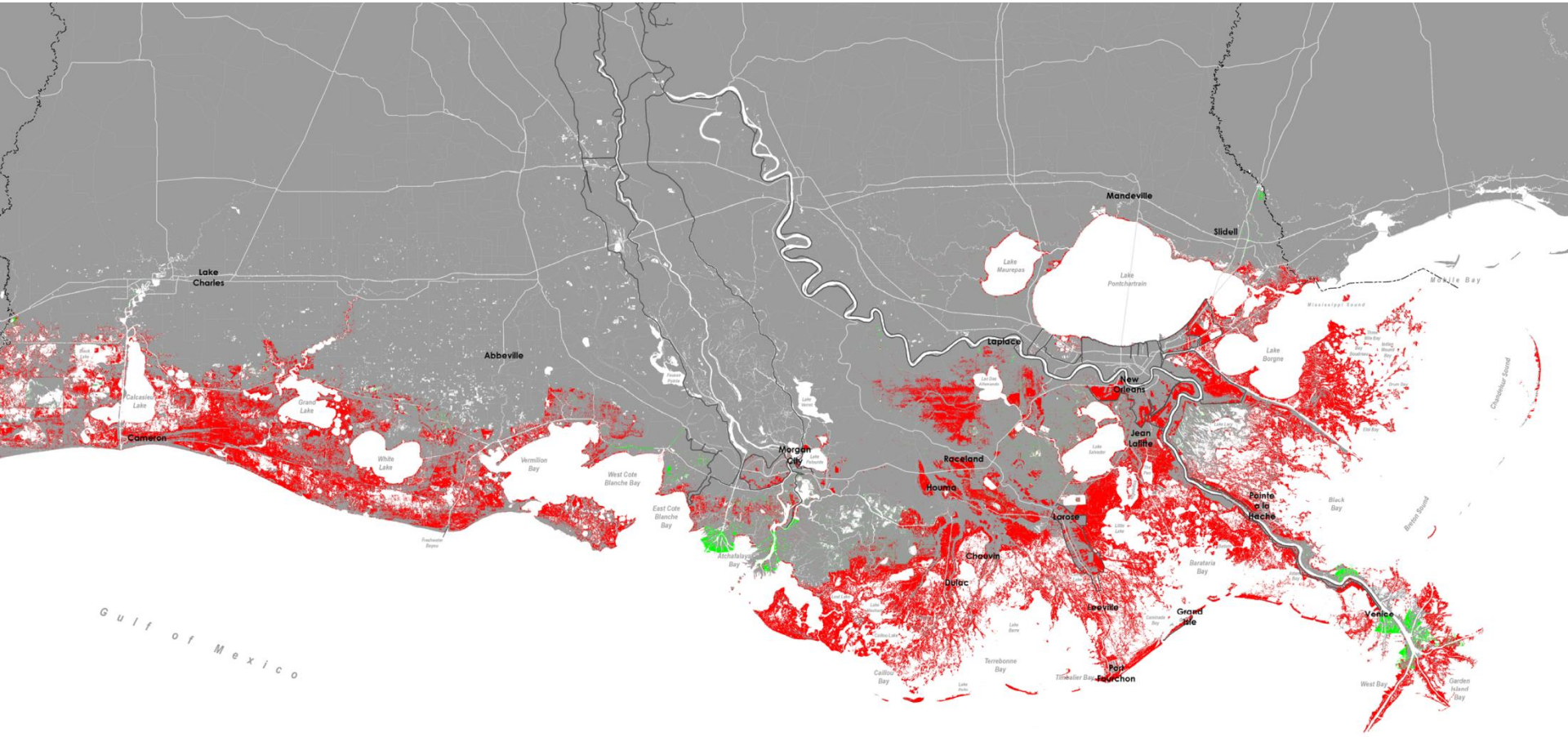
PREDICTED LAND CHANGE

FUTURE WITHOUT ACTION - YEAR 50, LOW SCENARIO



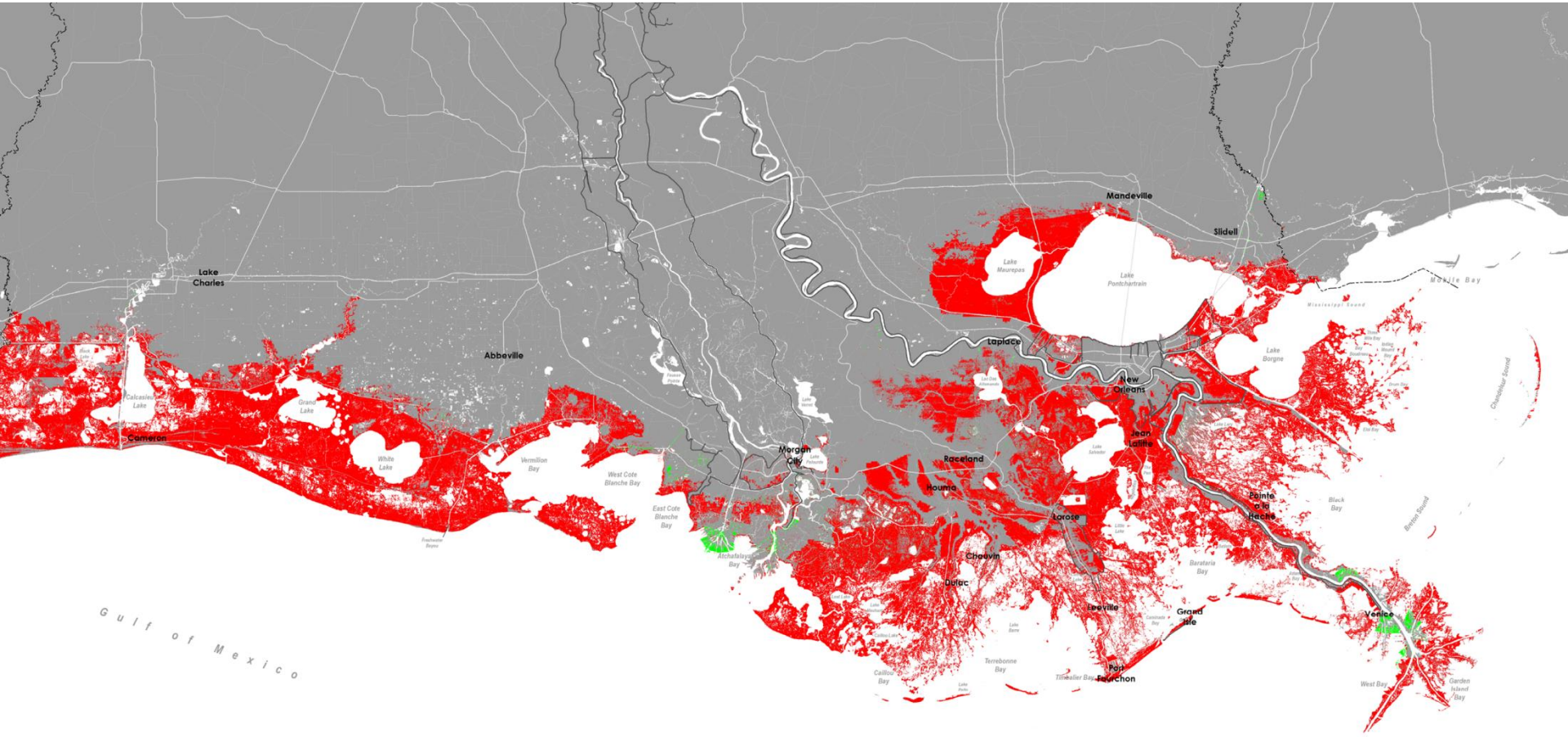
PREDICTED LAND CHANGE

FUTURE WITHOUT ACTION - YEAR 50, MEDIUM SCENARIO

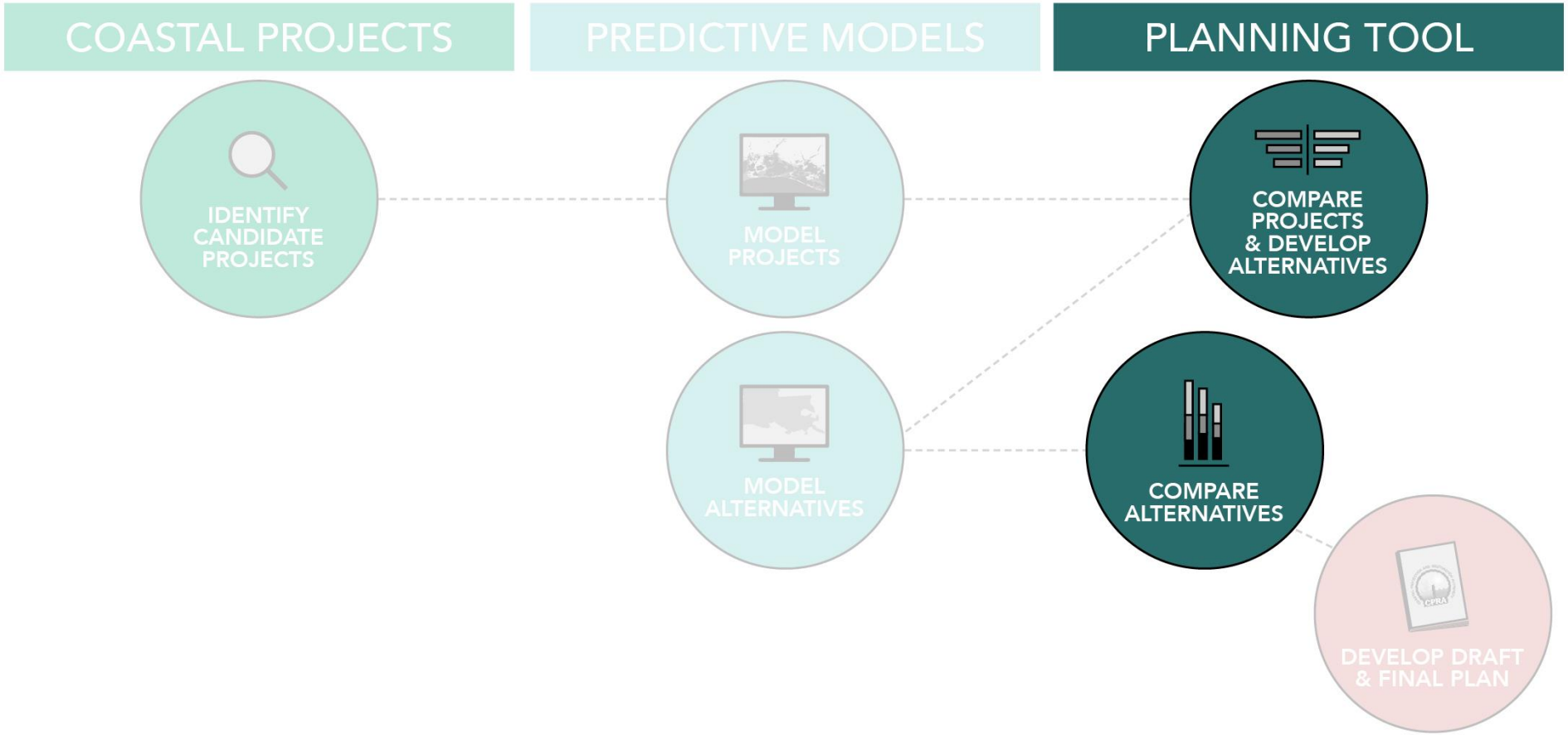


PREDICTED LAND CHANGE

FUTURE WITHOUT ACTION - YEAR 50, HIGH SCENARIO



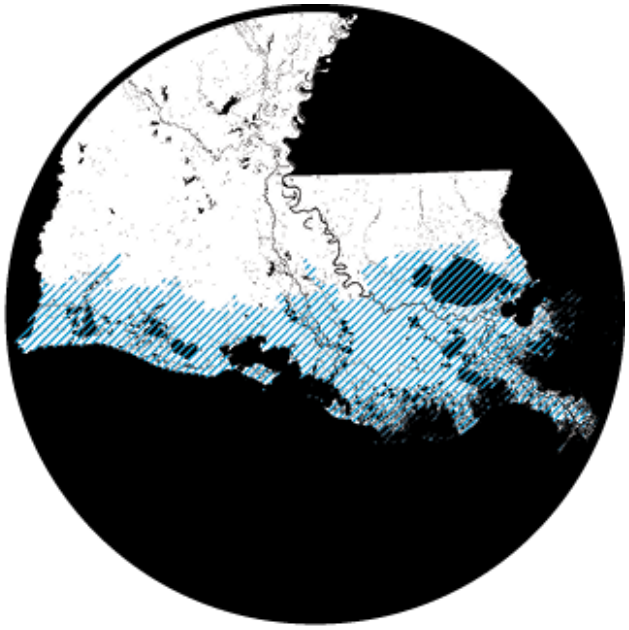
DEVELOPING THE COASTAL MASTER PLAN



OUTREACH & ENGAGEMENT

DECISION DRIVERS FOR PROJECT SELECTION

REDUCING FLOOD RISK



BUILDING/ MAINTAINING LAND

A PLAN BUILT ON THE BEST AVAILABLE SCIENCE…

PLANNING TOOL

DECISION DRIVERS

REDUCING FLOOD RISK

BUILDING/ MAINTAINING LAND

CONSTRAINTS

SEDIMENT

FUNDING

METRICS

COMMUNITY METRICS

AGRICULTURAL COMMUNITIES

FLOOD PROTECTION OF STRATEGIC ASSETS

OIL & GAS COMMUNITIES

SOCIAL VULNERABILITY

FLOOD PROTECTION OF HISTORIC PROPERTIES

NAVIGATION

TRADITIONAL FISHING COMMUNITIES

ENVIRONMENTAL METRICS

ALLIGATOR

CRAWFISH

SALTWATER FISH

USE OF NATURAL PROCESSES

BLUE CRAB

FRESHWATER FISH

SHRIMP

WATERFOWL

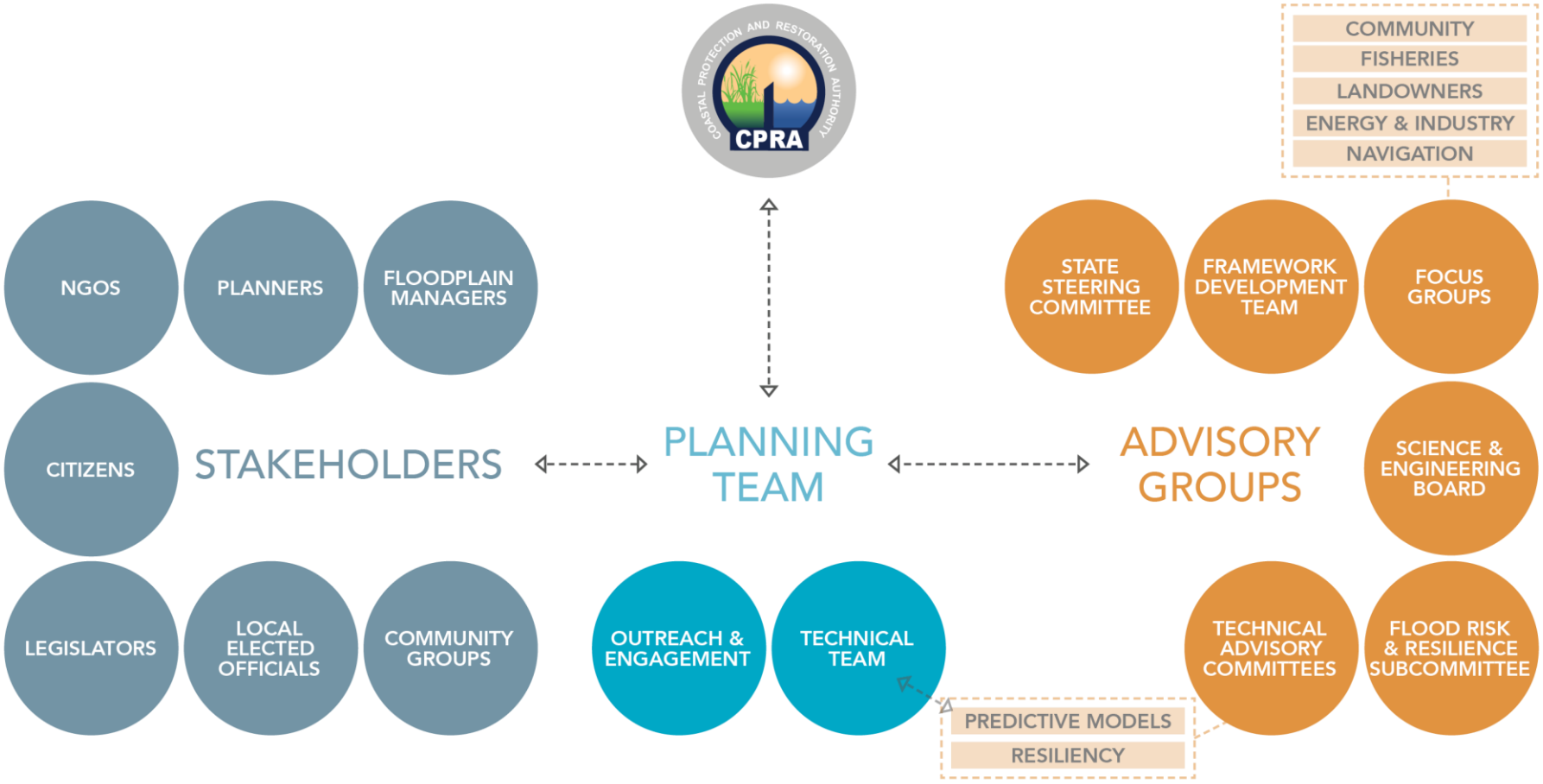
BROWN PELICAN

OYSTERS

SUSTAINABILITY OF LAND

…BUT RESPONSIVE TO THE NEEDS OF OUR COMMUNITIES

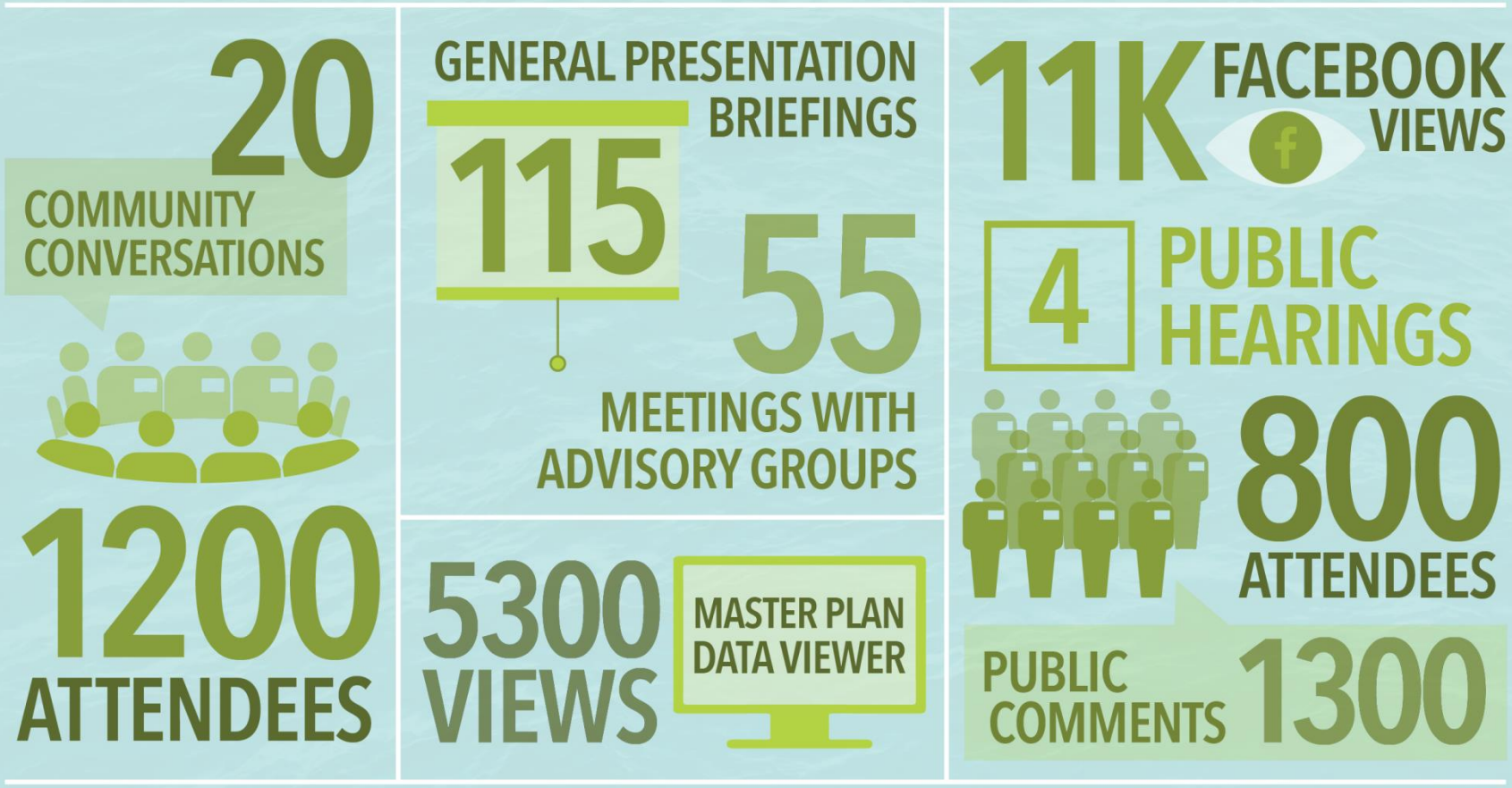
INPUT FROM CITIZENS, KEY STAKEHOLDERS, AND LOCAL/NATIONAL EXPERTS



OUTREACH & ENGAGEMENT

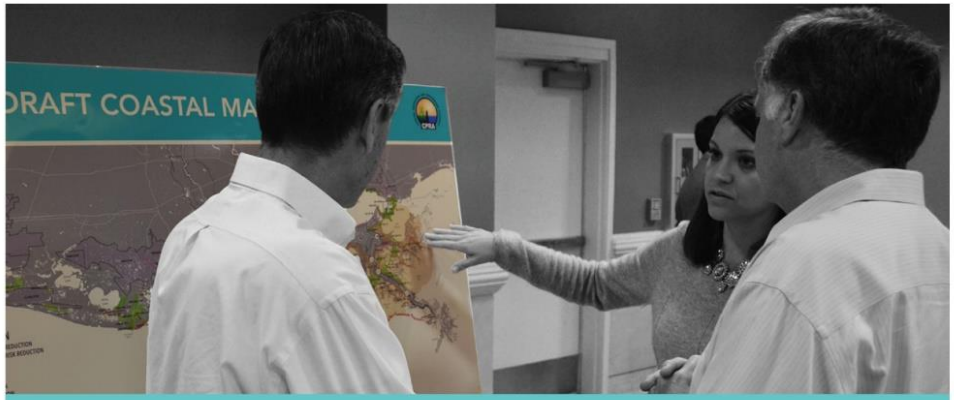
UNPRECEDENTED OUTREACH

BEFORE AND DURING THE DRAFT PLAN



UNPRECEDENTED OUTREACH

OFFICIAL PUBLIC HEARINGS



HOUMA

LAKE CHARLES

MANDEVILLE

NEW ORLEANS

PLANNING TEAM

- Bren Haase
- Mandy Green
- Melanie Saucier
- Raynie Harlan
- Andrea Galinski
- Ashley Cobb
- Zach Rosen

SUPPORTED BY:

THE WATER INSTITUTE OF THE GULF™

RAND CORPORATION

ARCADIS

EMERGENT METHOD

ROYAL engineeringpossibilities.

TECHNICAL TEAM

COLLABORATIVE TEAM OF OVER 70 EXPERTS

THE WATER INSTITUTE OF THE GULF™

LSU

Deltares
Enabling Delta Life

UNIVERSITY OF LOUISIANA Lafayette

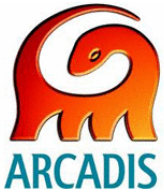
USGS
science for a changing world

MOFFATT & NICHOL

