COASTAL TX PROTECTION AND RESTORATION FEASIBILITY STUDY

Stakeholders Forum

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February 27, 2018

"The views, opinions and findings contained in this report are those of the authors(s) and should not be construed as an official Department of the Army position, policy or decision, unless so designated by other official documentation."

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STUDY AUTHORITY

Section 4091, Water Resources Development Act (WRDA) of 2007
Public Law (P.L.) 110-114

Coastal Texas Ecosystem Protection and Restoration, Texas.

(a) In General.—The Secretary shall develop a comprehensive plan to determine the feasibility of carrying out projects for ***flood damage reduction, hurricane and storm damage reduction, and ecosystem restoration*** *in the coastal areas of the State of Texas.*

(b) Scope.—The comprehensive plan shall provide for the ***protection, conservation, and restoration*** *of* ***wetlands, barrier islands, shorelines, and related lands and features that protect critical resources****, habitat, and infrastructure from the impacts of coastal storms, hurricanes, erosion, and subsidence.*

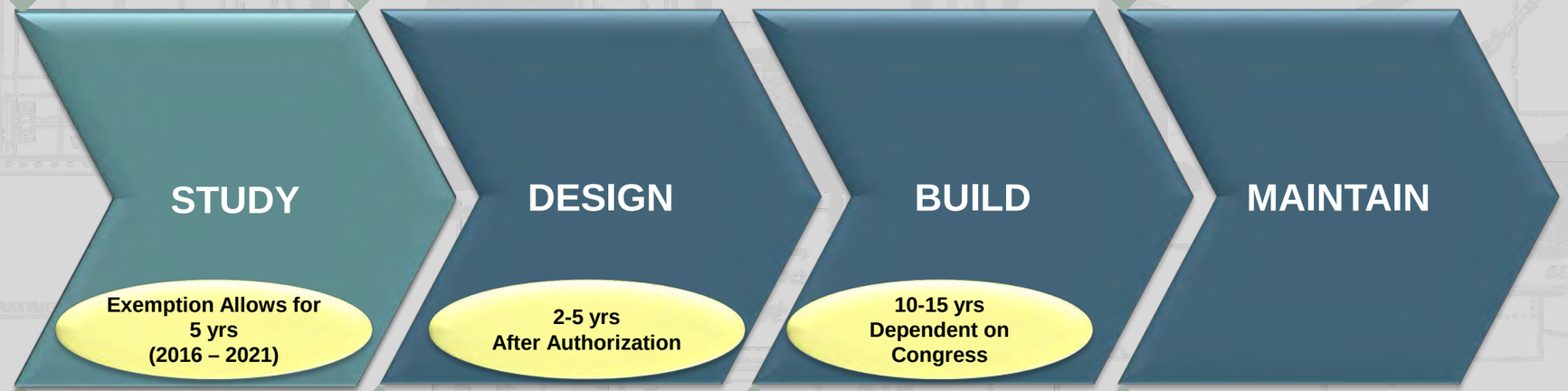
(c) Definition.—For purposes of this section, the term "coastal areas in the State of Texas" means the coastal areas of the State of Texas from the ***Sabine River on the east to the Rio Grande River*** *on the west and includes tidal waters, barrier islands, marshes, coastal wetlands, rivers and streams, and adjacent areas."*

PROJECT PROGRESSION & MAJOR MILESTONES

Congressional Authorization for the Study by the U.S. Army Corps of Engineers (2016)

Study Complete Request Congressional Authorization for Project(s) (2021)

Local Sponsors Maintain the Projects



Identify Cost-Share Sponsors

Congressional Appropriations for Authorized Projects

Future Dates Dependent on Congressional Authorization **AND** Congressional Appropriations

STUDY PROCESS

Identify Problems & Opportunities

10% Designs, Assess Environmental Consequences Id Tentatively Selected Plan

Complete Final Analysis (Eng, Econ & Enviro)

ID Recommended Plan

SCOPING

ALTERNATIVES FORMULATION

DRAFT REPORT

RECOMMEND PLAN

FINAL REPORT

Alternative Measures Milestone (AMM) Jun 2016

Tentatively Selected Plan (TSP) May 2018

Agency Decision Milestone (ADM) Oct 2018

Chief's Report Feb 2021

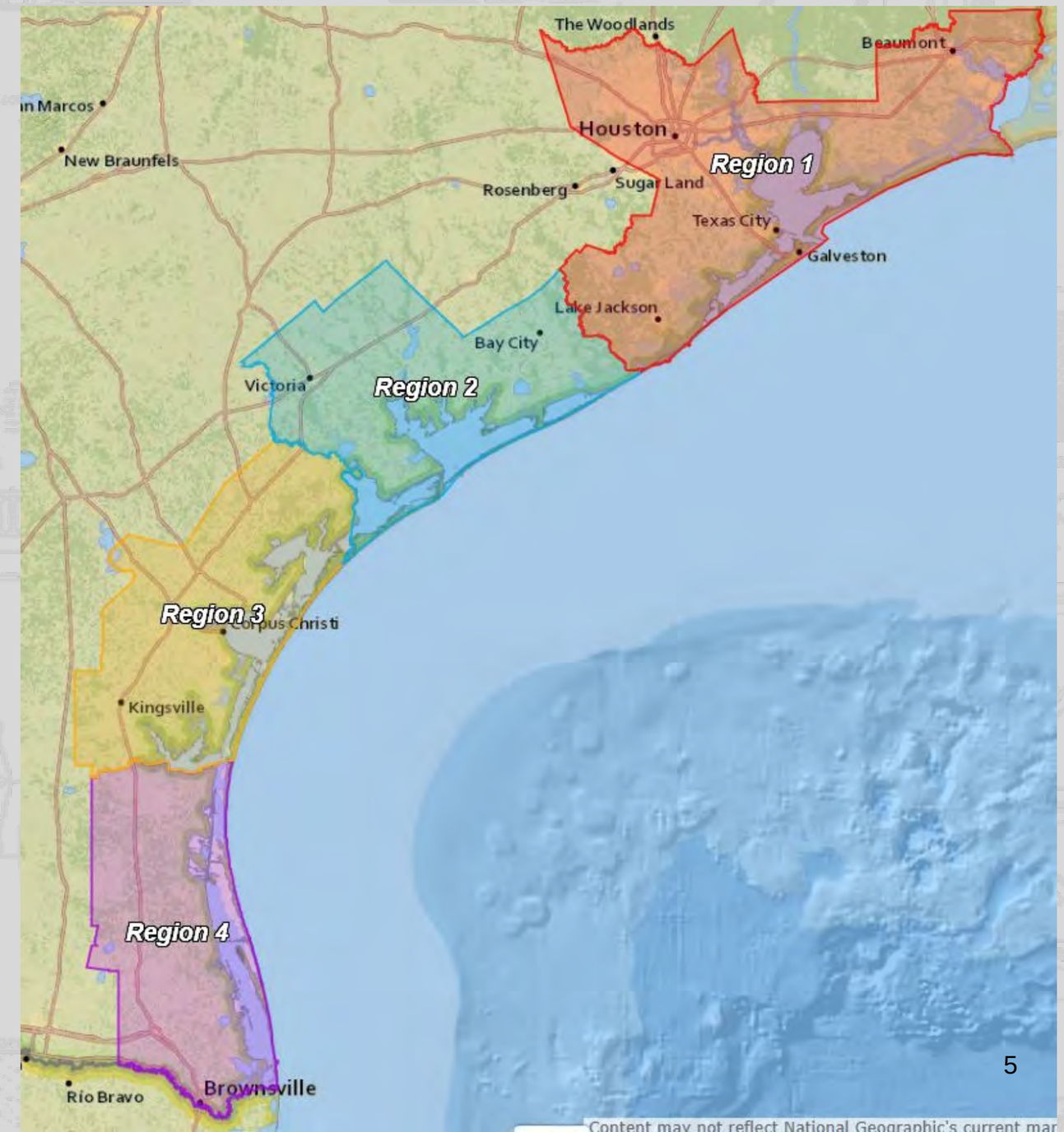
Get Public Input

Public Review & Comment

Provide Recommendation to Congress

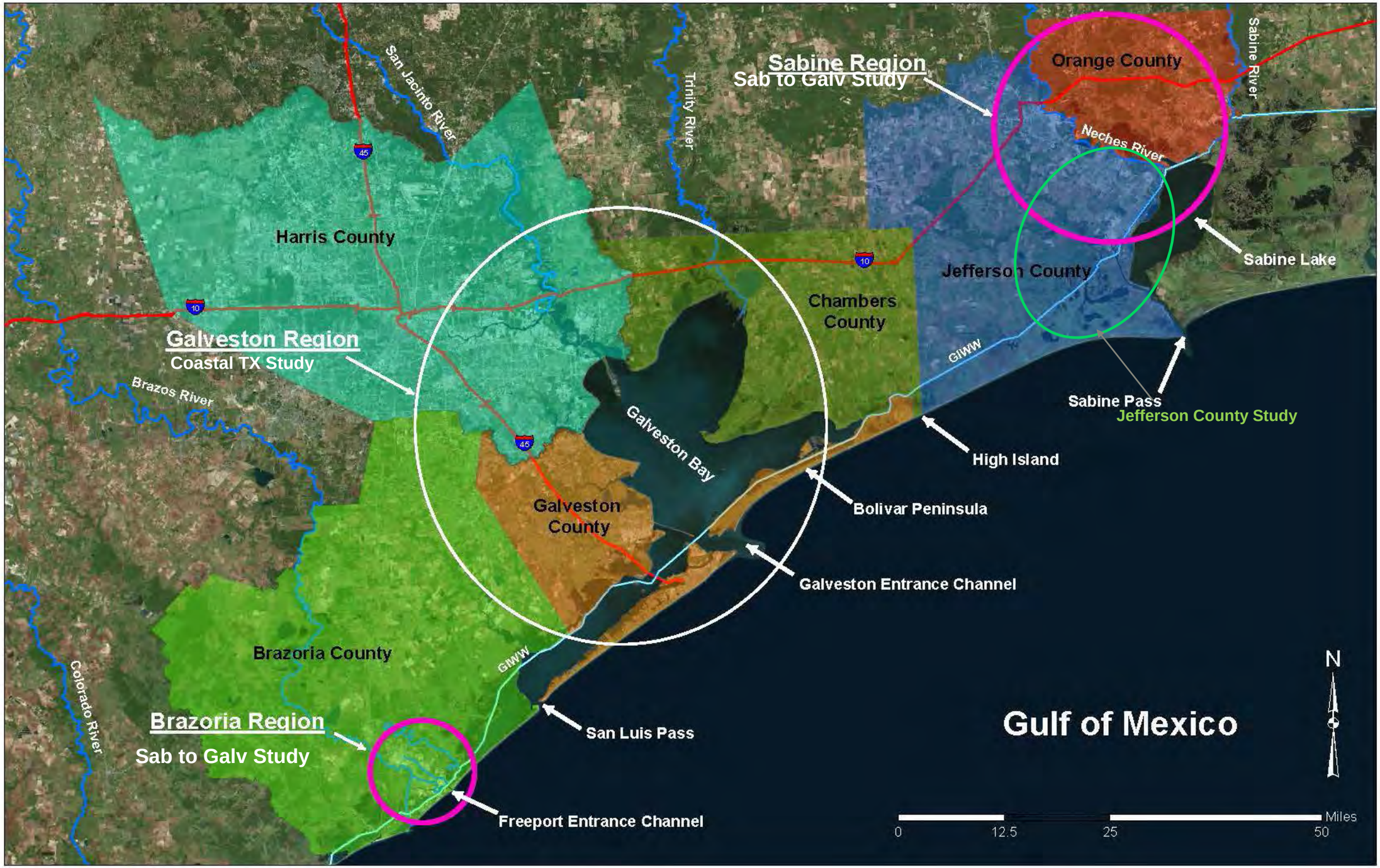
Public Input is critical for understanding needs/opportunities & reaching and implementable plan for authorization