COASTAL ENGINEERING CONSULTANTS INC.

CB&I

THE UNIVERSITY of NEW ORLEANS



ARCADIS

GEORGE MASON UNIVERSITY

RAND CORPORATION

Ecopath
Research and Development Consortium

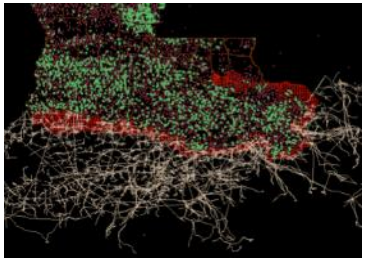
FRAMEWORK DEVELOPMENT TEAM

FOCUS GROUPS

- **Key industries or stakeholder groups that are impacted by land loss and large scale protection and restoration efforts**
- **Focus Groups:**
  - Community
  - Energy and Industry
  - Fisheries
  - Landowners
  - Navigation







SCIENCE AND ENGINEERING BOARD

Name	Organization	Expertise
Carl Friedrichs	VIMS, William & Mary	Coastal Geoscience
Dan Childers	Arizona State University	Wetlands
Ed Houde	University of Maryland	Fisheries
Jen Irish	Virginia Tech	Risk
Len Shabman	Resources for the Future	Economics
Margaret Davidson	NOAA (deceased)	Natural Resource/Economic Policies
Marius Sokolewicz	Royal Haskoning	Coastal Modeling
Michael Orbach	Duke University	Socio-Economics
Sandra Knight	WaterWonks, LLC	Water Resources
William Fulton	Rice University	Urban Planning

TECHNICAL ADVISORY COMMITTEES

Predictive Models

- John Callaway, University of San Francisco
- Scott Hagen, Louisiana State University
- Courtney Harris, Virginia Institute of Marine Sciences
- Wim Kimmerer, San Francisco State University
- Mike Waldon, US Fish and Wildlife Services (retired)

Resiliency

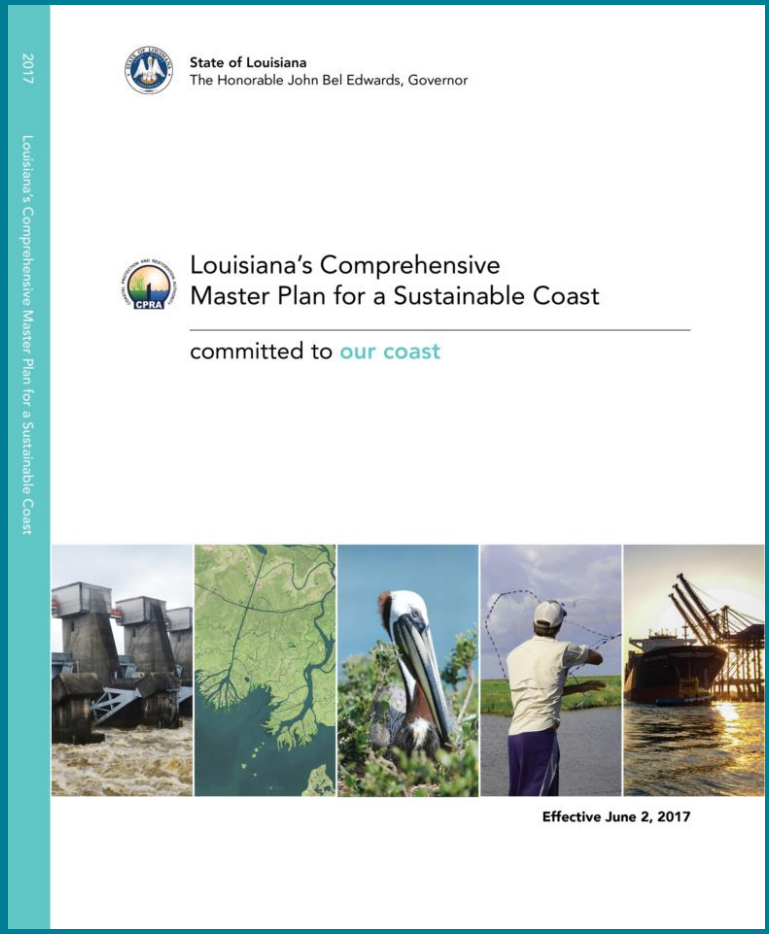
- Daniel Aldrich, Northeastern University
- Diane Austin, University of Arizona
- Gavin Smith, University of North Carolina
- Dan Zarrilli, City of New York, Mayor’s Office of Recovery & Resiliency

KEY DECISION POINTS

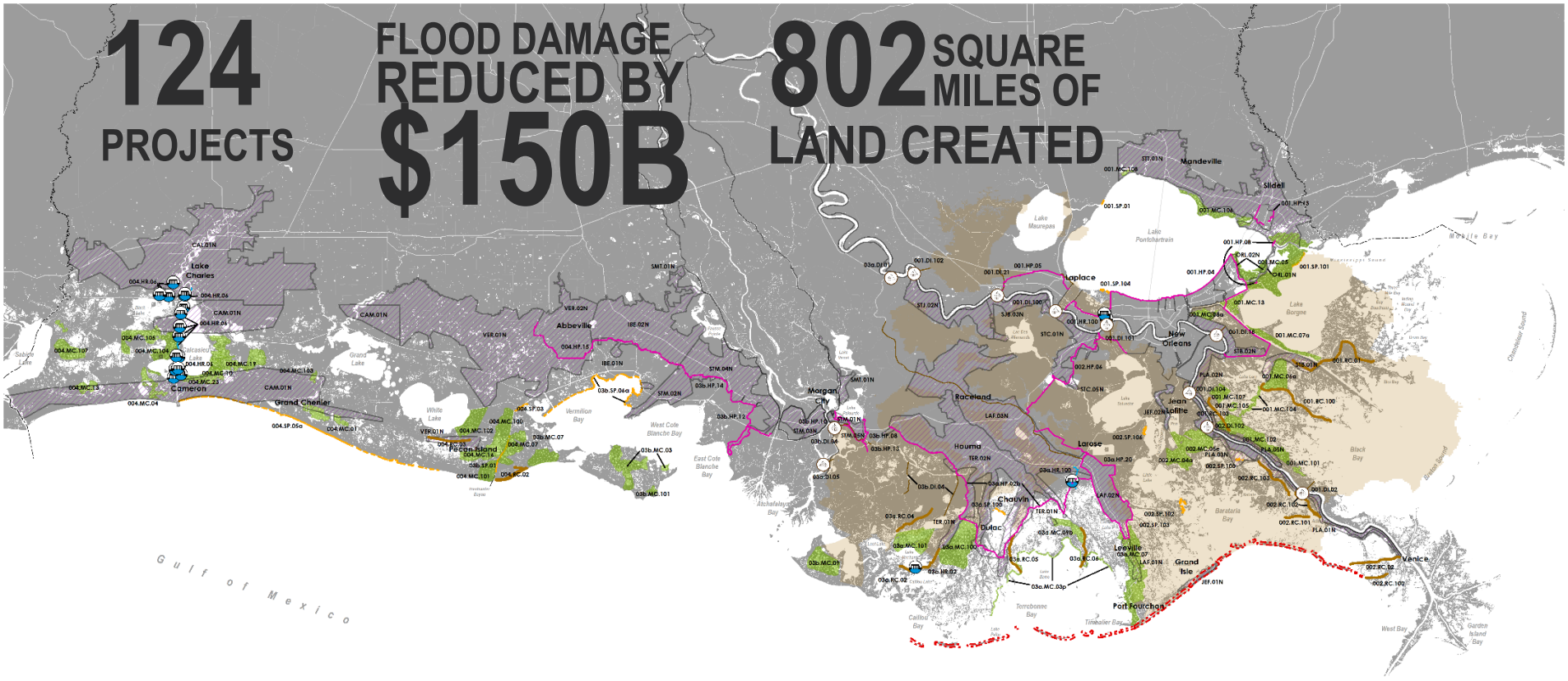
- **Overall Funding:** $50 Billion, front-load dollars
- **Funding Split:** An equal split of $25 billion each for restoration and risk reduction
- **Scenario:** Plan for the worst conditions (High) and hope for the best
- **Near-Term/Long-Term Results:** Equal emphasis was placed on the near term and the long term
- **Public Input:** Changes to the draft plan were made based on the feedback received