STUDY AREA



- **Broad area of possible effects**
- **4 unique areas identified under Recon**
- **9 Texas Congressional Districts**
- **U.S. Senators Cornyn and Cruz (TX)**

OTHER PROJECTS IN THE AREA



STAKEHOLDERS & COLLABORATORS

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Maximizing Capital

- Organizational Change
- Strategic Partnerships
- Civil Works Transformation / Process Improvement

Communication

Transparency

Stakeholder Community

CBP & ICE

Port of Texas City

Port of Corpus Christi

Port of Harlingen

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GOALS & OBJECTIVES

Goals	Objectives	Key
COASTAL STORM DAMAGE RISK REDUCTION Promote a sustainable economy by reducing the risk of storm damage to residential structures, industries and businesses critical to the nation's economy.	**Reduce economic damage** from coastal storm surge to business, residents and infrastructure along coastal Texas;	Economic Damage
	Reduce risk to human life from storm surge impacts along coastal Texas;	Life Safety
	Enhance energy security and reduce economic impacts of petrochemical supply-related interruption due to storm surge impacts;	Industrial Damage
	Reduce risks to critical infrastructure (e.g., medical centers, ship channels, schools, transportation, etc.) from storm surge impact;	Critical Infrastructure
	Manage regional sediment so it contributes to storm surge attenuation where feasible.	Sediment Management (CSRM)
	Increase the resilience existing HFPS from sea level rise and storm surge impacts.	Existing Systems
	Enhance and restore coastal geomorphology that contributes to storm surge attenuation where feasible.	Geomorphic Landforms
ECOSYSTEM RESTORATION Promote a sustainable coastal ecosystem by minimizing future land loss, enhancing wetland productivity, and providing and sustaining diverse fish and wildlife habitats.	**Restore** size and quality of fish and wildlife **habitats** such as coastal wetlands, forested wetlands, rookery, oyster reefs, and beaches and dunes;	Restore Size and Quality
	Improve hydrologic connectivity into sensitive estuarine systems;	Hydrologic Connectivity
	Reduce erosion to barrier island, mainland, interior bay and channel shorelines;	Reduce Erosion
	Create, restore and nourish oyster reefs to benefit coastal and marine resources;	Oyster Reefs
	Manage regional sediment so it contributes to improving and sustaining diverse fish	Sediment

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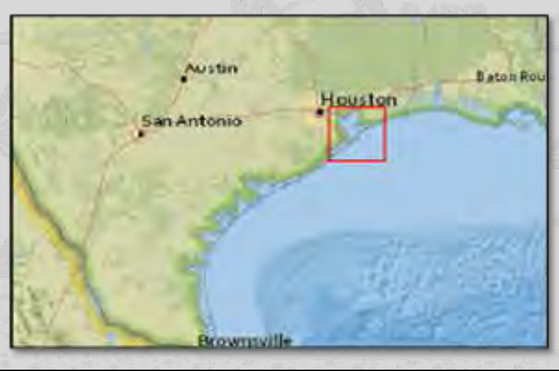
PLAN A: COASTAL BARRIER/NONSTRUCTURAL SYSTEM

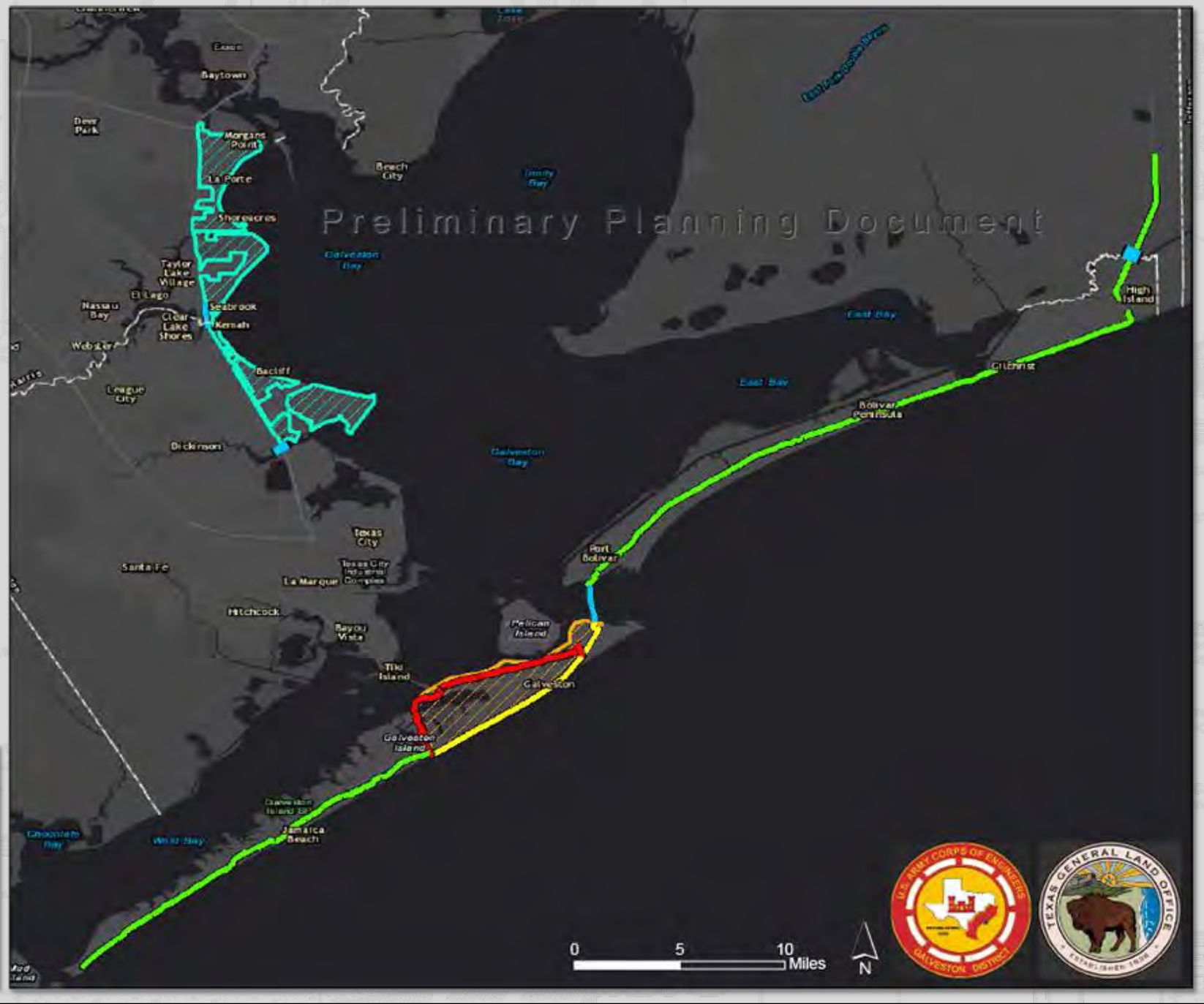
Coastal Texas Protection and Restoration Feasibility Study

Alternative A

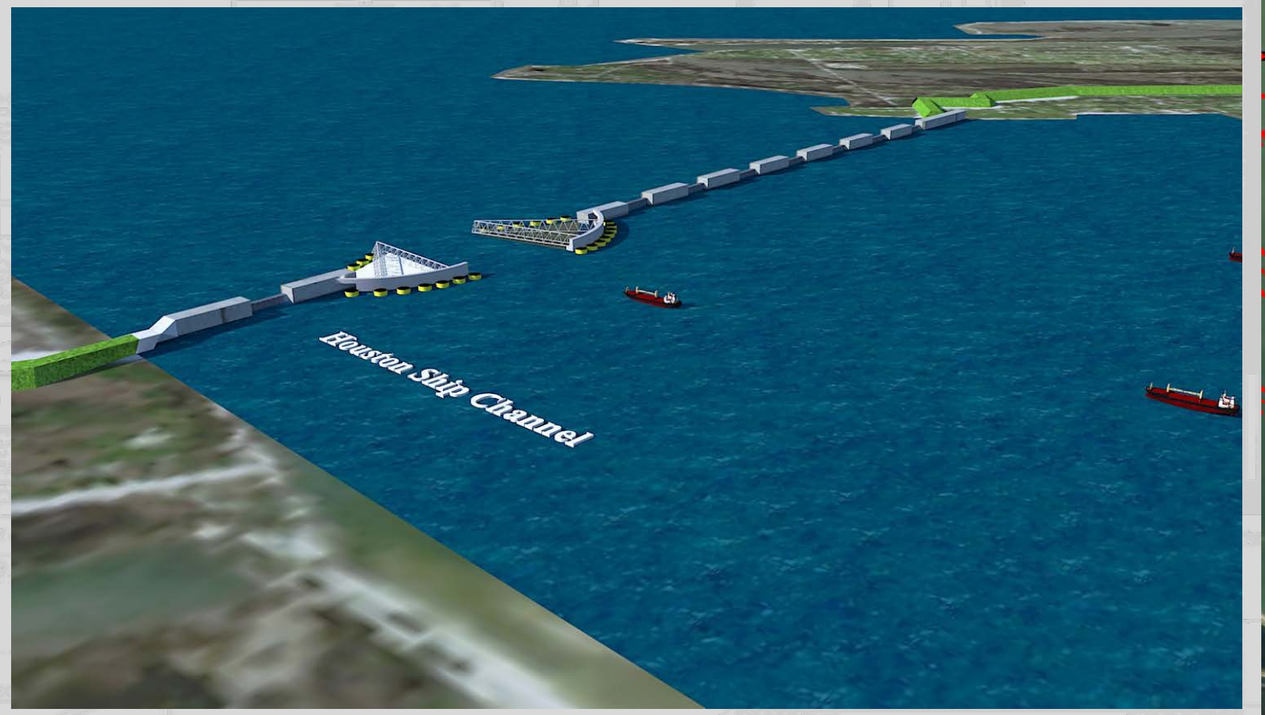
- Navigation and Environmental Gates
- Levee/Floodwall
- Galveston Ring Levee *
- Galveston Seawall Improvements
- Galveston Island * Nonstructural Improvements
- Nonstructural Improvements

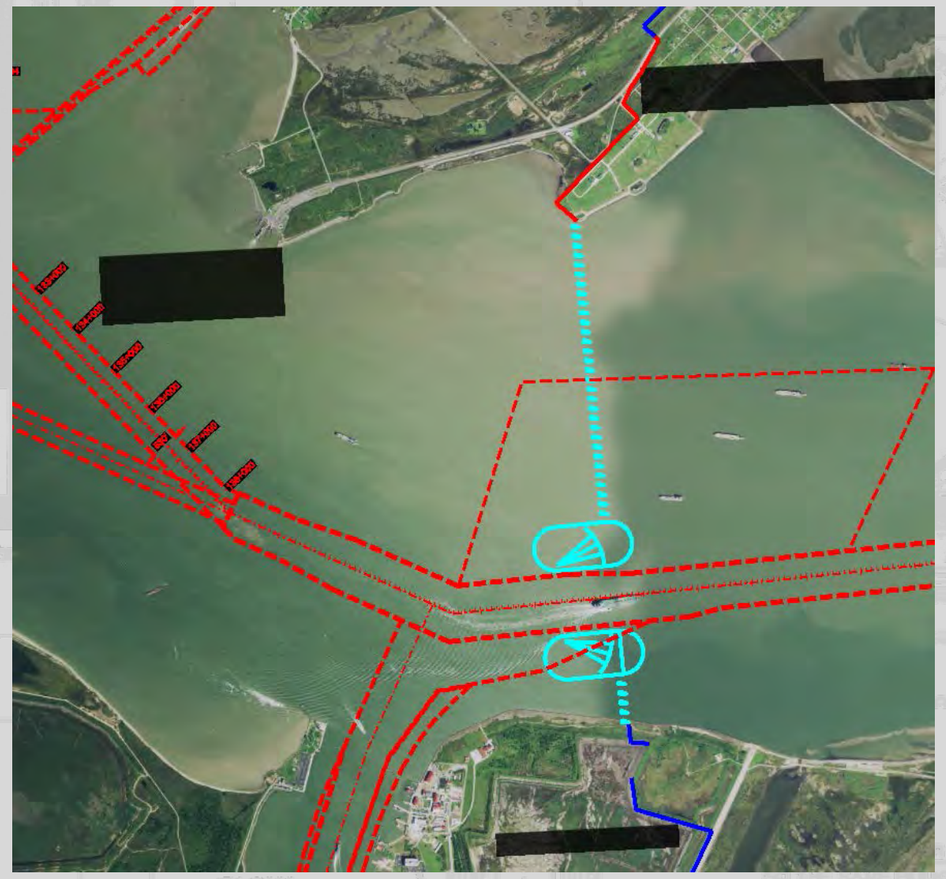
* One or both of these features may be selected.