A Plan Based on Science, But Responsive to the Needs of Our Communities

2017 COASTAL MASTER PLAN



LOUISIANA'S 2017 COASTAL MASTER PLAN



PROJECT TYPES

Structural Protection
Nonstructural Risk Reduction
Ridge Restoration
Shoreline Protection
Barrier Island Restoration
Marsh Creation
Sediment Diversion
Hydrologic Restoration

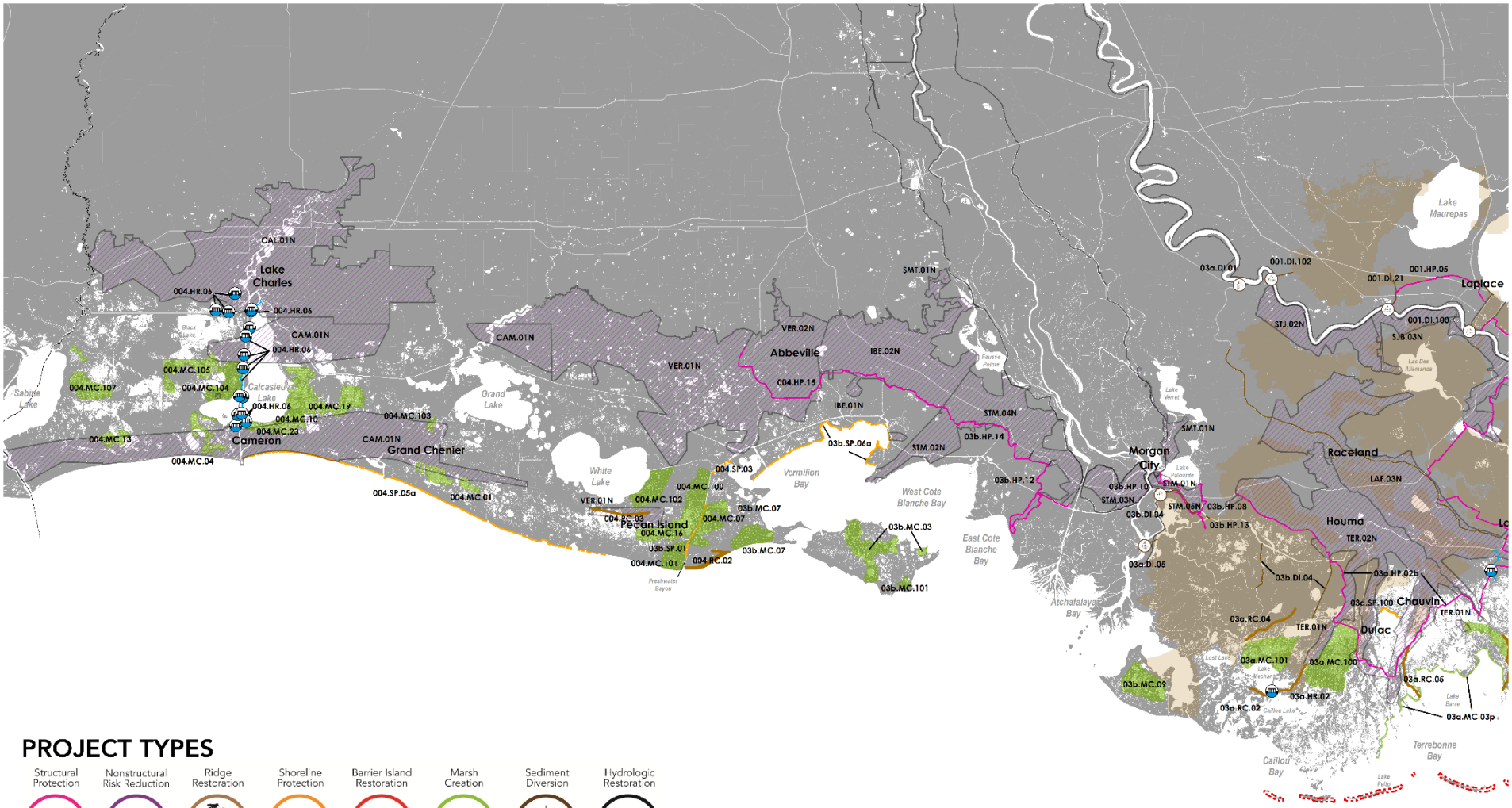
Small scale hydrologic restoration and oyster reef/living shoreline projects are included programmatically in the 2017 Coastal Master Plan. Consistency of individual projects will be determined on a case-by-case basis.

N

0 5 10 20 Miles

COASTAL PROTECTION AND RESTORATION AUTHORITY
CPRA

A CLOSER LOOK: WEST



PROJECT TYPES

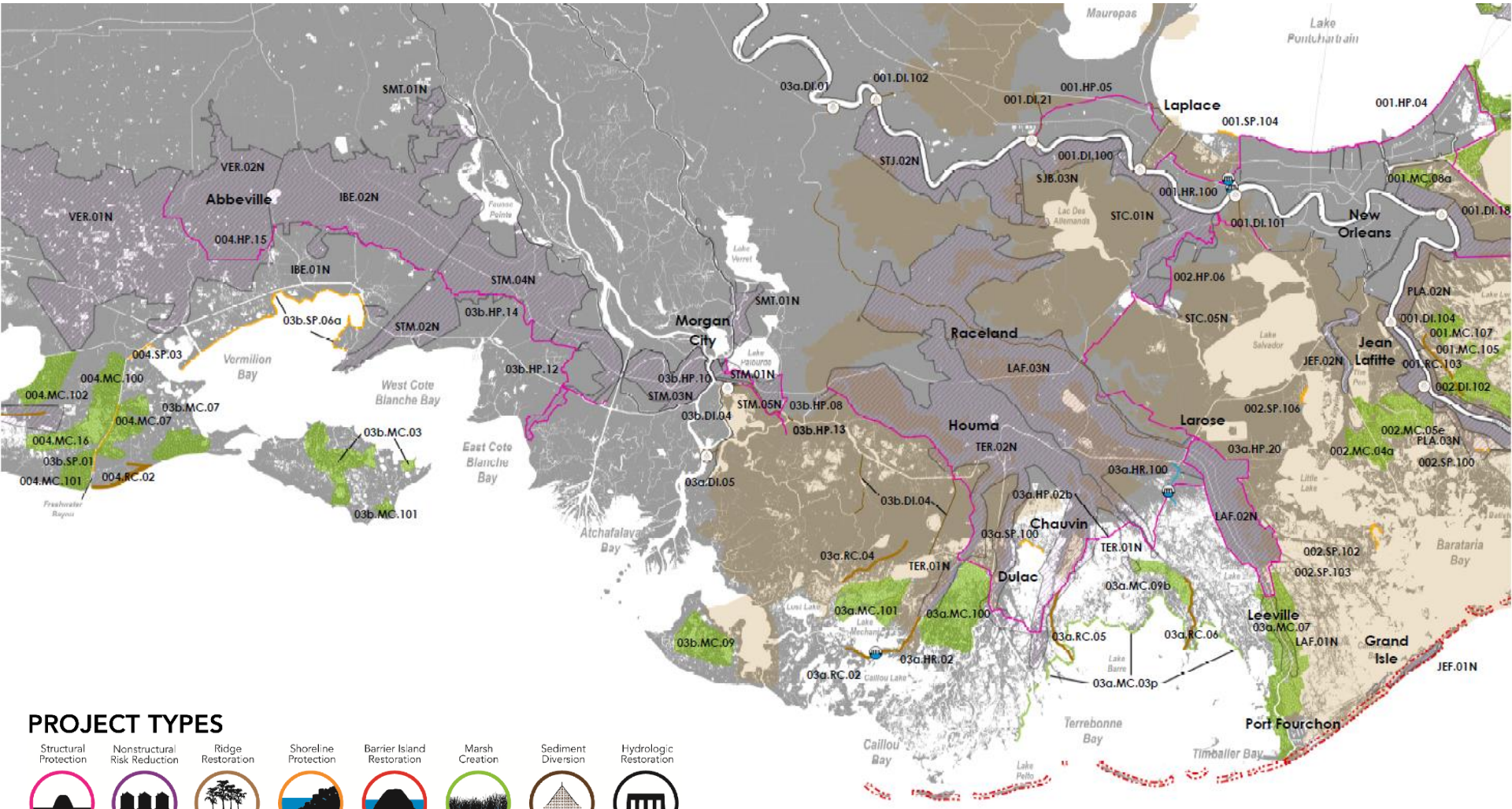
Small scale hydrologic restoration and oyster reef/living shoreline projects are included programmatically in the 2017 Coastal Master Plan. Consistency of individual projects will be determined on a case-by-case basis.

N

0 5 10 20 Miles

COASTAL PROTECTION AND RESTORATION AUTHORITY CPRA

A CLOSER LOOK: CENTRAL



PROJECT TYPES

Structural Protection | Nonstructural Risk Reduction | Ridge Restoration | Shoreline Protection | Barrier Island Restoration | Marsh Creation | Sediment Diversion | Hydrologic Restoration

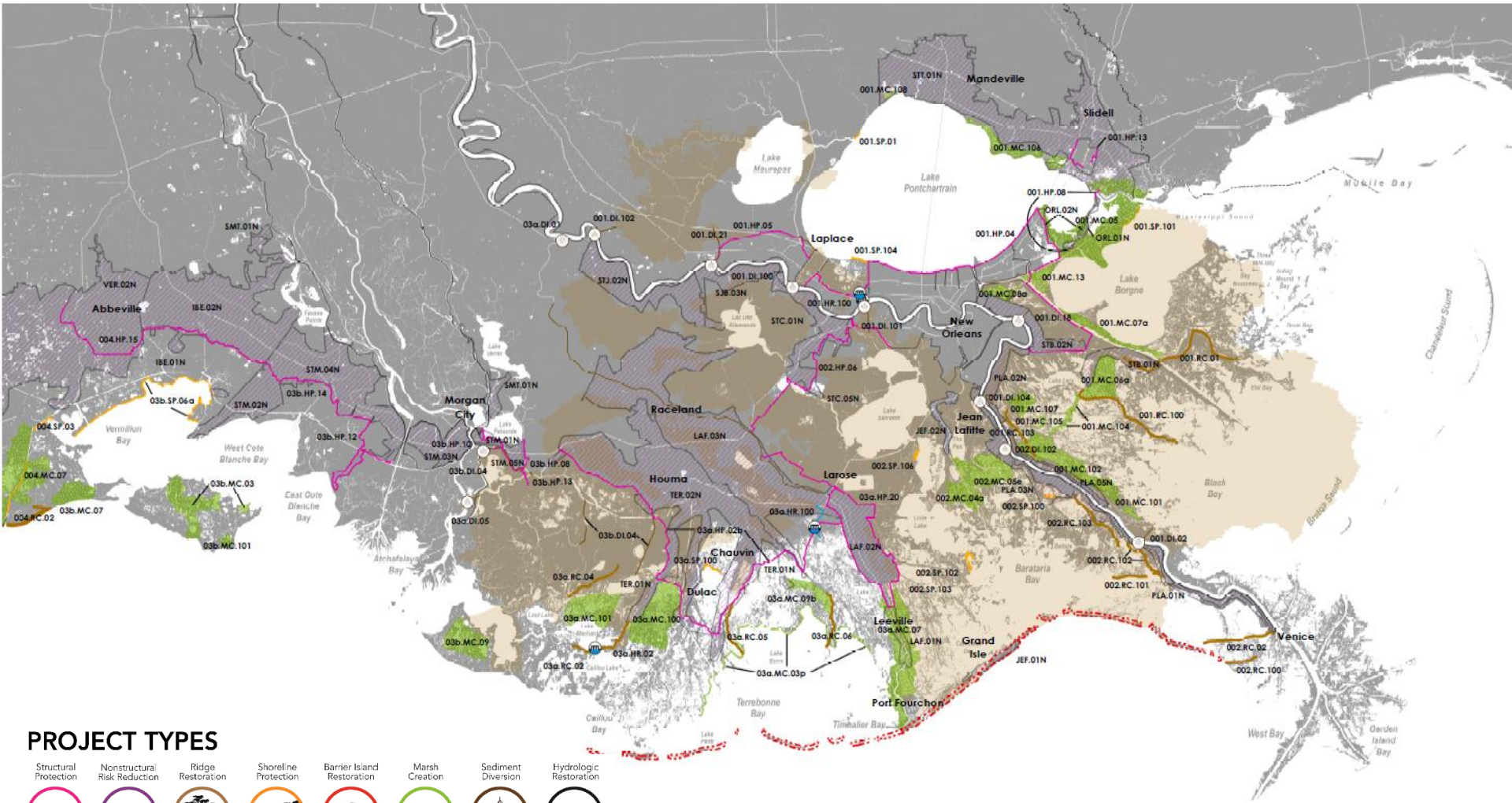
Small scale hydrologic restoration and oyster reef/living shoreline projects are included programmatically in the 2017 Coastal Master Plan. Consistency of individual projects will be determined on a case-by-case basis.