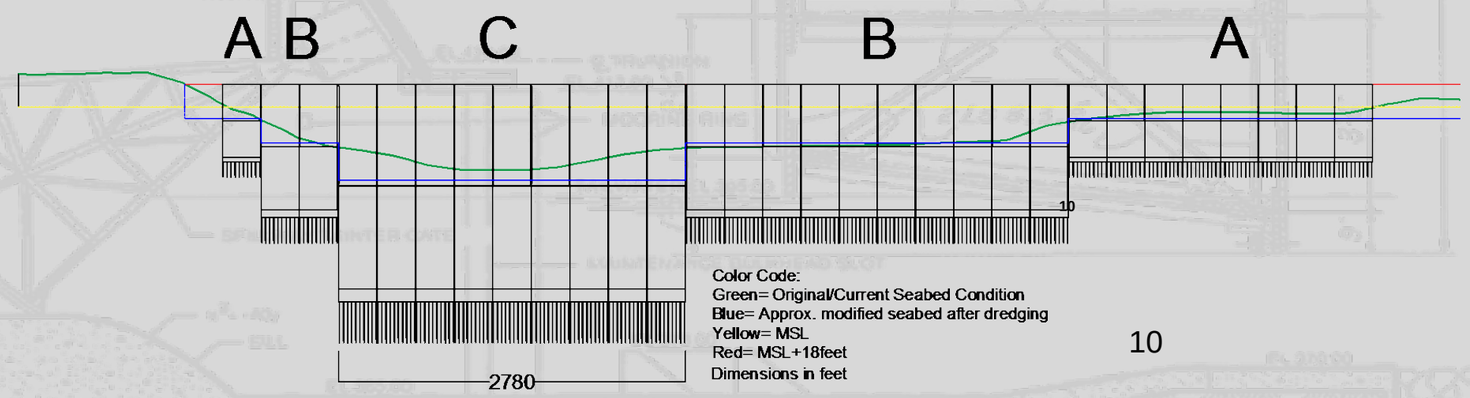


PLAN A: PRELIMINARY GATE DESIGNS

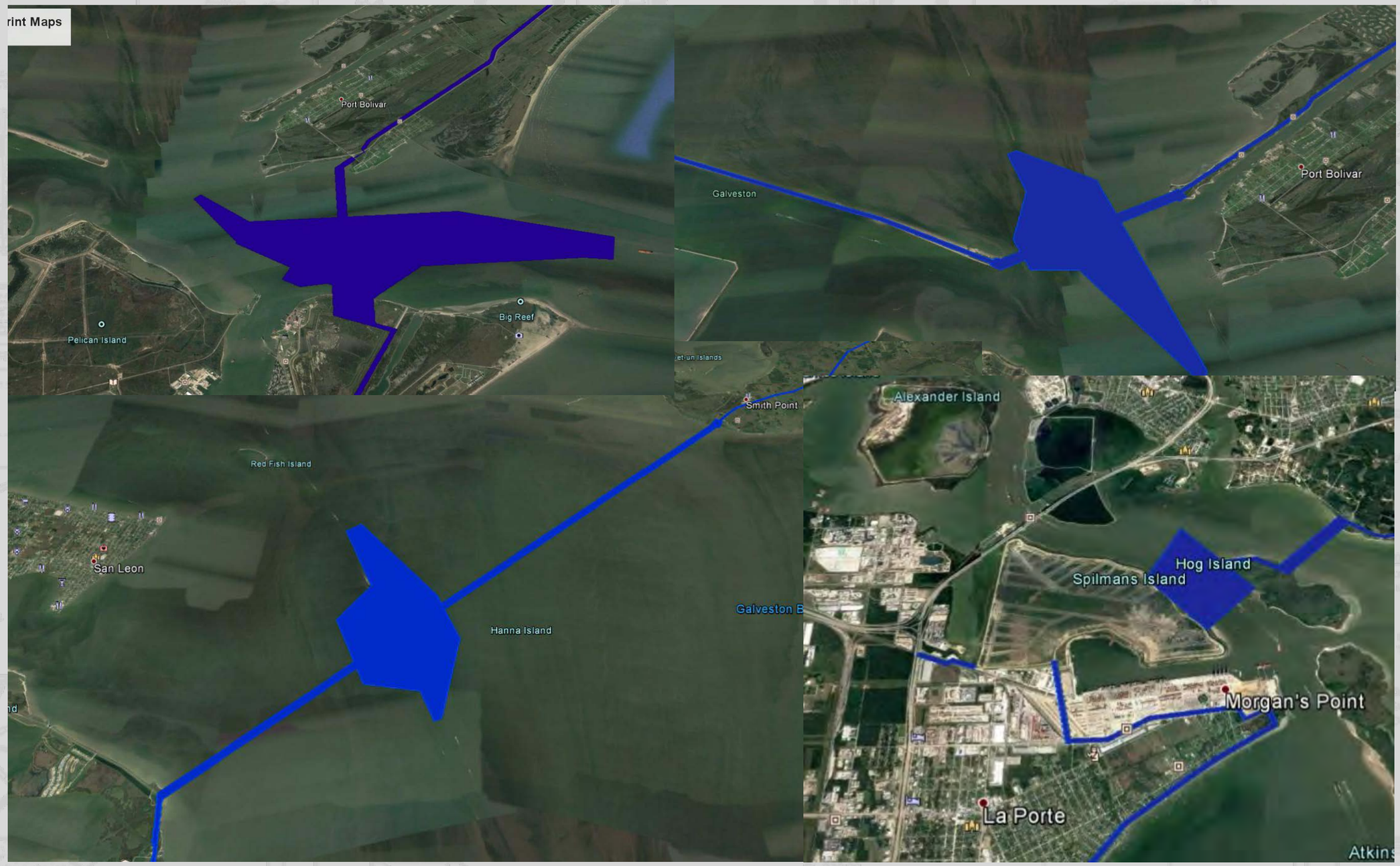




Lift Gates or Rising Gates



PLAN A: CONSTRUCTION FOOTPRINTS (DREDGING)



PLAN B: MODIFIED COASTAL BARRIER /NONSTRUCTURAL SYSTEM

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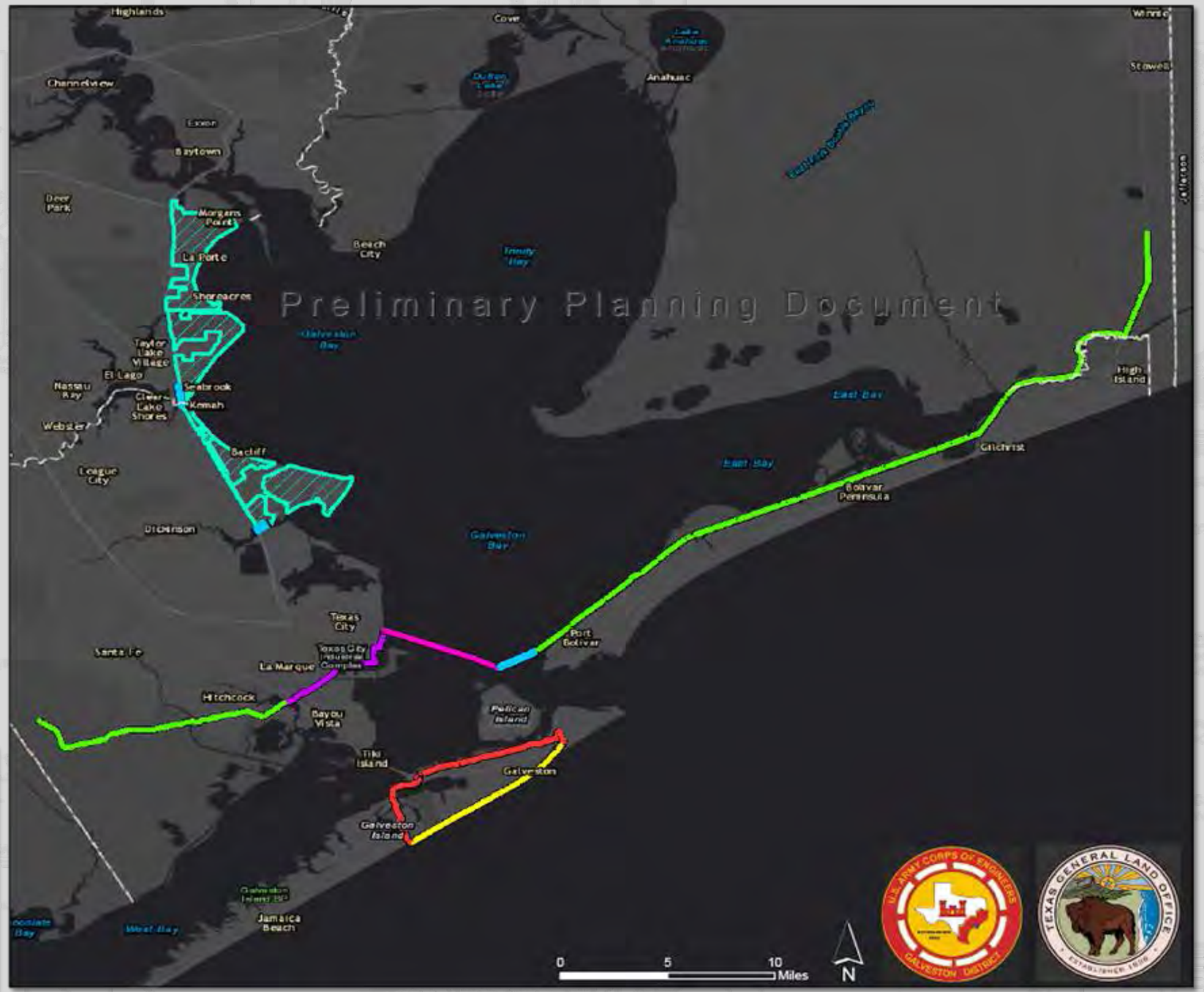
Coastal Texas Protection and Restoration Feasibility Study

Alternative B

- Navigation and Environmental Gates
- Levee/Floodwall
- Galveston Ring Levee
- Galveston Seawall Improvements
- Texas City Dike Improvements
- Texas City Hurricane Flood Protection Levee Improvements
- Nonstructural Improvements