N

0 5 10 20 Miles

COASTAL PROTECTION AND RESTORATION AUTHORITY
CPRA

A CLOSER LOOK: EAST



PROJECT TYPES

Structural Protection | Nonstructural Risk Reduction | Ridge Restoration | Shoreline Protection | Barrier Island Restoration | Marsh Creation | Sediment Diversion | Hydrologic Restoration

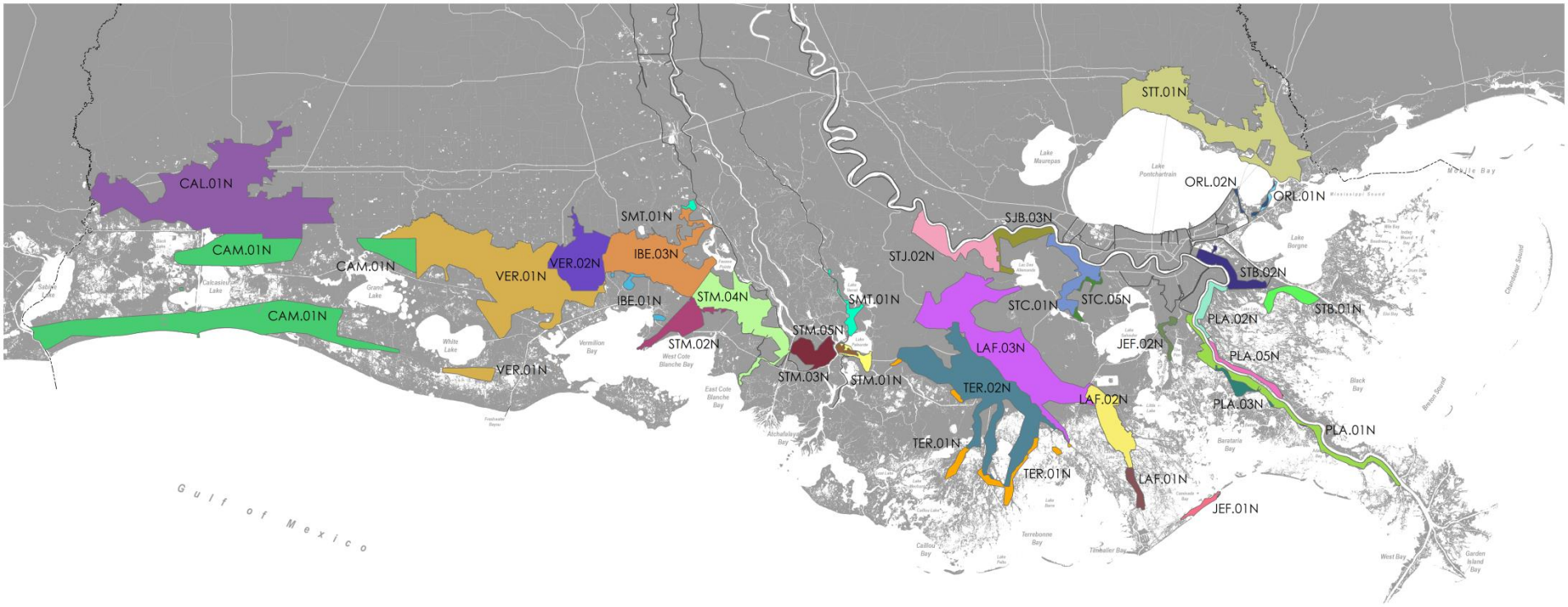
Small scale hydrologic restoration and oyster reef/living shoreline projects are included programmatically in the 2017 Coastal Master Plan. Consistency of individual projects will be determined on a case-by-case basis.

N

0 5 10 20 Miles

COASTAL PROTECTION AND RESTORATION AUTHORITY CPRA

NONSTRUCTURAL PROJECTS



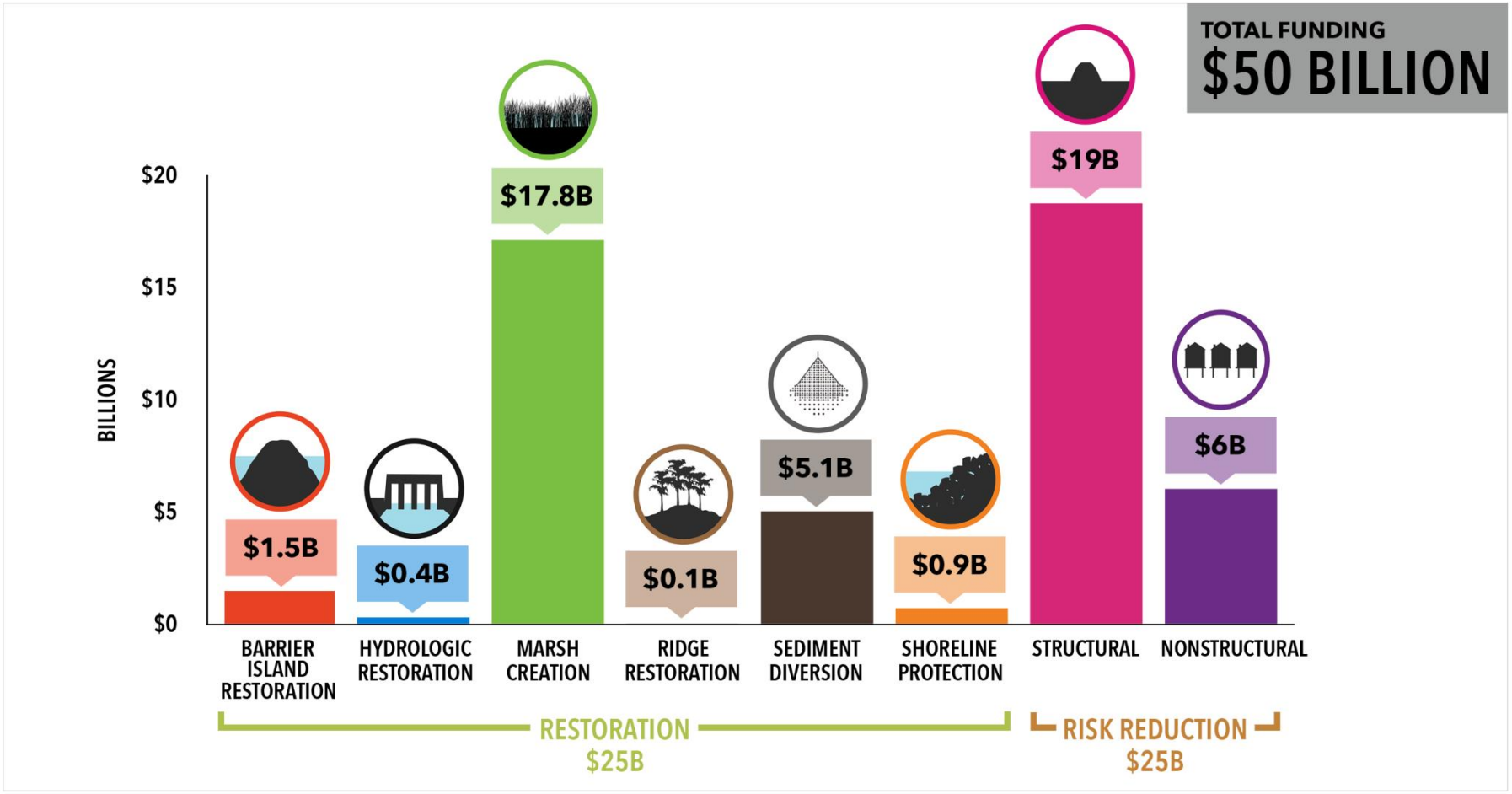
- Calcasieu
- Cameron
- Iberia - Atchafalaya
- Iberia - Lower
- Jefferson - Grand Isle
- Jefferson - Lafitte/Barataria
- Lafourche - Larose/Golden Meadow
- Lafourche - Lower
- Lafourche - Raceland
- Orleans - Lake Catherine
- Orleans - Rigolets
- Plaquemines - Braithwaite
- Plaquemines - Grand Bayou
- Plaquemines - Phoenix/Pointe A La Hache
- Plaquemines - West Bank
- St. Bernard
- St. Bernard - Yscloskey/Delacroix
- St. Charles - Hahnville/Luling
- St. Charles - Salvador
- St. James - Vacherie
- St. John the Baptist - Edgard
- St. Martin
- St. Mary - Franklin/Charenton
- St. Mary - Glencoe
- St. Mary - Lower
- St. Mary - Morgan City
- St. Mary - Patterson
- St. Tammany
- Terrebonne - Houma
- Terrebonne - Lower
- Vermillion
- Vermillion - Abbeville/Delcambre

N

0 5 10 20 Miles

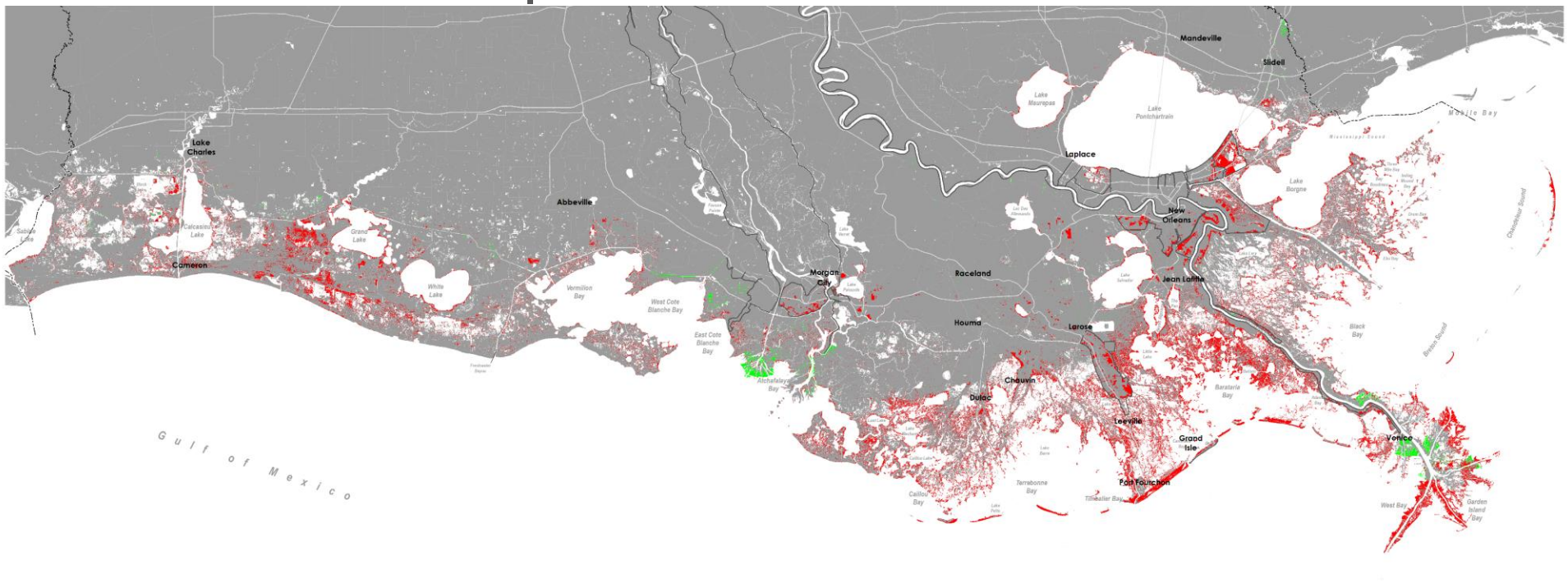
COASTAL PROTECTION AND RESTORATION AUTHORITY
CPRA

FUNDING BY PROJECT TYPE



FUTURE WITHOUT ACTION

MEDIUM SCENARIO | YEAR 30



Land Gain

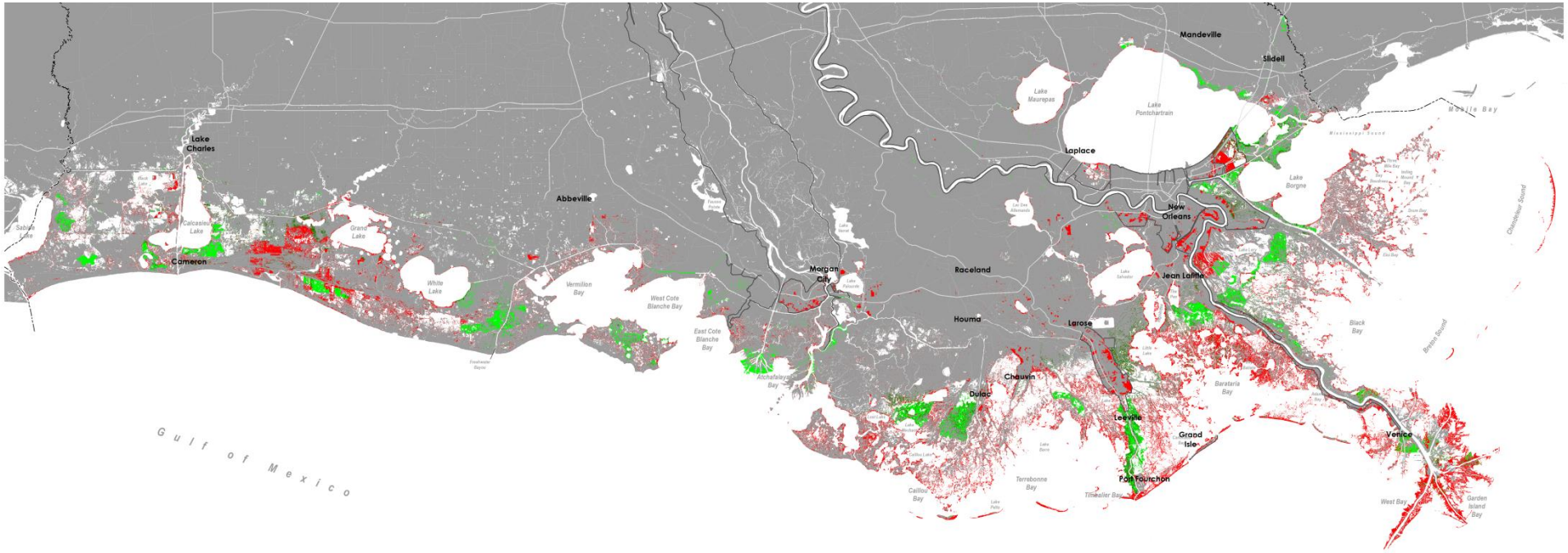
Land Loss

N

0 5 10 20 Miles

WHAT THE PLAN DELIVERS: LAND CHANGE

MEDIUM SCENARIO | YEAR 30



LAND CHANGE

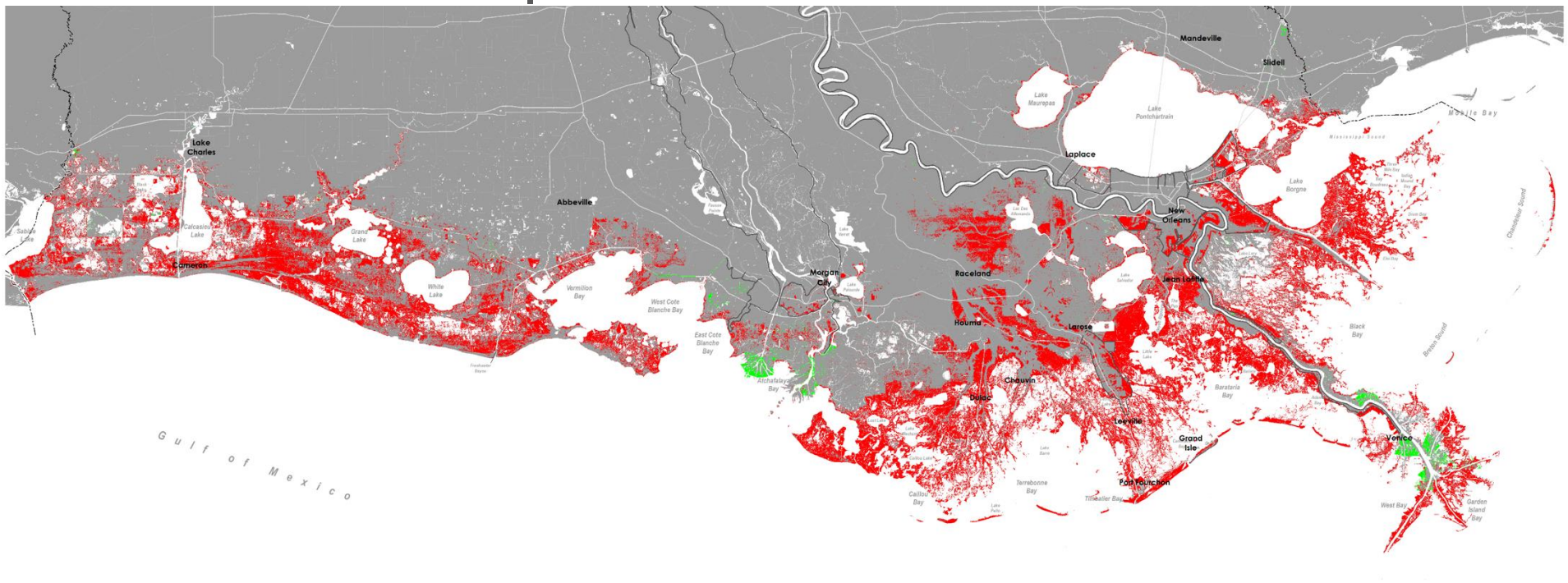
- Land Lost
- Land Gained
- Land Maintained