PLAN C: MID BAY COASTAL BARRIER SYSTEM

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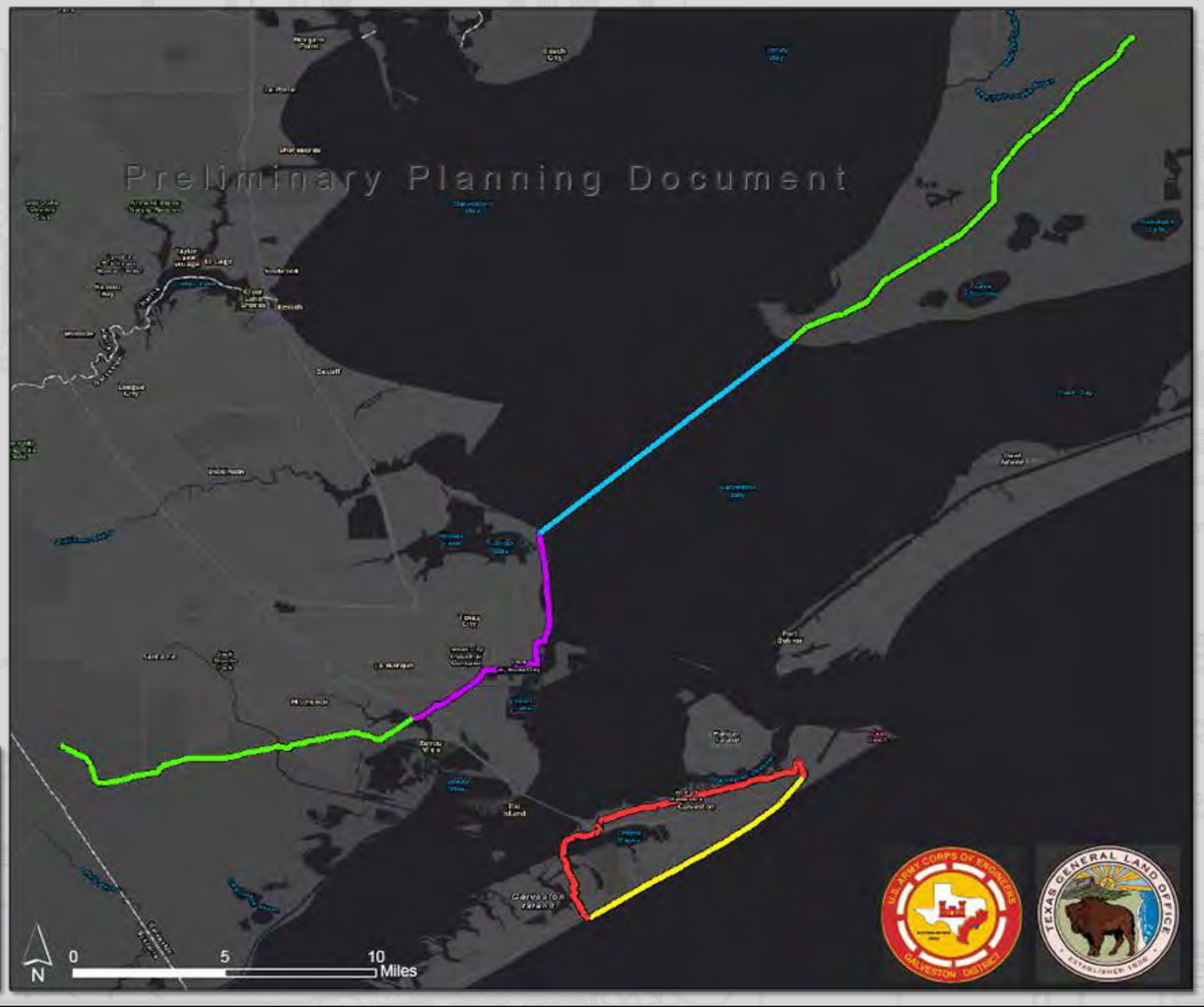
Coastal Texas Protection and Restoration Feasibility Study

Alternative C

- Navigation and Environmental Gates
- Levee/Floodwall
- Galveston Ring Levee
- Galveston Seawall Improvements
- Texas City Hurricane Flood Protection Levee Improvements



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PLAN D1: UPPER BAY BARRIER/NONSTRUCTURAL

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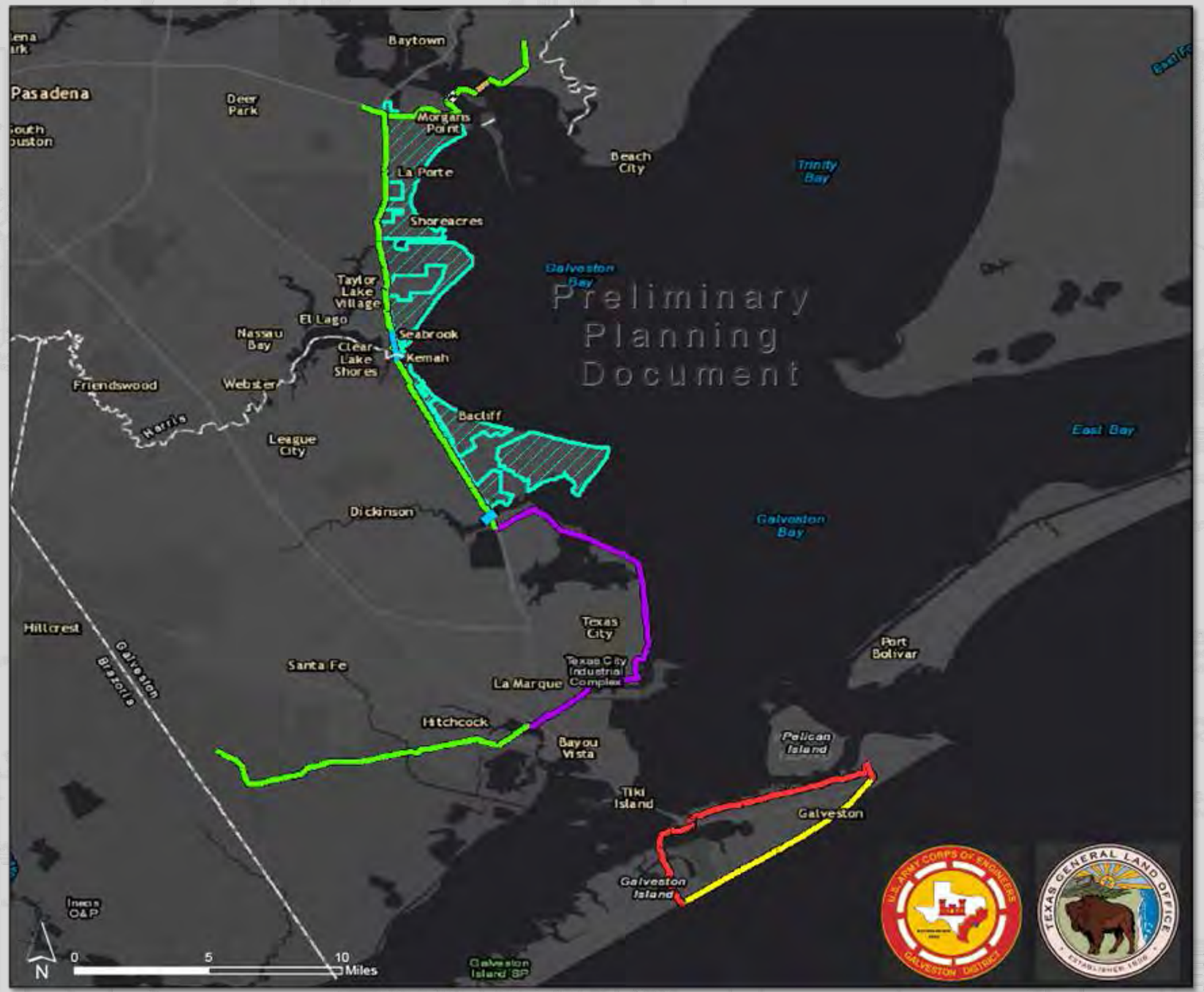
Coastal Texas Protection and Restoration Feasibility Study

Alternative D1

- Navigation and Environmental Gates
- Levee/Floodwall
- Galveston Ring Levee
- Galveston Seawall Improvements
- Texas City Hurricane Flood Protection Levee Improvements
- Navigation Gate
- Environmental Gate
- Nonstructural Improvements



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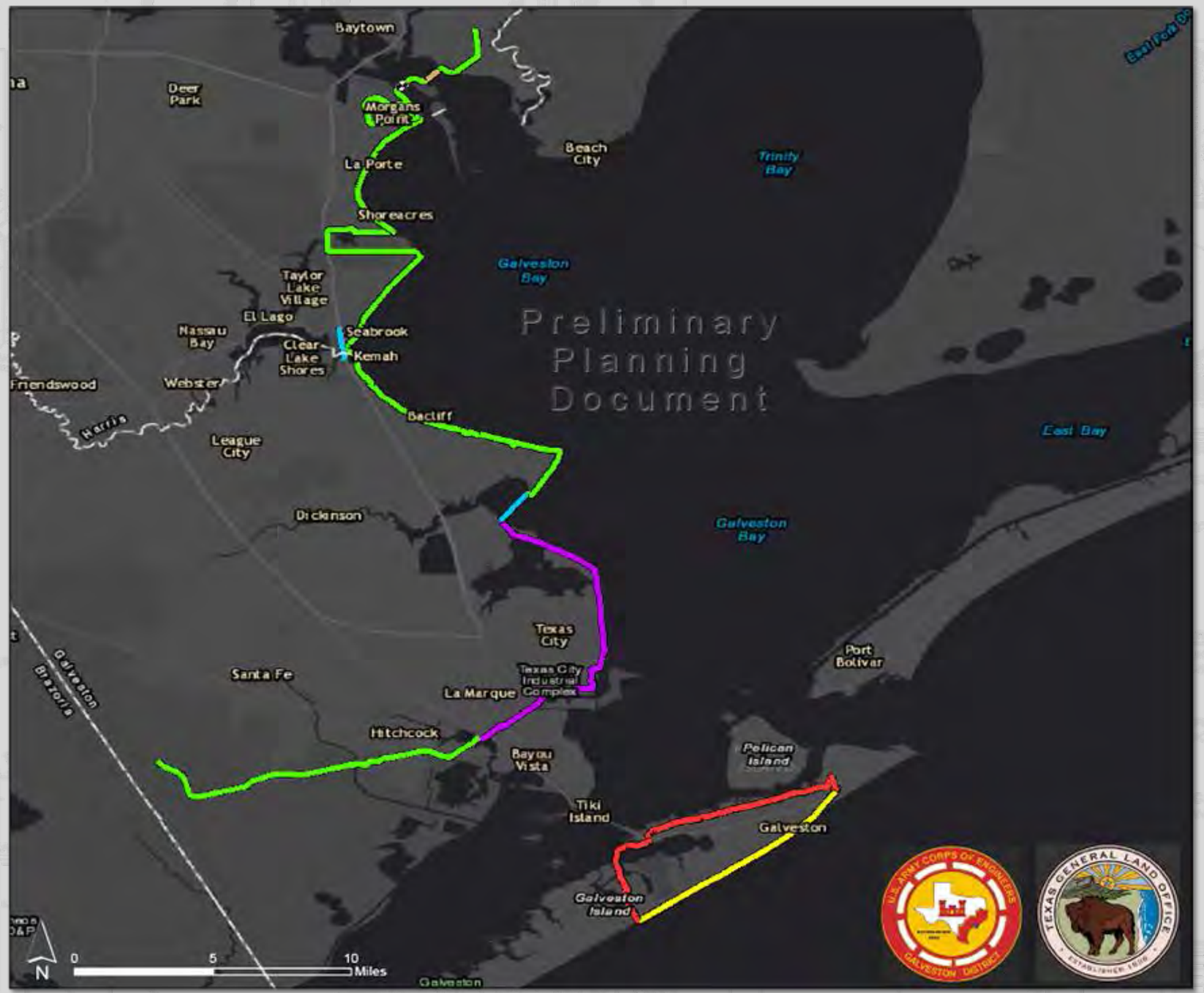
PLAN D2 – UPPER BAY BARRIER BAY RIM

Coastal Texas Protection and Restoration Feasibility Study

Alternative D2

- Navigation and Environmental Gates
- Levee/Floodwall
- Galveston Ring Levee
- Galveston Seawall Improvements
- Texas City Hurricane Flood Protection Levee Improvements
- Navigation Gate
- Environmental Gate



ECOSYSTEM RESTORATION GOALS & OBJECTIVES

Goals:

1. Promote a **resilient and sustainable** coastal ecosystem by **reducing future land loss and restoring and enhancing coastal wetlands** in order to achieve and sustain a coastal ecosystem that can support and protect the environment, economy, and culture of coastal Texas.
2. Maintain or establish **natural landscape features and hydrologic processes** that are critical to sustainable ecosystem structure and function and that provides diverse fish and wildlife habitats.

Objectives:

- Shoreline Protection
- Hydrologic Connectivity
- Barrier Beach, Dune and Marsh Restoration
- Oyster Reef Restoration
- Estuarine Bay System Restoration
- Migratory Bird Habitat Restoration
- Bird Island Restoration
- Threatened and Endangered Species

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ECOSYSTEM RESTORATION PLANS

Alt 1: Coastwide All-Inclusive Restoration Alternative

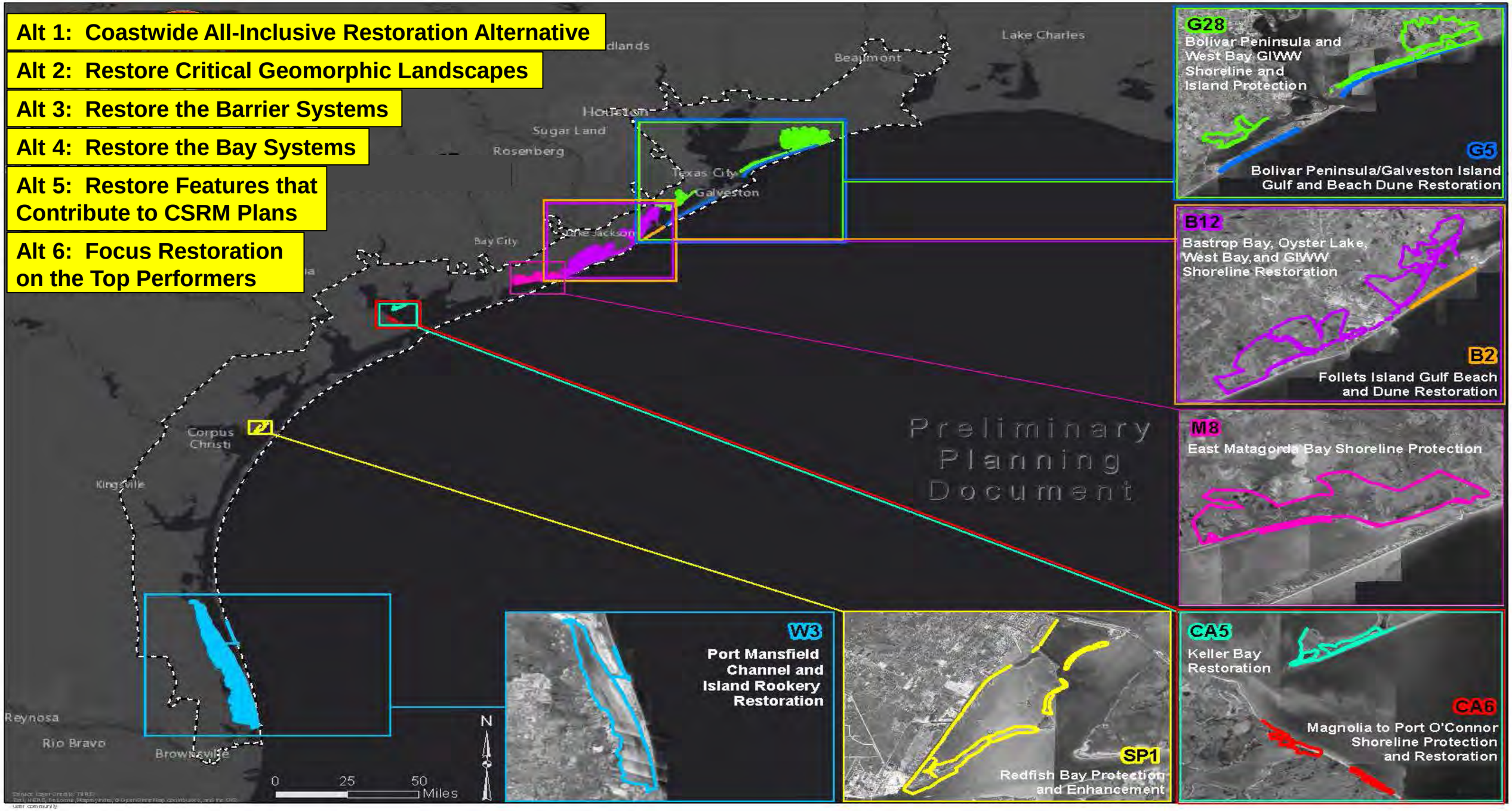
Alt 2: Restore Critical Geomorphic Landscapes

Alt 3: Restore the Barrier Systems

Alt 4: Restore the Bay Systems

Alt 5: Restore Features that Contribute to CSRM Plans

Alt 6: Focus Restoration on the Top Performers

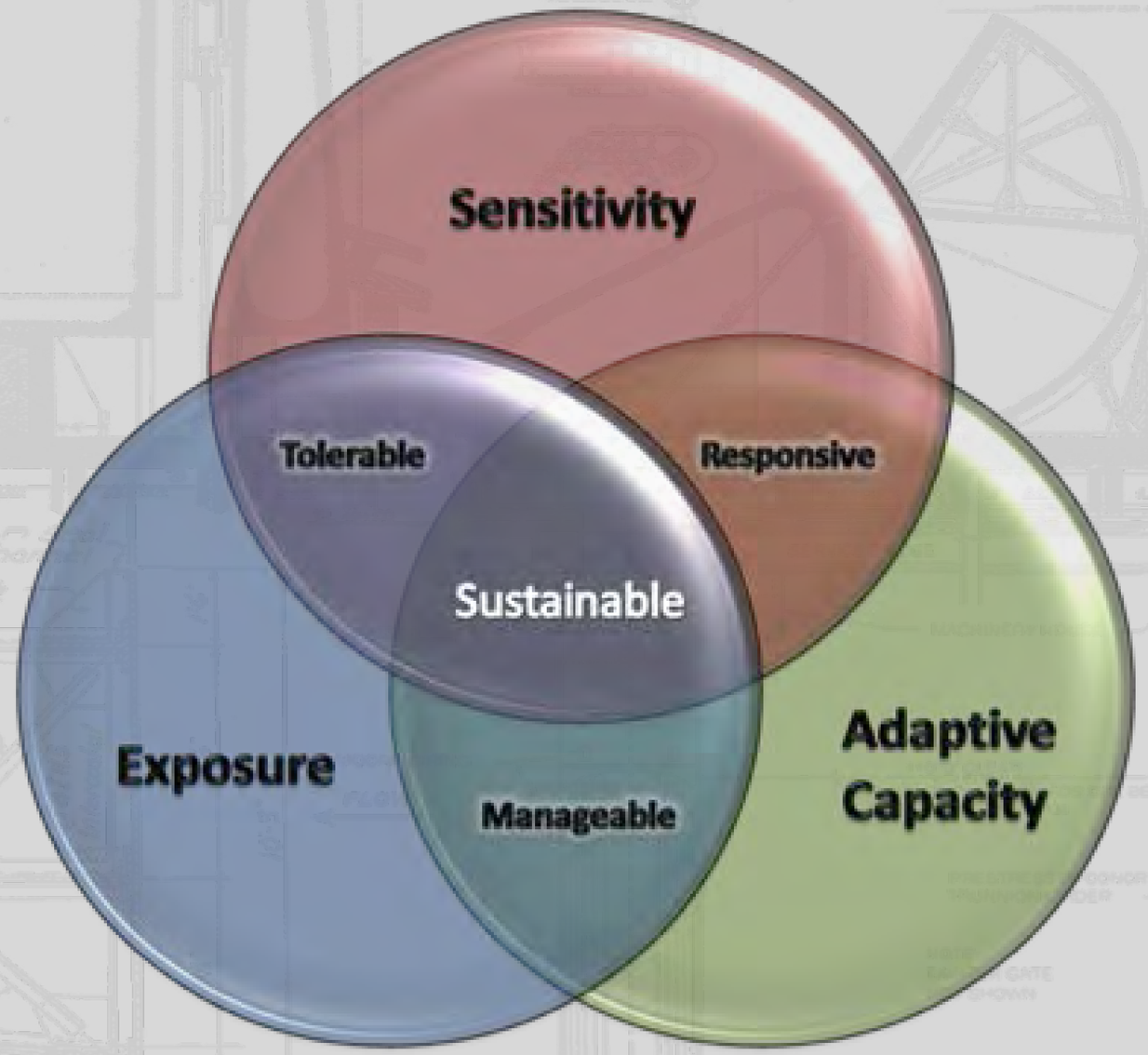


PLAN EVALUATIONS

- **Selection Criteria**
  - Cost Effective
  - Environmentally Acceptable
  - Resilient
    - Prepare
    - Resist
    - Recover
    - Adapt
  - Sustainable
  - Socially Beneficial
  - Synergistic