N

0 5 10 20 Miles

FUTURE WITHOUT ACTION

MEDIUM SCENARIO | YEAR 50



Land Gain

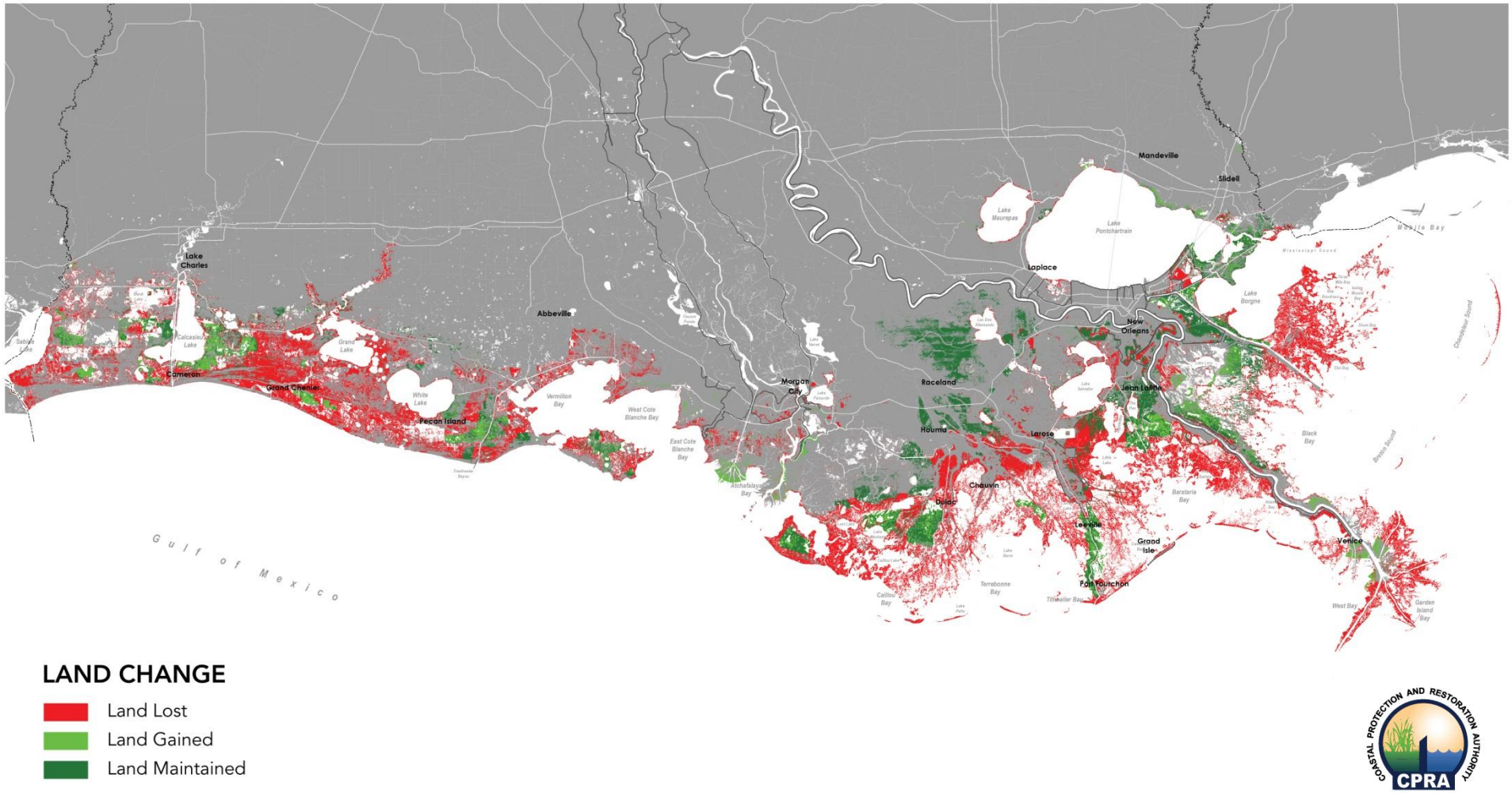
Land Loss

N

0 5 10 20 Miles

WHAT THE PLAN DELIVERS: LAND CHANGE

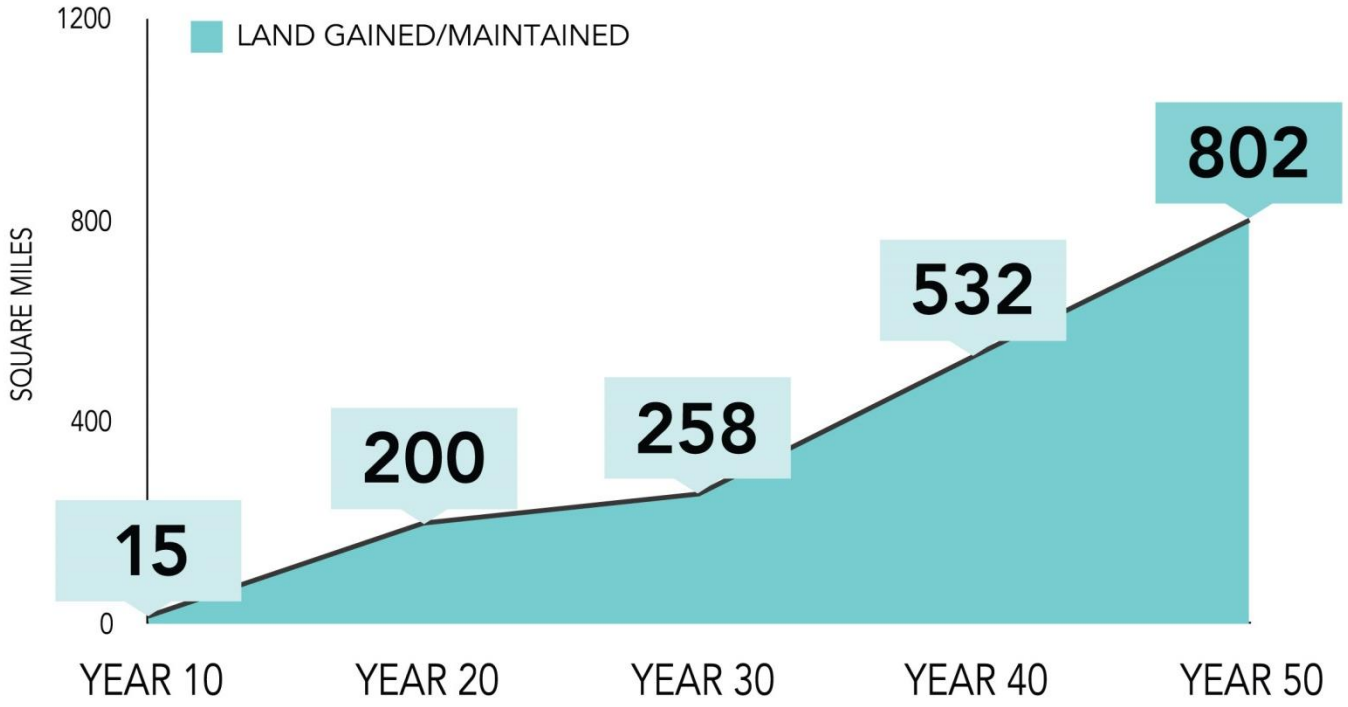
MEDIUM SCENARIO | YEAR 50



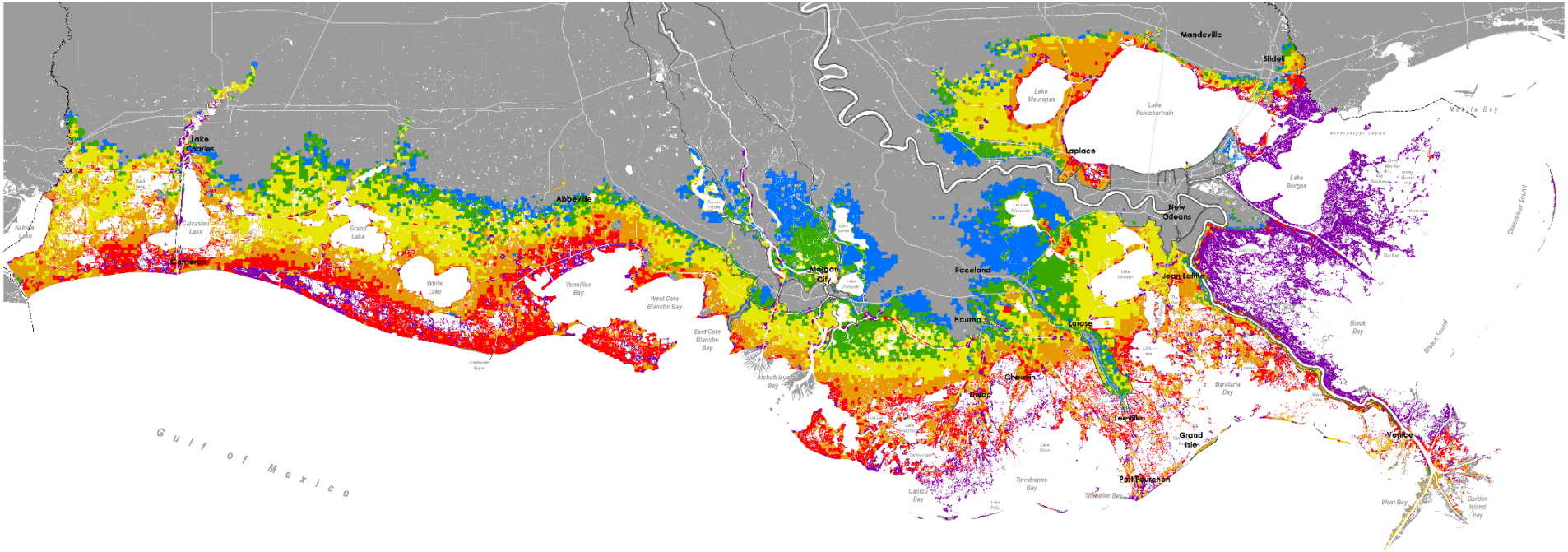
WHAT THE PLAN DELIVERS
LAND GAINED/MAINTAINED