- **Storm Modeling**

- **Habitat Modeling**



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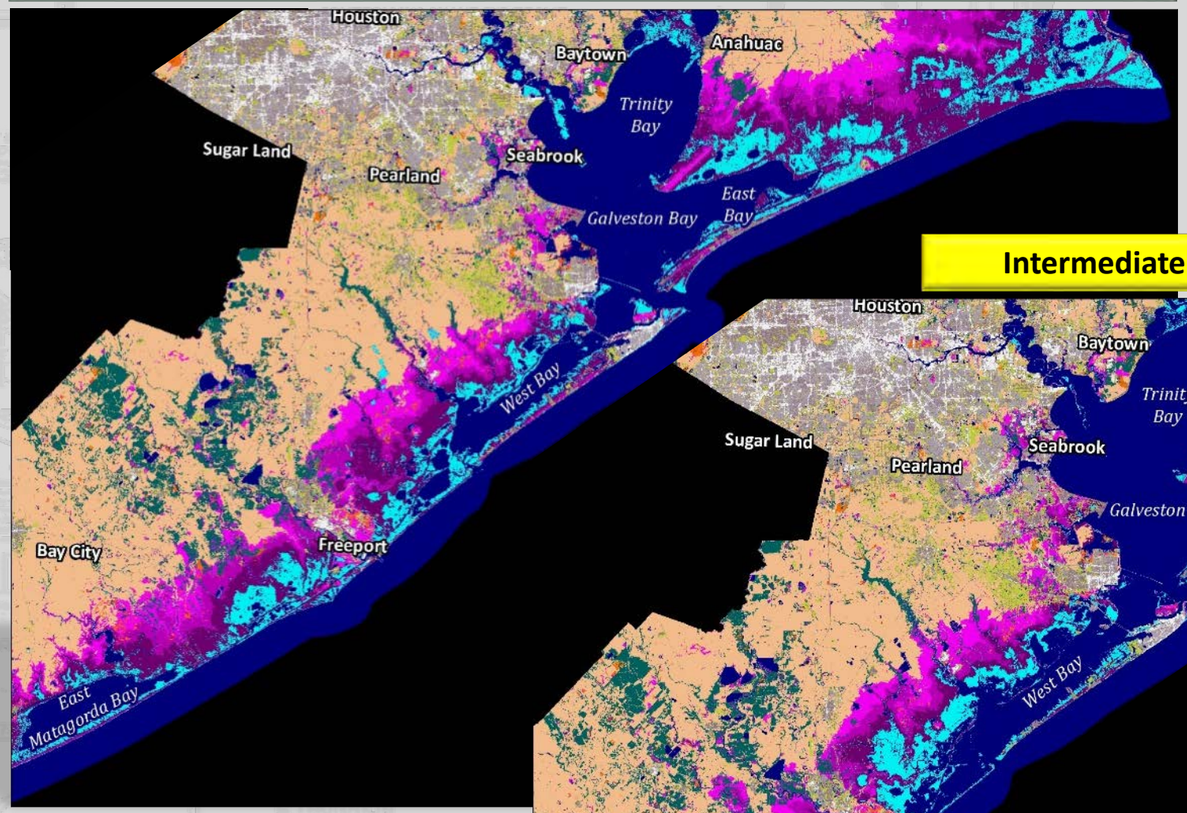
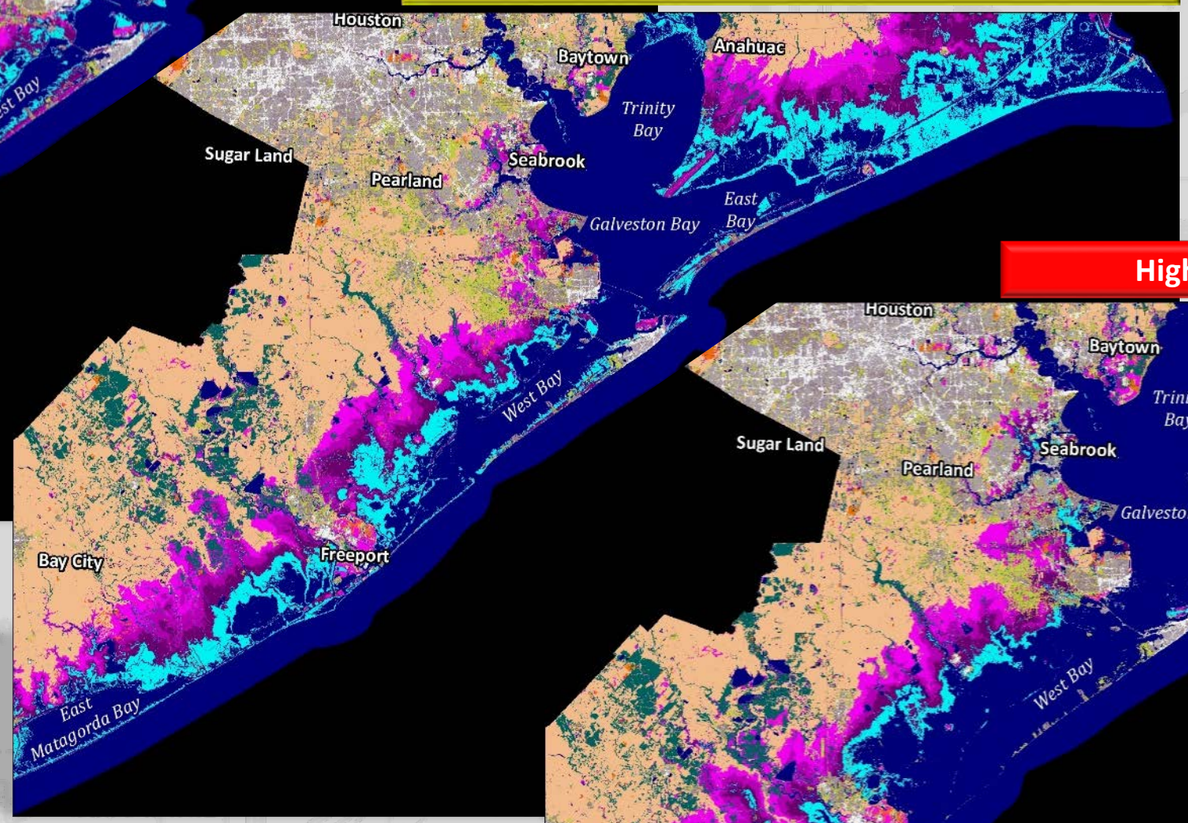
TEXAS UPPER COAST

RANGE OF POTENTIAL RELATIVE SEA LEVEL CHANGE AT 2085

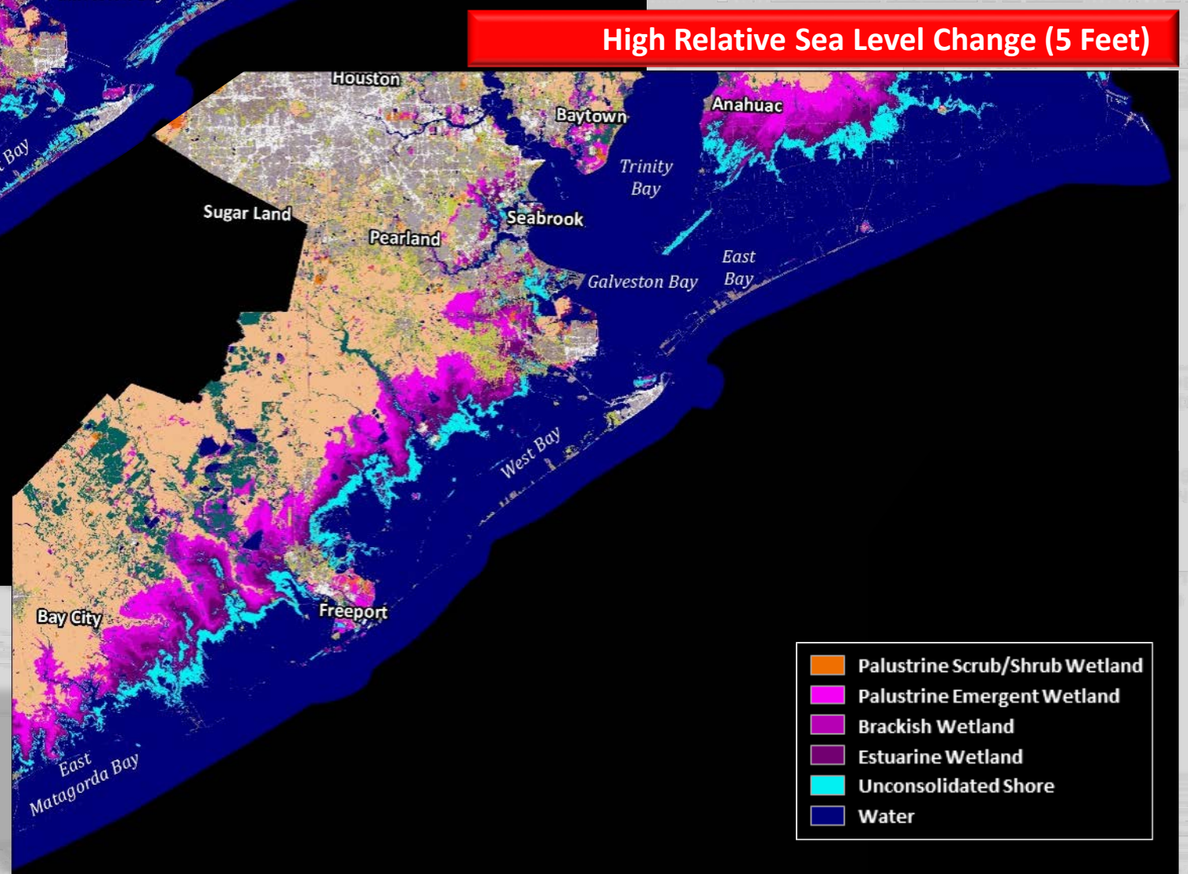
Low Relative Sea Level Change (2 Feet)



Intermediate Relative Sea Level Change (3 Feet)



High Relative Sea Level Change (5 Feet)



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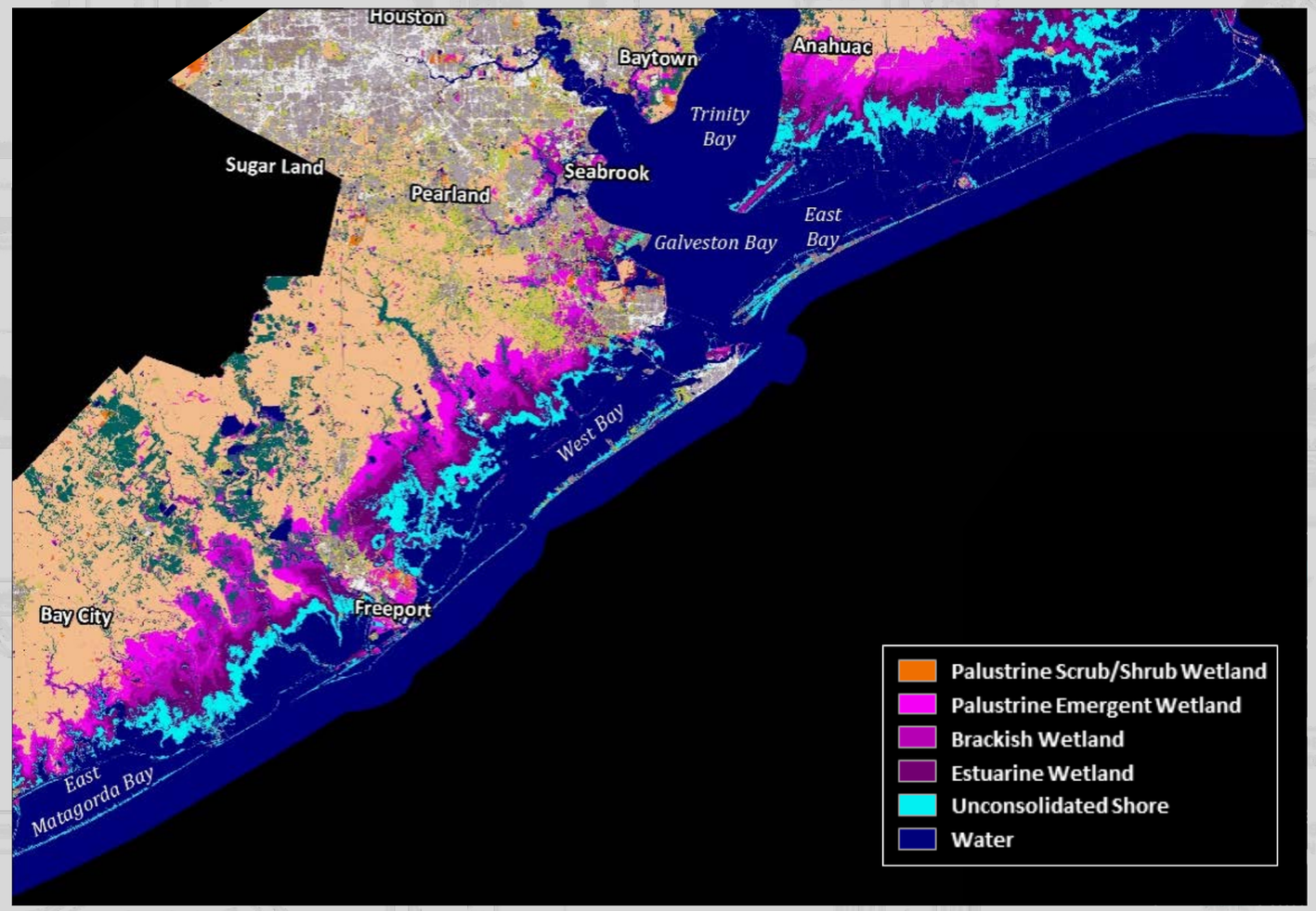
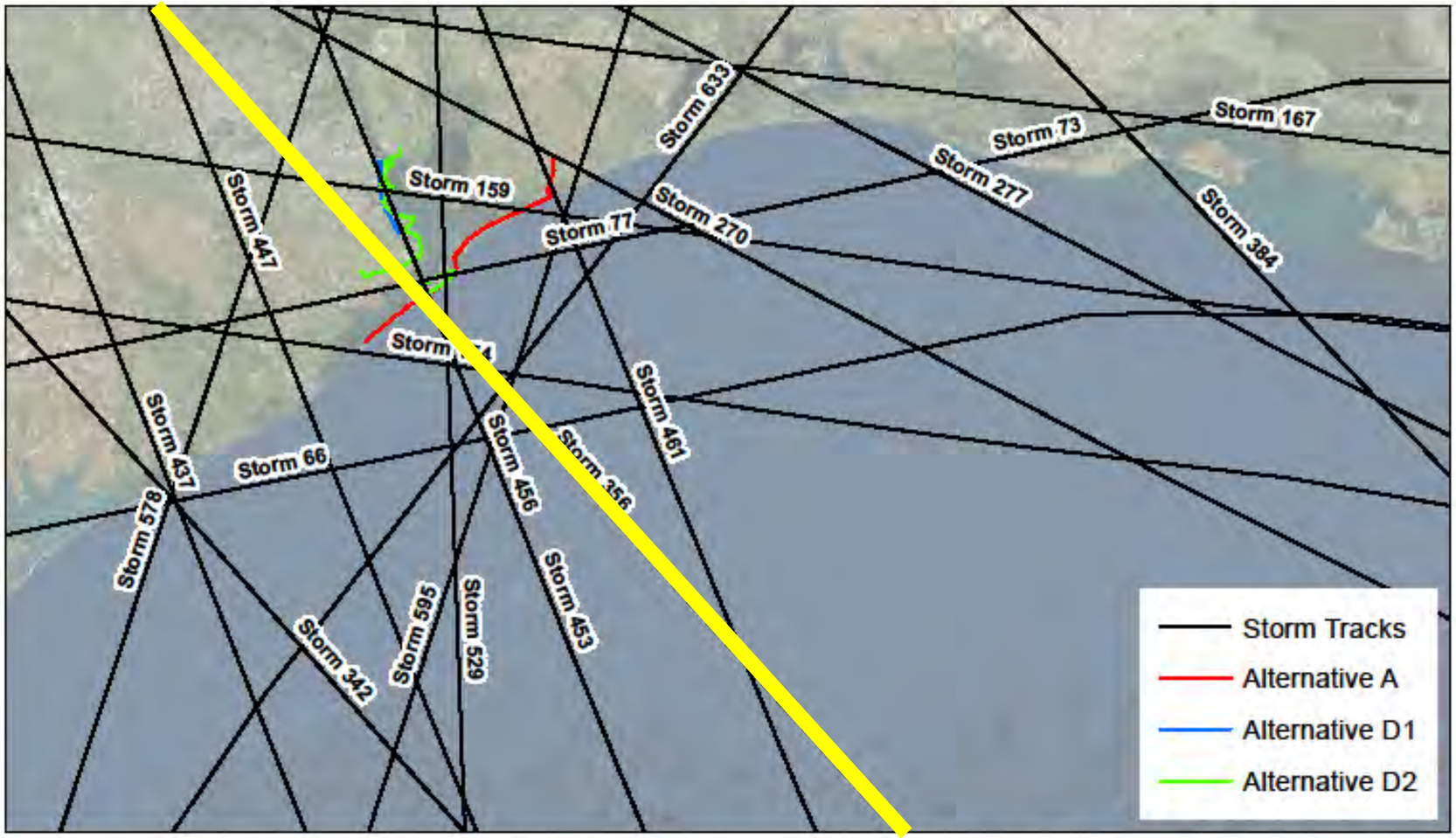
TEXAS UPPER COAST

BREAK POINT IN SEA LEVEL CHANGE (ABOUT 3.5 FEET)

~ 2075 (High)
~ 2130 (Intermediate)
~ 2300 (Low)

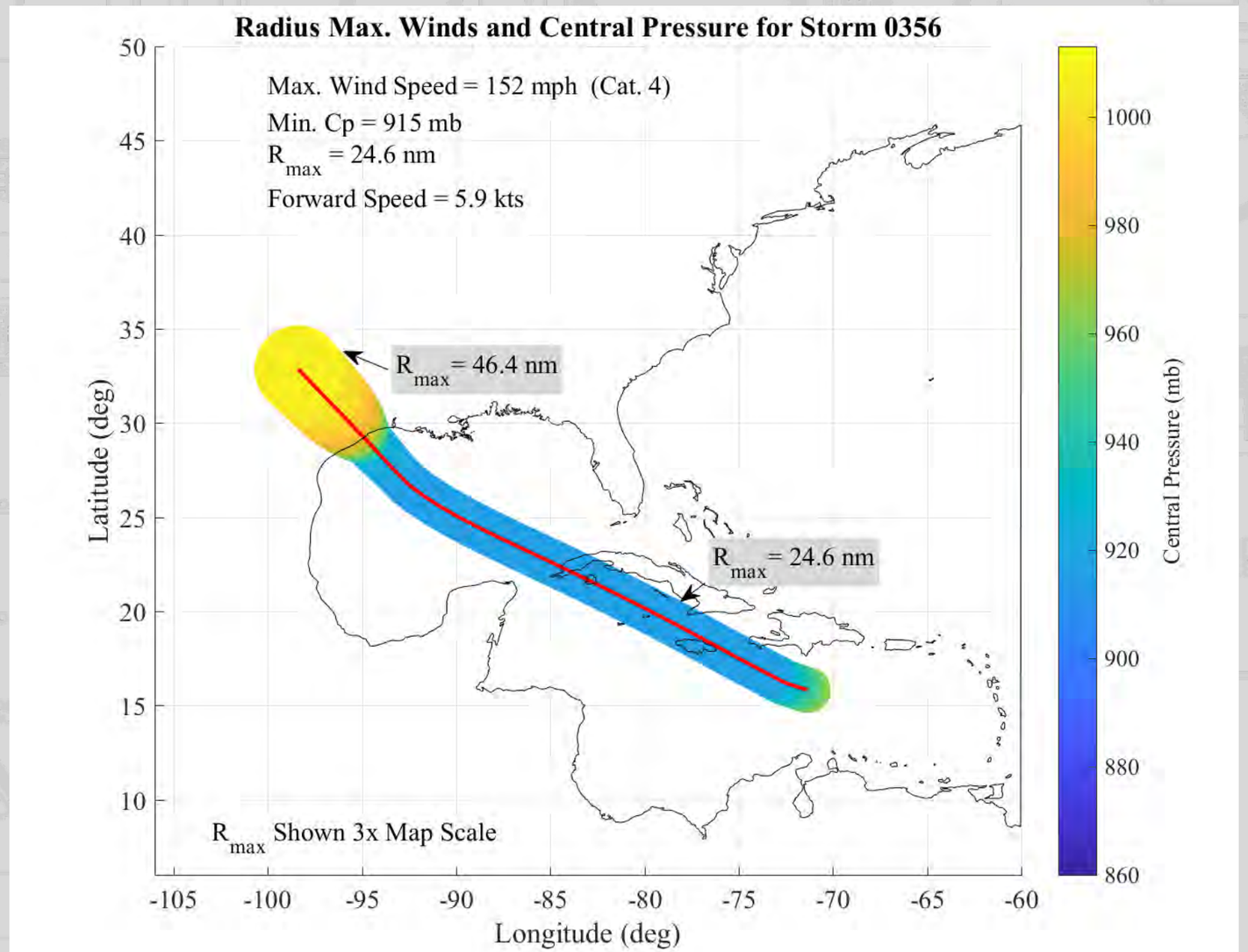


STORM MODELING (CSTORM)



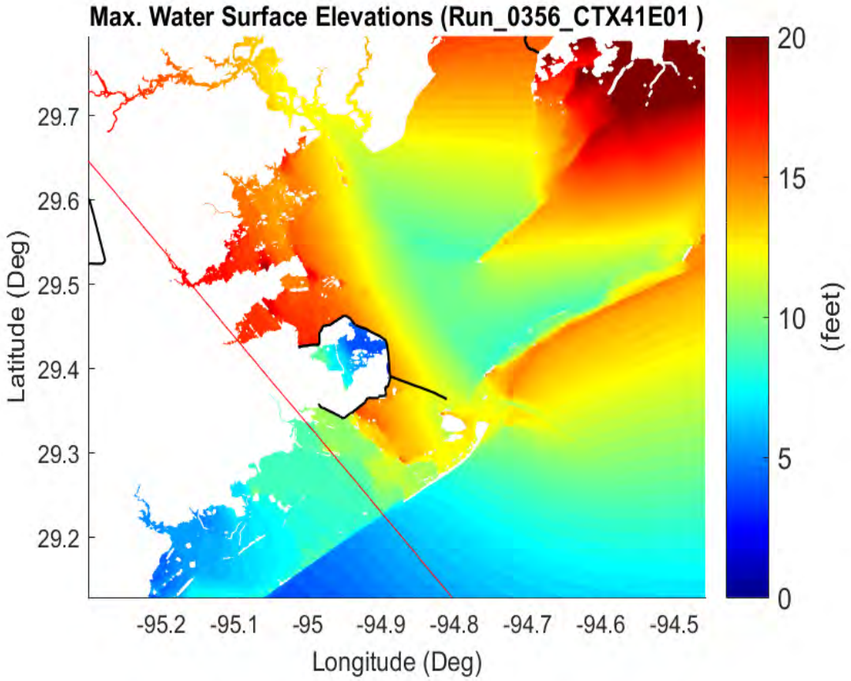
Storm No.	66	73	77	154	159	167	270	277	342	356	384	437	447	453	456	461	529	578	595	633
Max. Wind Speed [mph]	117	181	115	121	101	89	143	162	109	152	162	206	105	201	87	197	187	210	195	170
Saffir-Simpson Scale Cat. #	3	5	3	3	2	1	4	5	2	4	5	5	2	5	1	5	5	5	5	5
Min. Central Pressure [mb]	885	865	945	935	895	915	905	885	915	915	915	865	905	865	925	865	895	865	885	875
Radius to Max. Winds [nmi]	28.9	8.0	26.6	39.7	27.2	32.3	17.8	24.7	54.1	24.6	20.8	9.3	44.6	12.3	44.3	17.5	21.5	12.8	17.0	22.7
Forward Storm Speed [kts]	13.2	4.3	12.2	10.3	4.6	9.2	7.5	5.4	12.9	5.9	19.1	14.3	8.6	8.6	5.9	11.9	23.4	22.4	19.7	7.9

EXAMPLE OUTPUT : STORM # 356

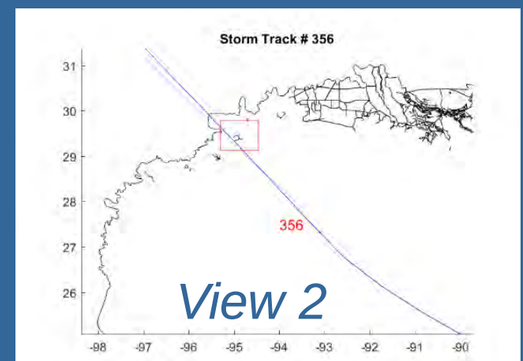


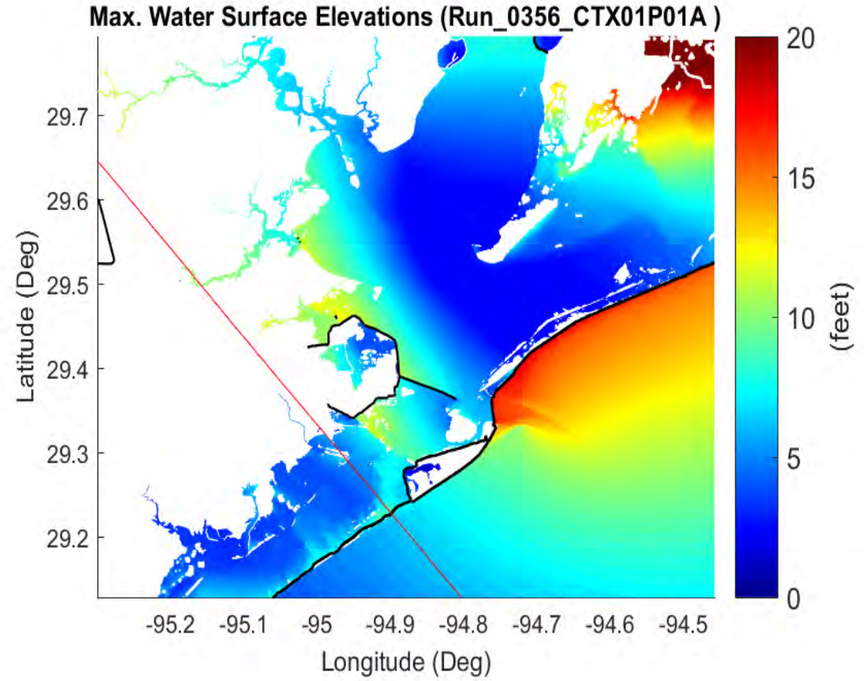
STORM # 356

Max. Wind Speed: 152 mph (Cat. 4)
Min. Cp: 915 mb
Rmax: 24.6 nm
Forward Speed: 5.9 kts