POTENTIAL LAND GAINED/MAINTAINED OVER TIME | FUTURE WITH ACTION

SCENARIO
MEDIUM



FUTURE WITHOUT ACTION: FLOOD DEPTHS
MEDIUM SCENARIO | YEAR 25 | 100-YEAR EVENT



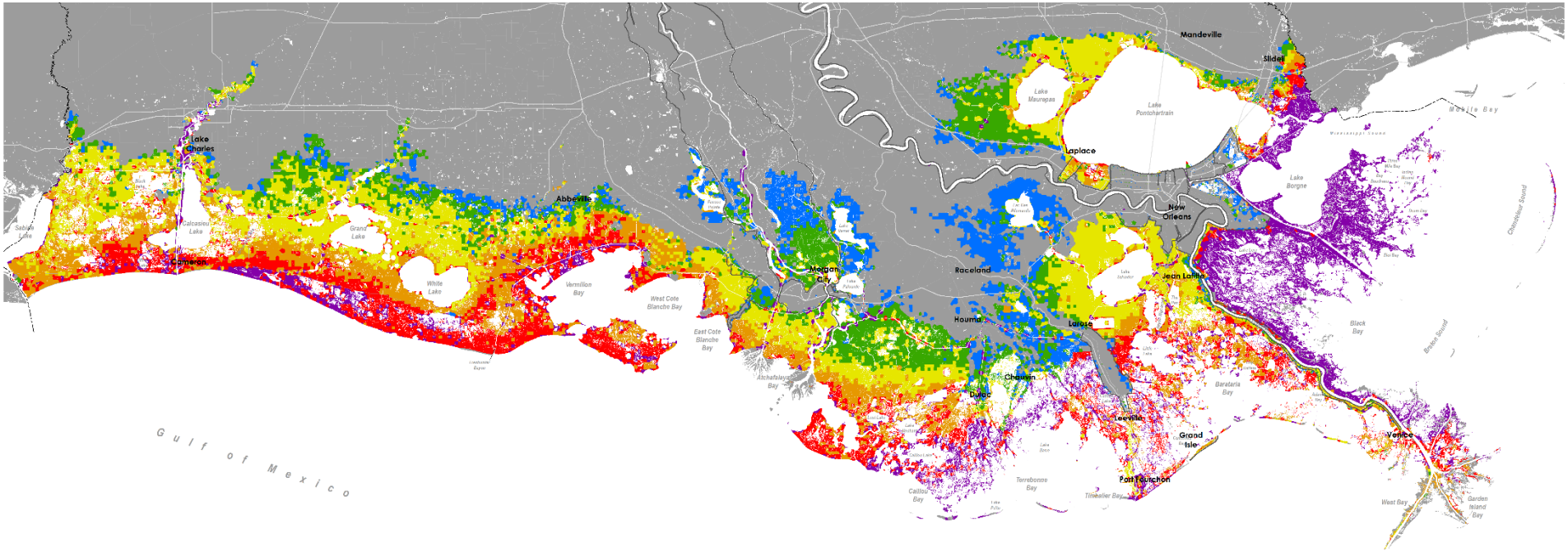
Flood Depths

1-3 ft	7-9 ft	13-15 ft
4-6 ft	10-12 ft	Over 15 ft

N

0 5 10 20 Miles

WHAT THE PLAN DELIVERS: FLOOD DEPTHS
MEDIUM SCENARIO | YEAR 25 | 100-YEAR EVENT



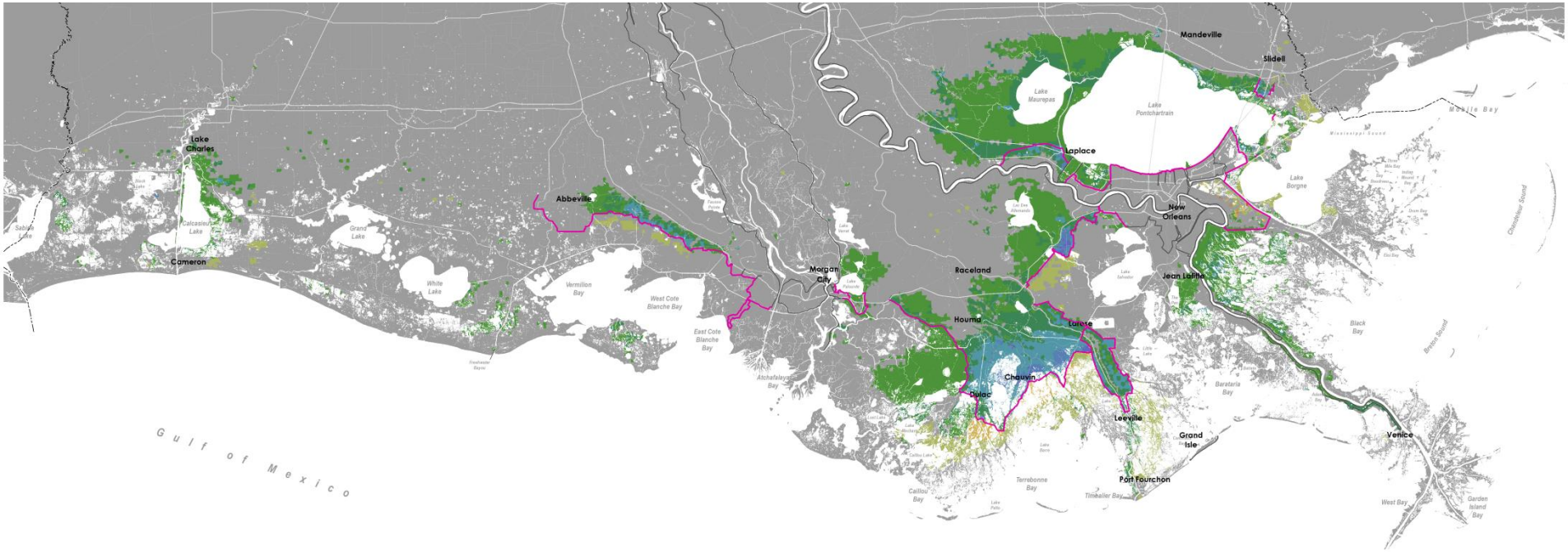
Flood Depths

1-3 ft	7-9 ft	13-15 ft
4-6 ft	10-12 ft	Over 15 ft

N

0 5 10 20 Miles

WHAT THE PLAN DELIVERS: FLOOD DEPTH DIFFERENCE
MEDIUM SCENARIO | YEAR 25 | 100-YEAR EVENT



Flood Depth Difference

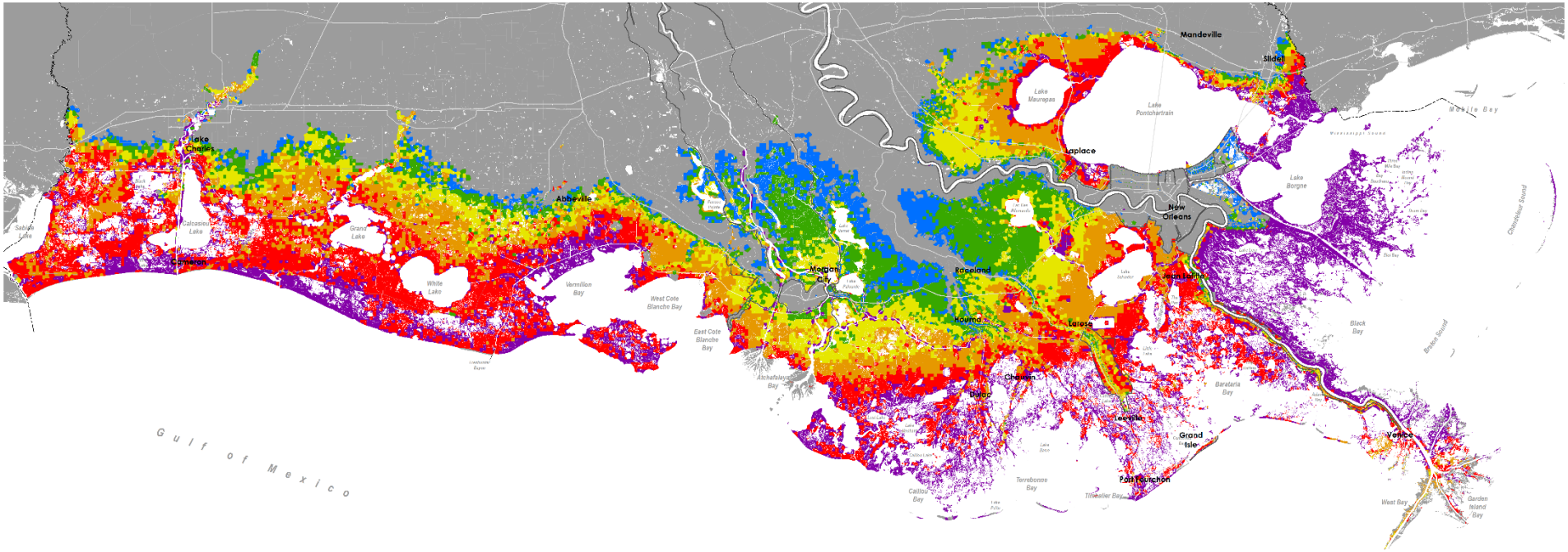
< -9 ft	-6 to -3 ft	1 to 3 ft
-9 to -6 ft	-3 to -1 ft	> 3 ft

Structural Protection

N

0 5 10 20 Miles

FUTURE WITHOUT ACTION: FLOOD DEPTHS
MEDIUM SCENARIO | YEAR 50 | 100-YEAR EVENT



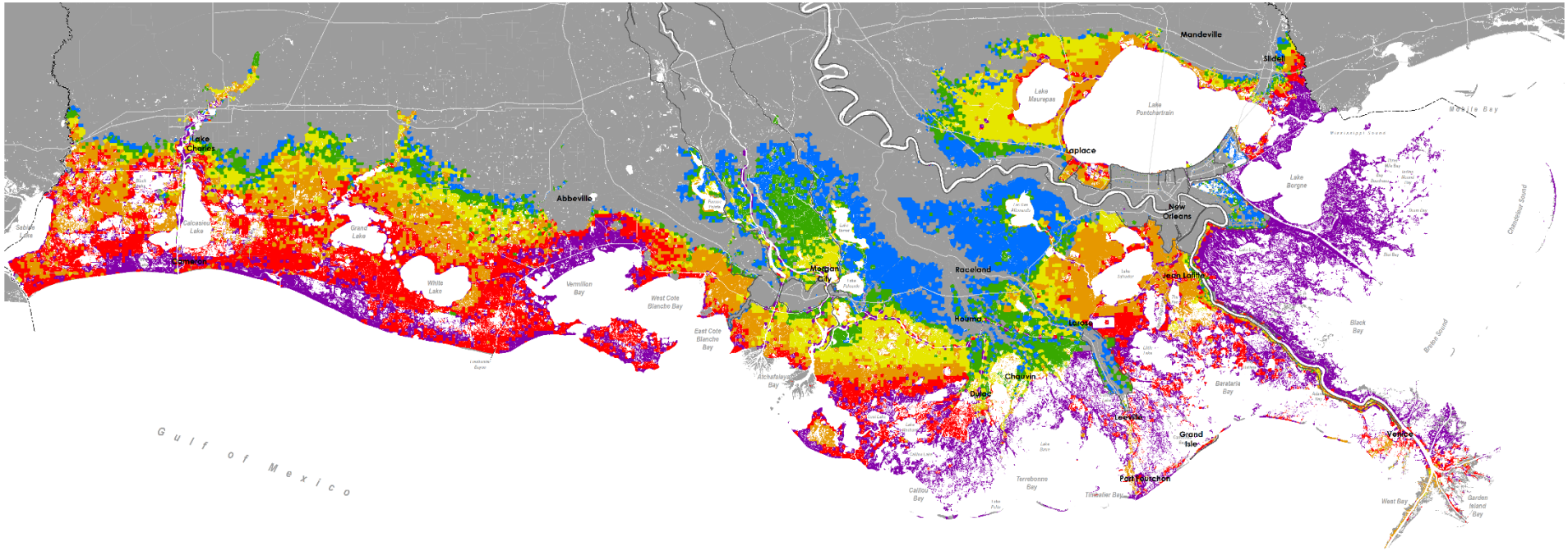
Flood Depths

1-3 ft	7-9 ft	13-15 ft
4-6 ft	10-12 ft	Over 15 ft

N

0 5 10 20 Miles

WHAT THE PLAN DELIVERS: FLOOD DEPTHS
MEDIUM SCENARIO | YEAR 50 | 100-YEAR EVENT



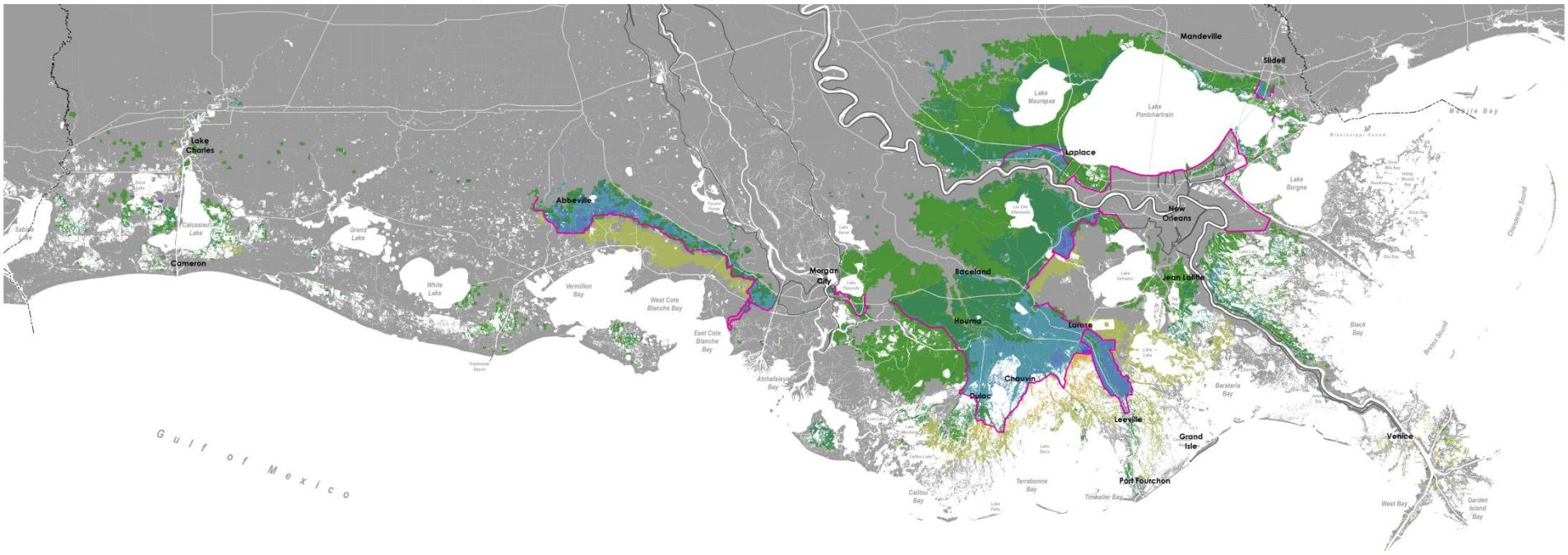
Flood Depths

1-3 ft	7-9 ft	13-15 ft
4-6 ft	10-12 ft	Over 15 ft

N

0 5 10 20 Miles

WHAT THE PLAN DELIVERS: FLOOD DEPTH DIFFERENCE
MEDIUM SCENARIO | YEAR 50 | 100-YEAR EVENT



Flood Depth Difference

< -9 ft	-6 to -3 ft	1 to 3 ft
-9 to -6 ft	-3 to -1 ft	> 3 ft

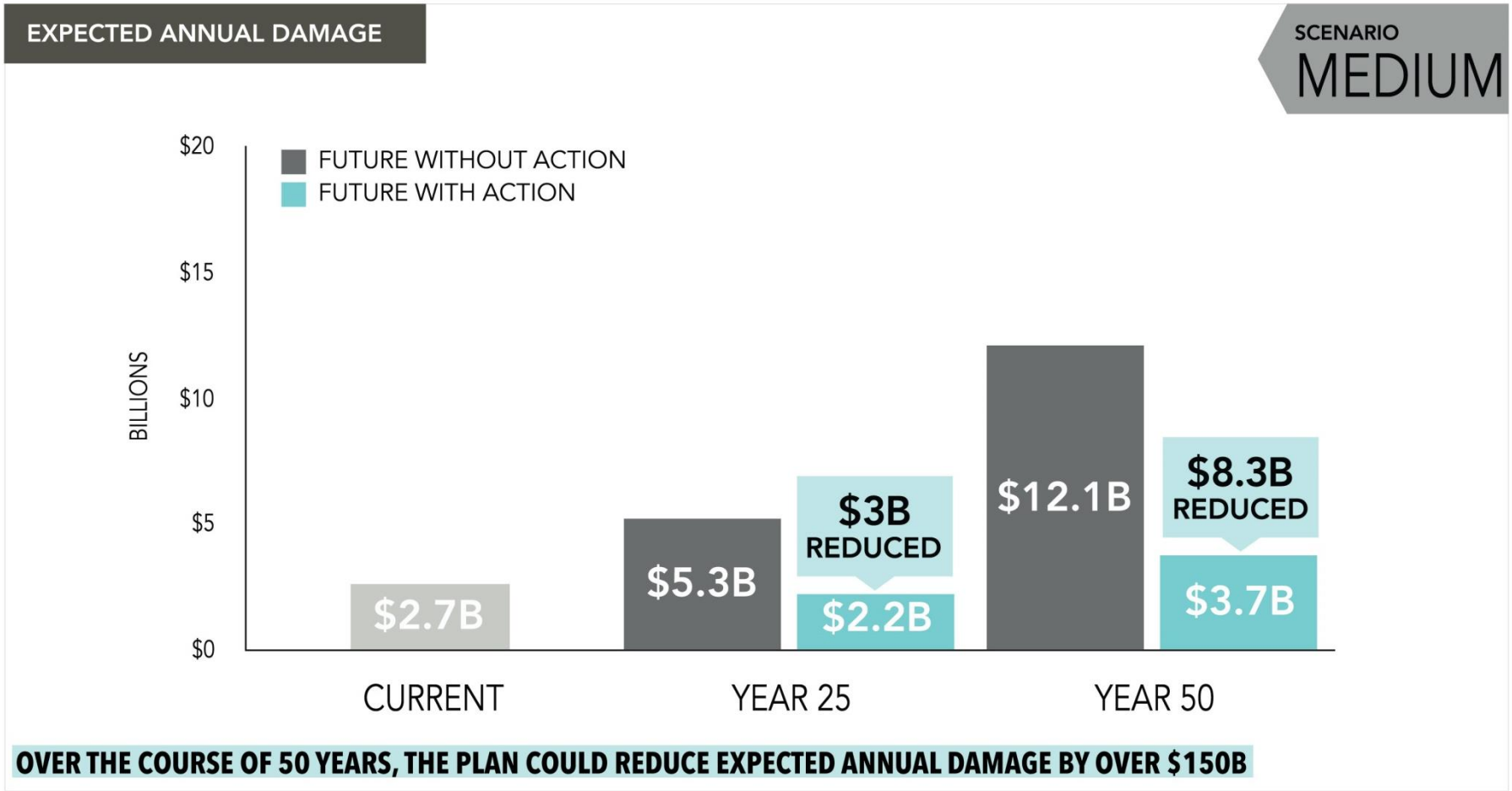
Structural Protection

N

0 5 10 20 Miles

COASTAL PROTECTION AND RESTORATION AUTHORITY CPRA

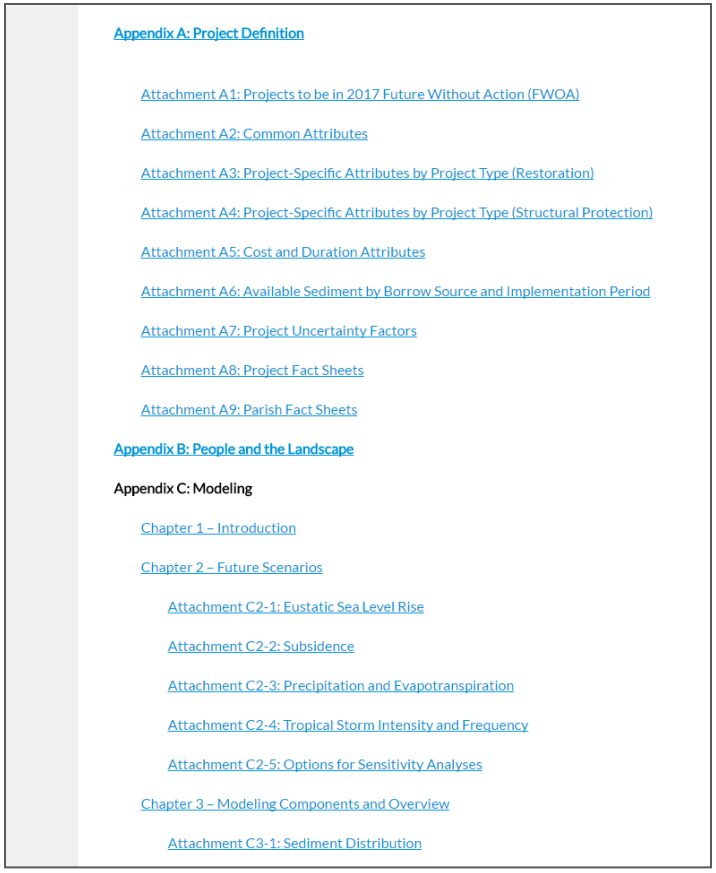
WHAT THE PLAN DELIVERS
REDUCTION IN EXPECTED ANNUAL DAMAGE



WHAT THE PLAN DELIVERS

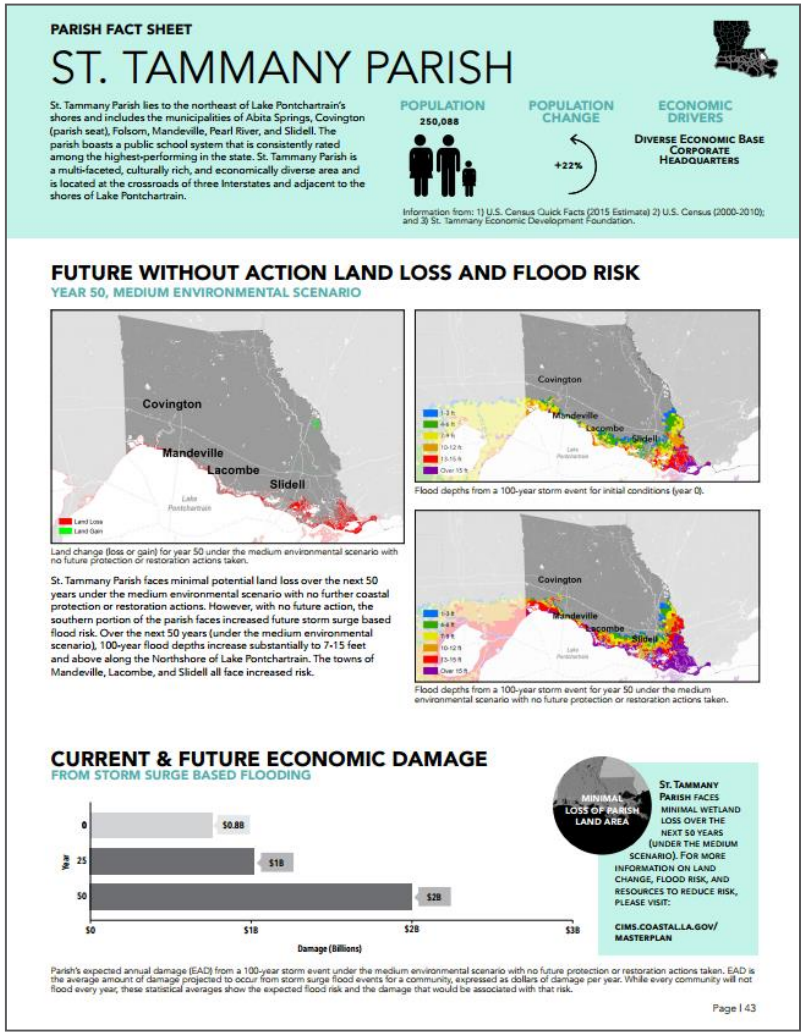
MASTER PLAN WEBSITE

MASTER PLAN & APPENDICES



coastal.la.gov

PARISH FACTSHEETS



PARISH FACT SHEET

ST. TAMMANY PARISH

St. Tammany Parish lies to the northeast of Lake Pontchartrain's shores and includes the municipalities of Abita Springs, Covington (parish seat), Folsom, Mandeville, Pearl River, and Slidell. The parish boasts a public school system that is consistently rated among the highest-performing in the state. St. Tammany Parish is a multi-faceted, culturally rich, and economically diverse area and is located at the crossroads of three Interstates and adjacent to the shores of Lake Pontchartrain.

POPULATION
250,088

POPULATION CHANGE
+22%

ECONOMIC DRIVERS
DIVERSE ECONOMIC BASE
CORPORATE HEADQUARTERS

Information from: 1) U.S. Census Quick Facts (2015 Estimate) 2) U.S. Census (2000-2010); and 3) St. Tammany Economic Development Foundation.

FUTURE WITHOUT ACTION LAND LOSS AND FLOOD RISK

YEAR 50, MEDIUM ENVIRONMENTAL SCENARIO

Land change (loss or gain) for year 50 under the medium environmental scenario with no future protection or restoration actions taken.

St. Tammany Parish faces minimal potential land loss over the next 50 years under the medium environmental scenario with no further coastal protection or restoration actions. However, with no future action, the southern portion of the parish faces increased future storm surge based flood risk. Over the next 50 years (under the medium environmental scenario), 100-year flood depths increase substantially to 7-15 feet and above along the Northshore of Lake Pontchartrain. The towns of Mandeville, Lacombe, and Slidell all face increased risk.

Flood depths from a 100-year storm event for initial conditions (year 0).

Flood depths from a 100-year storm event for year 50 under the medium environmental scenario with no future protection or restoration actions taken.

CURRENT & FUTURE ECONOMIC DAMAGE

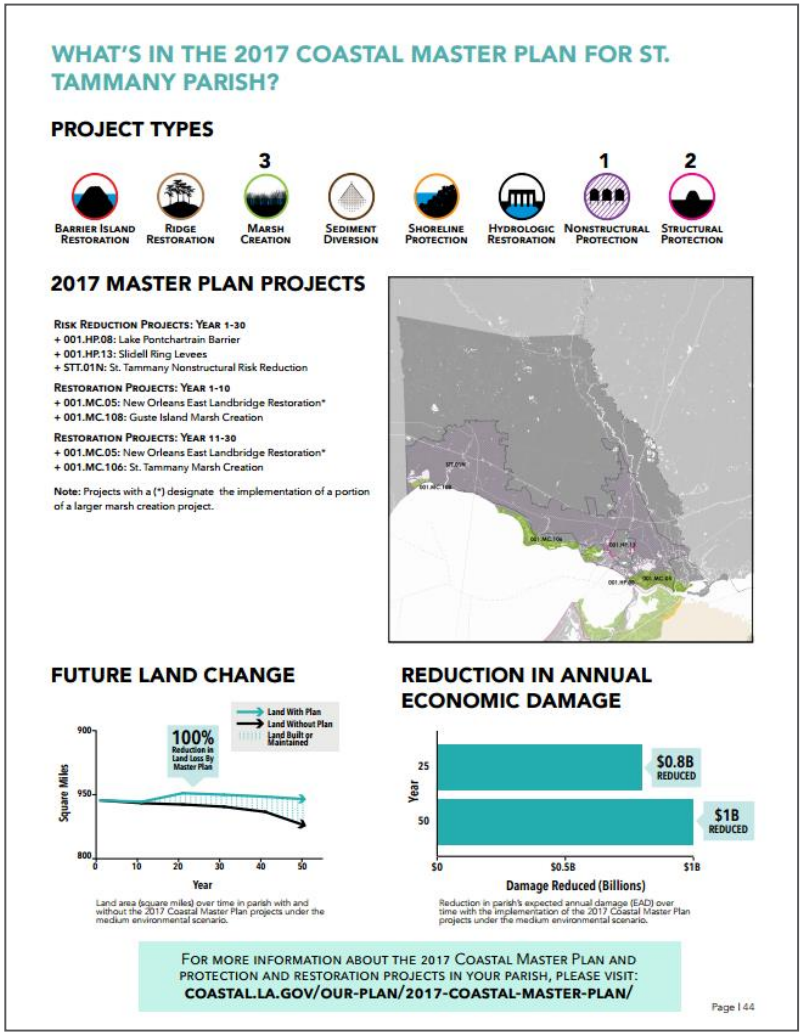
FROM STORM SURGE BASED FLOODING

ST. TAMMANY PARISH FACES MINIMAL WETLAND LOSS OVER THE NEXT 50 YEARS (UNDER THE MEDIUM SCENARIO). FOR MORE INFORMATION ON LAND CHANGE, FLOOD RISK, AND RESOURCES TO REDUCE RISK, PLEASE VISIT:

CIMS.COASTAL.LA.GOV/MASTERPLAN

Parish's expected annual damage (EAD) from a 100-year storm event under the medium environmental scenario with no future protection or restoration actions taken. EAD is the average amount of damage projected to occur from storm surge flood events for a community, expressed as dollars of damage per year. While every community will not flood every year, these statistical averages show the expected flood risk and the damage that would be associated with that risk.

Page | 43



WHAT'S IN THE 2017 COASTAL MASTER PLAN FOR ST. TAMMANY PARISH?

PROJECT TYPES

2017 MASTER PLAN PROJECTS

RISK REDUCTION PROJECTS: YEAR 1-30
+ 001.HP.08: Lake Pontchartrain Barrier
+ 001.HP.13: Slidell Ring Levees
+ STT.01N: St. Tammany Nonstructural Risk Reduction

RESTORATION PROJECTS: YEAR 1-10
+ 001.MC.05: New Orleans East Landbridge Restoration*
+ 001.MC.108: Guste Island Marsh Creation

RESTORATION PROJECTS: YEAR 11-30
+ 001.MC.05: New Orleans East Landbridge Restoration*
+ 001.MC.106: St. Tammany Marsh Creation

Note: Projects with a (*) designate the implementation of a portion of a larger marsh creation project.

FUTURE LAND CHANGE

Land area (square miles) over time in parish with and without the 2017 Coastal Master Plan projects under the medium environmental scenario.

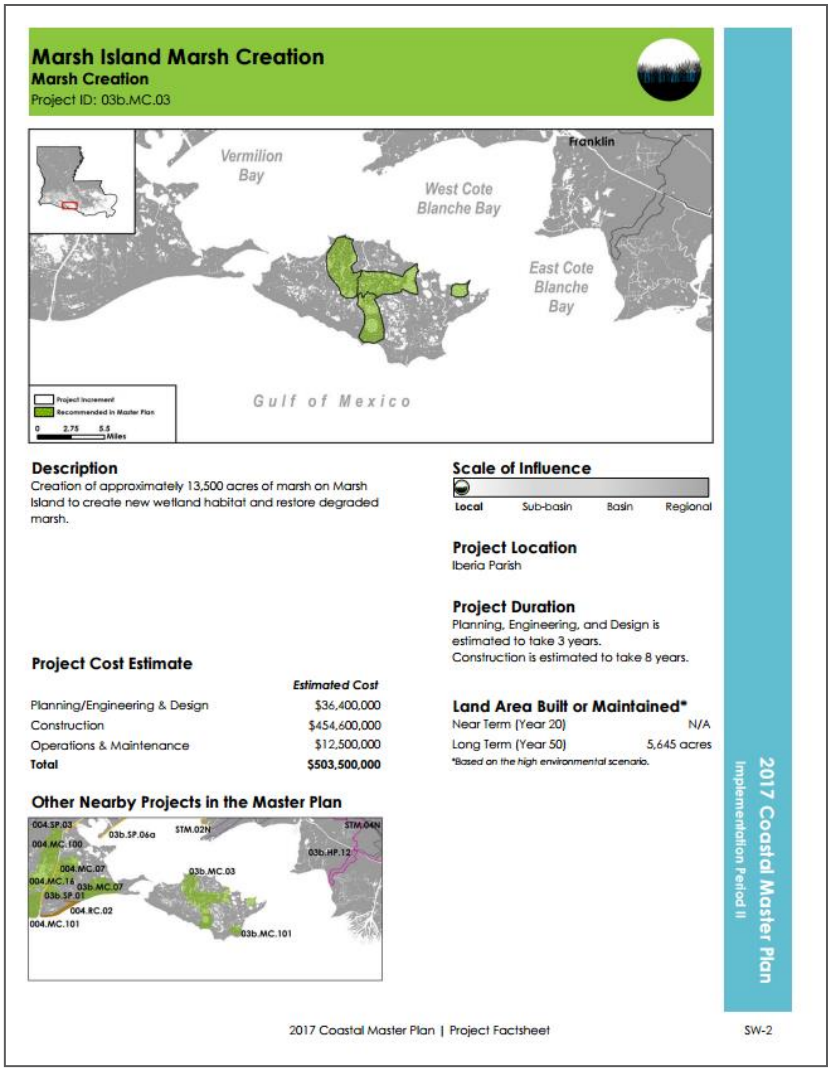
REDUCTION IN ANNUAL ECONOMIC DAMAGE

Reduction in parish's expected annual damage (EAD) over time with the implementation of the 2017 Coastal Master Plan projects under the medium environmental scenario.

FOR MORE INFORMATION ABOUT THE 2017 COASTAL MASTER PLAN AND PROTECTION AND RESTORATION PROJECTS IN YOUR PARISH, PLEASE VISIT:
COASTAL.LA.GOV/OUR-PLAN/2017-COASTAL-MASTER-PLAN/

Page | 44

PROJECT FACT SHEETS



Marsh Island Marsh Creation
Marsh Creation
Project ID: 03b.MC.03

Description
Creation of approximately 13,500 acres of marsh on Marsh Island to create new wetland habitat and restore degraded marsh.

Scale of Influence
Local | Sub-basin | Basin | Regional

Project Location
Iberia Parish

Project Duration
Planning, Engineering, and Design is estimated to take 3 years.
Construction is estimated to take 8 years.

Project Cost Estimate

	Estimated Cost
Planning/Engineering & Design	$36,400,000
Construction	$454,600,000
Operations & Maintenance	$12,500,000
Total	**$503,500,000**

Land Area Built or Maintained*

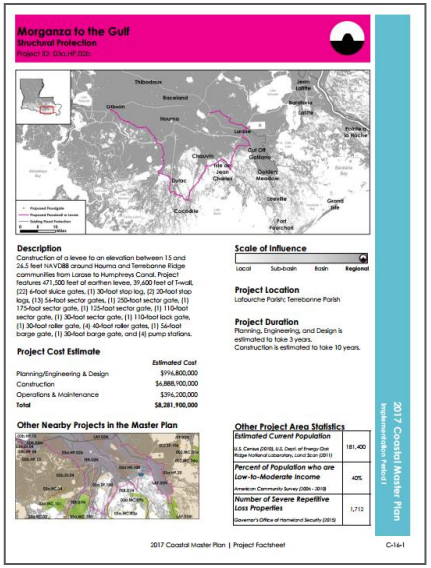
Near Term (Year 20)	N/A
Long Term (Year 50)	5,645 acres

*Based on the high environmental scenario.

Other Nearby Projects in the Master Plan

2017 Coastal Master Plan | Implementation Period II

2017 Coastal Master Plan | Project Factsheet SW-2



Morganza to the Gulf
Structural Protection
Project ID: 03a.HP.02b

Description
Construction of a levee to an elevation between 15 and 26.5 feet NAVD88 around Houma and Terrebonne Ridge communities from Larose to Humphreys Canal. Project features 471,500 feet of earthen levee, 39,600 feet of T-wall, (22) 6-foot sluice gates, (1) 30-foot stop log, (2) 30-foot stop logs, (13) 56-foot sector gates, (1) 230-foot sector gate, (1) 175-foot sector gate, (1) 125-foot sector gate, (1) 110-foot sector gate, (1) 30-foot sector gate, (1) 110-foot lock gate, (1) 30-foot roller gate, (4) 40-foot roller gates, (1) 56-foot barge gate, (1) 30-foot barge gate, and (4) pump stations.

Project Cost Estimate

	Estimated Cost
Planning/Engineering & Design	$996,800,000
Construction	$6,888,900,000
Operations & Maintenance	$396,200,000
Total	**$8,281,900,000**

Other Nearby Projects in the Master Plan

Scale of Influence
Local | Sub-basin | Basin | Regional

Project Location
Lafourche Parish; Terrebonne Parish

Project Duration
Planning, Engineering, and Design is estimated to take 3 years.
Construction is estimated to take 10 years.

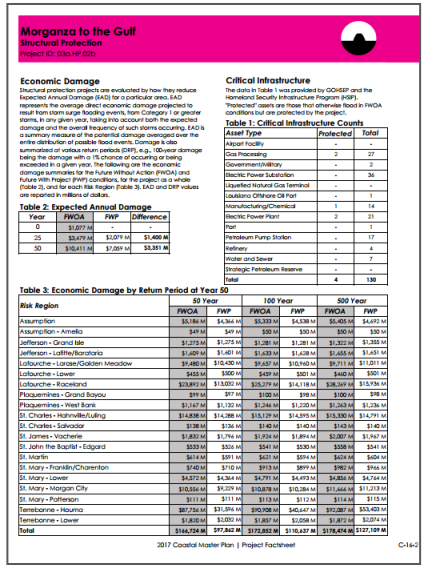
Other Project Area Statistics

Estimated Current Population	181,400
Percent of Population who are Low-to-Moderate Income	40%
Number of Severe Repetitive Loss Properties	1,712

U.S. Census (2010), U.S. Dept. of Energy Oak Ridge National Laboratory, Land Scan (2011)
American Community Survey (2006–2010)
Governor's Office of Homeland Security (2015)

2017 Coastal Master Plan | Implementation Period I

2017 Coastal Master Plan | Project Factsheet C-16-1



Morganza to the Gulf
Structural Protection
Project ID: 03a.HP.02b

Economic Damage
Structural protection projects are evaluated by how they reduce Expected Annual Damage (EAD) for a particular area. EAD represents the average direct economic damage projected to result from storm surge flooding events, from Category 1 or greater storms, in any given year, taking into account both the expected damage and the overall frequency of such storms occurring. EAD is a summary measure of the potential damage averaged over the entire distribution of possible flood events. Damage is also summarized at various return periods (DRP), e.g., 100-year damage being the damage with a 1% chance of occurring or being exceeded in a given year. The following are the economic damage summaries for the Future Without Action (FWOA) and Future With Project (FWP) conditions, for the project as a whole (Table 2), and for each Risk Region (Table 3). EAD and DRP values are reported in millions of dollars.

Table 2: Expected Annual Damage

Year	FWOA	FWP	Difference
0	$1,077 M	-	-
25	$3,479 M	$2,079 M	$1,400 M
50	$10,411 M	$7,059 M	$3,351 M

Critical Infrastructure
The data in Table 1 was provided by GOHSEP and the Homeland Security Infrastructure Program (HSIP). "Protected" assets are those that otherwise flood in FWOA conditions but are protected by the project.

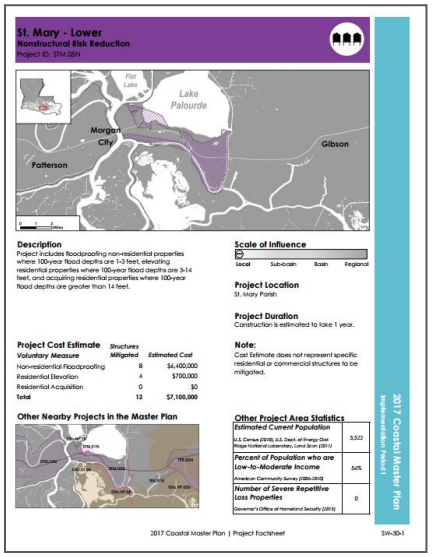
Table 1: Critical Infrastructure Counts

Asset Type	Protected	Total
Airport Facility	-	-
Gas Processing	2	27
Government/Military	-	2
Electric Power Substation	-	36
Liquefied Natural Gas Terminal	-	-
Louisiana Offshore Oil Port	-	1
Manufacturing/Chemical	1	14
Electric Power Plant	2	21
Port	-	1
Petroleum Pump Station	-	17
Refinery	-	4
Water and Sewer	-	7
Strategic Petroleum Reserve	-	-
Total	4	130

Table 3: Economic Damage by Return Period at Year 50

Risk Region	50 Year		100 Year		500 Year	
	FWOA	FWP	FWOA	FWP	FWOA	FWP
Assumption	$5,186 M	$4,364 M	$5,333 M	$4,538 M	$5,405 M	$4,692 M
Assumption - Amelia	$49 M	$49 M	$50 M	$50 M	$50 M	$50 M
Jefferson - Grand Isle	$1,275 M	$1,275 M	$1,281 M	$1,281 M	$1,322 M	$1,350 M
Jefferson - Lafitte/Barataria	$1,609 M	$1,601 M	$1,633 M	$1,628 M	$1,655 M	$1,651 M
Lafourche - Larose/Golden Meadow	$9,480 M	$10,400 M	$9,657 M	$10,960 M	$9,711 M	$11,011 M
Lafourche - Lower	$455 M	$500 M	$459 M	$501 M	$460 M	$501 M
Lafourche - Raceland	$13,892 M	$13,032 M	$25,279 M	$14,118 M	$28,269 M	$15,936 M
Plaquemines - Grand Bayou	$99 M	$97 M	$100 M	$98 M	$100 M	$98 M
Plaquemines - West Bank	$1,167 M	$1,132 M	$1,246 M	$1,220 M	$1,263 M	$1,236 M
St. Charles - Hahnville/Luling	$14,838 M	$14,388 M	$15,129 M	$14,595 M	$15,300 M	$14,791 M
St. Charles - Salvador	$138 M	$136 M	$140 M	$140 M	$143 M	$140 M
St. James - Vacherie	$1,832 M	$1,796 M	$1,924 M	$1,894 M	$2,007 M	$1,967 M
St. John the Baptist - Edgard	$533 M	$506 M	$541 M	$530 M	$558 M	$541 M
St. Martin	$614 M	$591 M	$621 M	$594 M	$624 M	$604 M
St. Mary - Franklin/Charenton	$740 M	$710 M	$913 M	$899 M	$982 M	$966 M
St. Mary - Lower	$4,572 M	$4,364 M	$4,791 M	$4,493 M	$4,856 M	$4,764 M
St. Mary - Morgan City	$10,556 M	$9,229 M	$10,878 M	$10,284 M	$11,666 M	$11,213 M
St. Mary - Patterson	$111 M	$111 M	$113 M	$112 M	$114 M	$113 M
Terrebonne - Houma	$87,756 M	$31,596 M	$90,908 M	$45,647 M	$92,287 M	$53,450 M
Terrebonne - Lower	$1,800 M	$2,032 M	$1,857 M	$2,058 M	$1,872 M	$2,074 M
Total	**$166,724 M**	**$97,862 M**	**$172,852 M**	**$110,637 M**	**$178,474 M**	**$127,109 M**

2017 Coastal Master Plan | Project Factsheet C-16-2



St. Mary - Lower
Nonstructural Risk Reduction
Project ID: STM.05N

Description
Project includes floodproofing non-residential properties where 100-year flood depths are 1–3 feet, elevating residential properties where 100-year flood depths are 3–14 feet, and acquiring residential properties where 100-year flood depths are greater than 14 feet.

Project Cost Estimate

Voluntary Measure	*Structures Mitigated*	*Estimated Cost*
Non-residential Floodproofing	8	$6,400,000
Residential Elevation	4	$700,000
Residential Acquisition	0	$0
Total	**12**	**$7,100,000**

Other Nearby Projects in the Master Plan

Scale of Influence
Local | Sub-basin | Basin | Regional

Project Location
St. Mary Parish

Project Duration
Construction is estimated to take 1 year.

Note:
Cost Estimate does not represent specific residential or commercial structures to be mitigated.

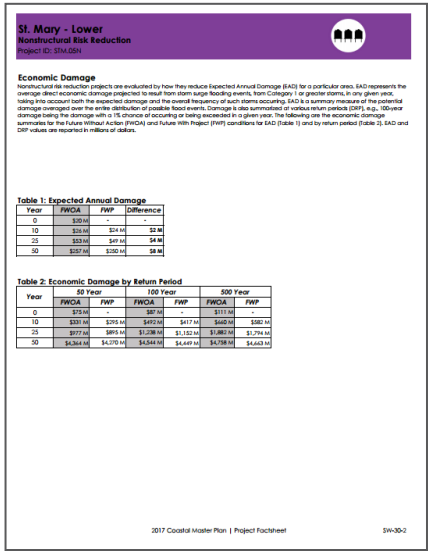
Other Project Area Statistics

Estimated Current Population	3,522
Percent of Population who are Low-to-Moderate Income	56%
Number of Severe Repetitive Loss Properties	0

U.S. Census (2010), U.S. Dept. of Energy Oak Ridge National Laboratory, Land Scan (2011)
American Community Survey (2006–2010)
Governor's Office of Homeland Security (2015)

2017 Coastal Master Plan | Implementation Period I

2017 Coastal Master Plan | Project Factsheet SW-30-1



St. Mary - Lower
Nonstructural Risk Reduction
Project ID: STM.05N

Economic Damage
Nonstructural risk reduction projects are evaluated by how they reduce Expected Annual Damage (EAD) for a particular area. EAD represents the average direct economic damage projected to result from storm surge flooding events, from Category 1 or greater storms, in any given year, taking into account both the expected damage and the overall frequency of such storms occurring. EAD is a summary measure of the potential damage averaged over the entire distribution of possible flood events. Damage is also summarized at various return periods (DRP), e.g., 100-year damage being the damage with a 1% chance of occurring or being exceeded in a given year. The following are the economic damage summaries for the Future Without Action (FWOA) and Future With Project (FWP) conditions for EAD (Table 1) and by return period (Table 2). EAD and DRP values are reported in millions of dollars.

Table 1: Expected Annual Damage

Year	FWOA	FWP	Difference
0	$20 M	-	-
10	$26 M	$24 M	$2 M
25	$53 M	$49 M	$4 M
50	$257 M	$250 M	$8 M

Table 2: Economic Damage by Return Period

Year	50 Year		100 Year		500 Year	
	FWOA	FWP	FWOA	FWP	FWOA	FWP
0	$75 M	-	$87 M	-	$115 M	-
10	$331 M	$295 M	$492 M	$417 M	$660 M	$582 M
25	$977 M	$895 M	$1,238 M	$1,152 M	$1,882 M	$1,794 M
50	$4,364 M	$4,170 M	$4,544 M	$4,449 M	$4,758 M	$4,663 M

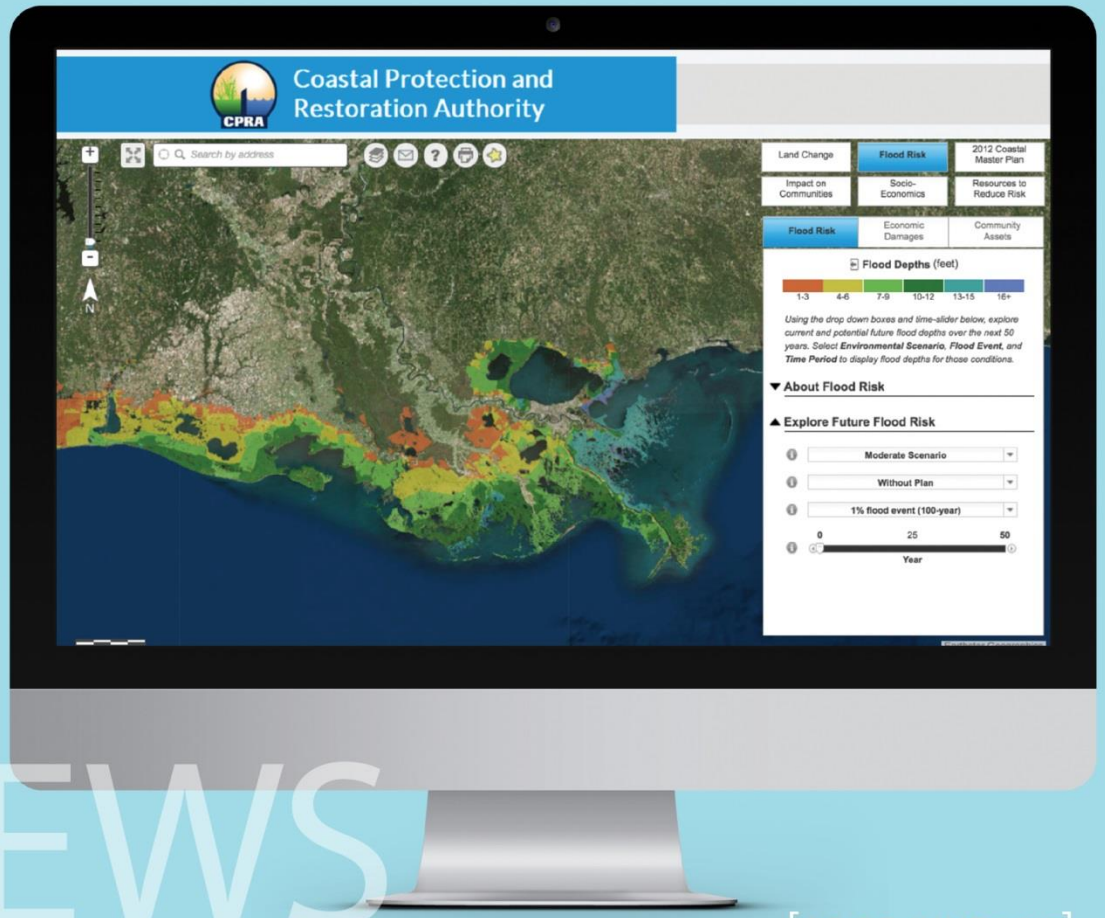
2017 Coastal Master Plan | Project Factsheet SW-30-2

MASTER PLAN DATA VIEWER

LEARN MORE ABOUT HOW FLOOD RISK IMPACTS COMMUNITIES TODAY AND IN THE FUTURE, AS WELL AS HOW TO MAKE YOUR COMMUNITY SAFER AND MORE RESILIENT.

VISIT THE MASTER PLAN DATA VIEWER AT:

CIMS.COASTAL.LOUISIANA.GOV/MASTERPLAN



9800 VIEWS

[AS OF JUNE 2017]

QUESTIONS?

coastal.la.gov