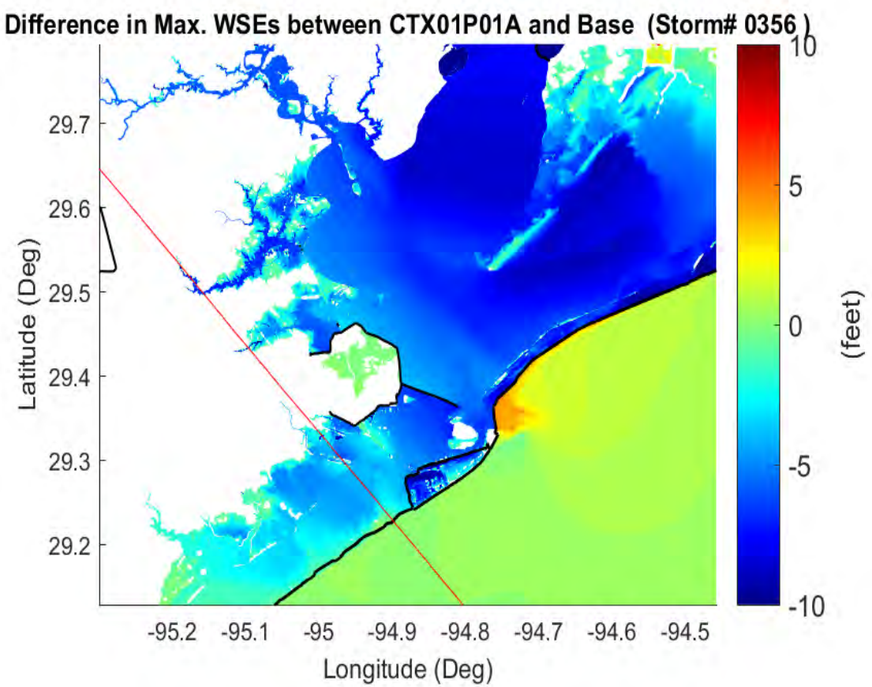


Base (Without Project)



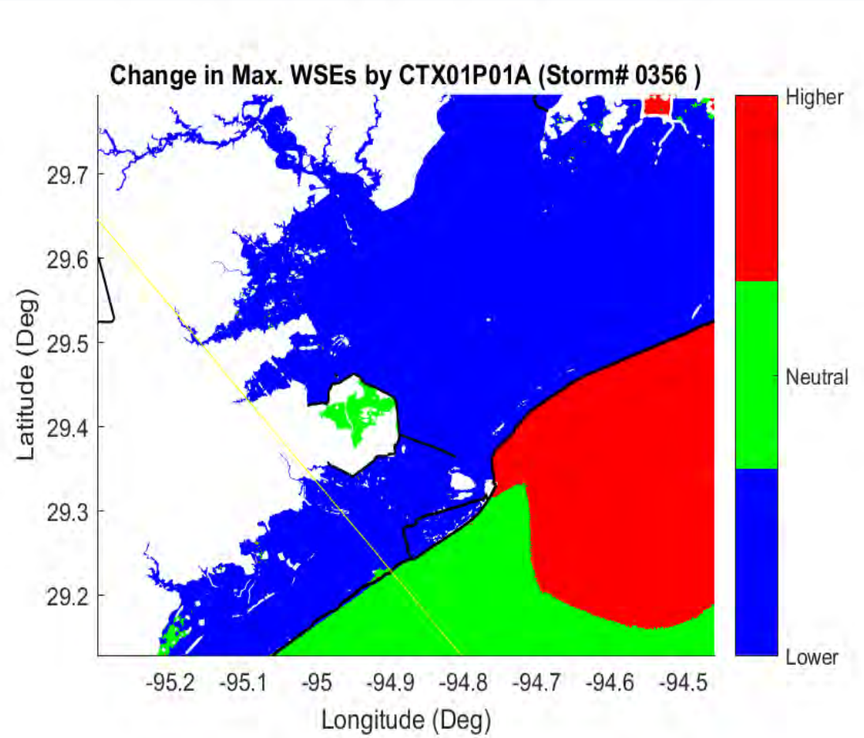


Plan A

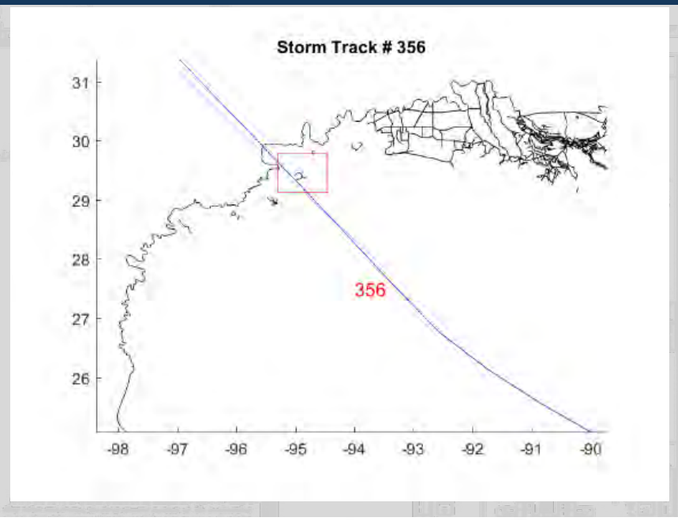


Difference (Alt A – Base)

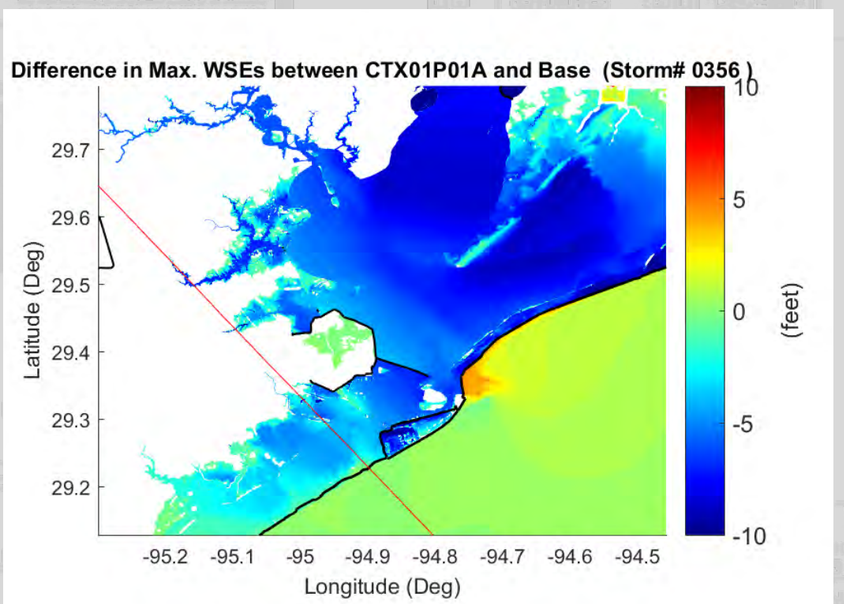
Change in WSEs:
Higher: > 1/2 ft increase
Lower: > 1/2 ft decrease
Neutral: in between



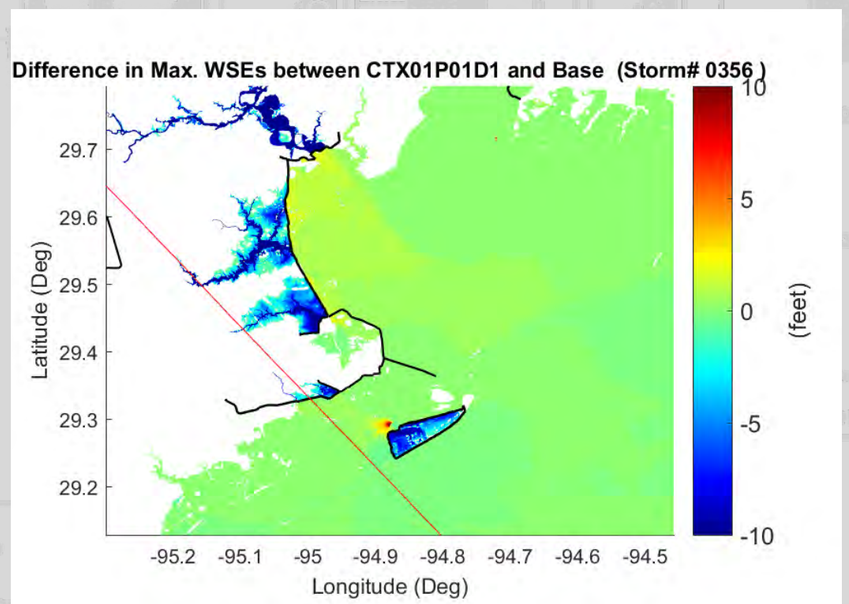
EXAMPLE OUTPUT : STORM # 356



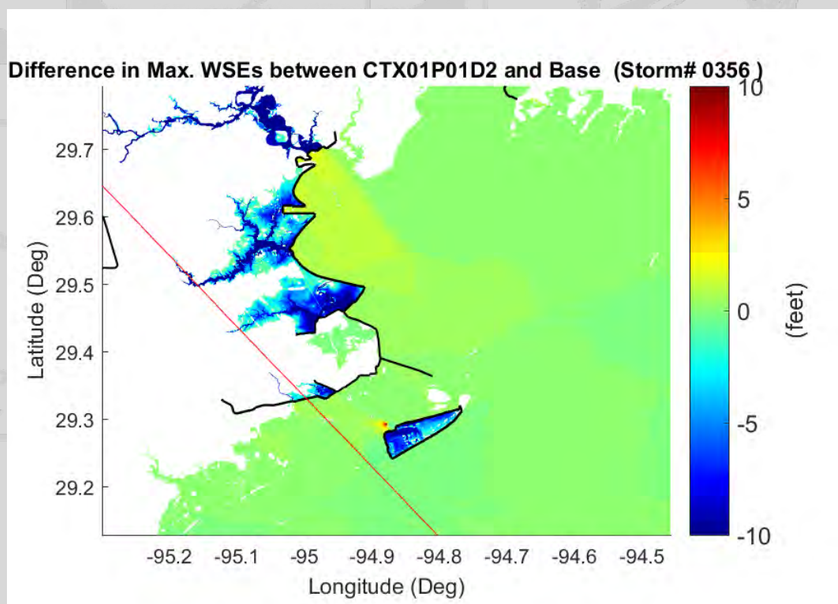
In general, Plan A reduces surge in the Bay covering wide area



Difference (Alt A – Base)



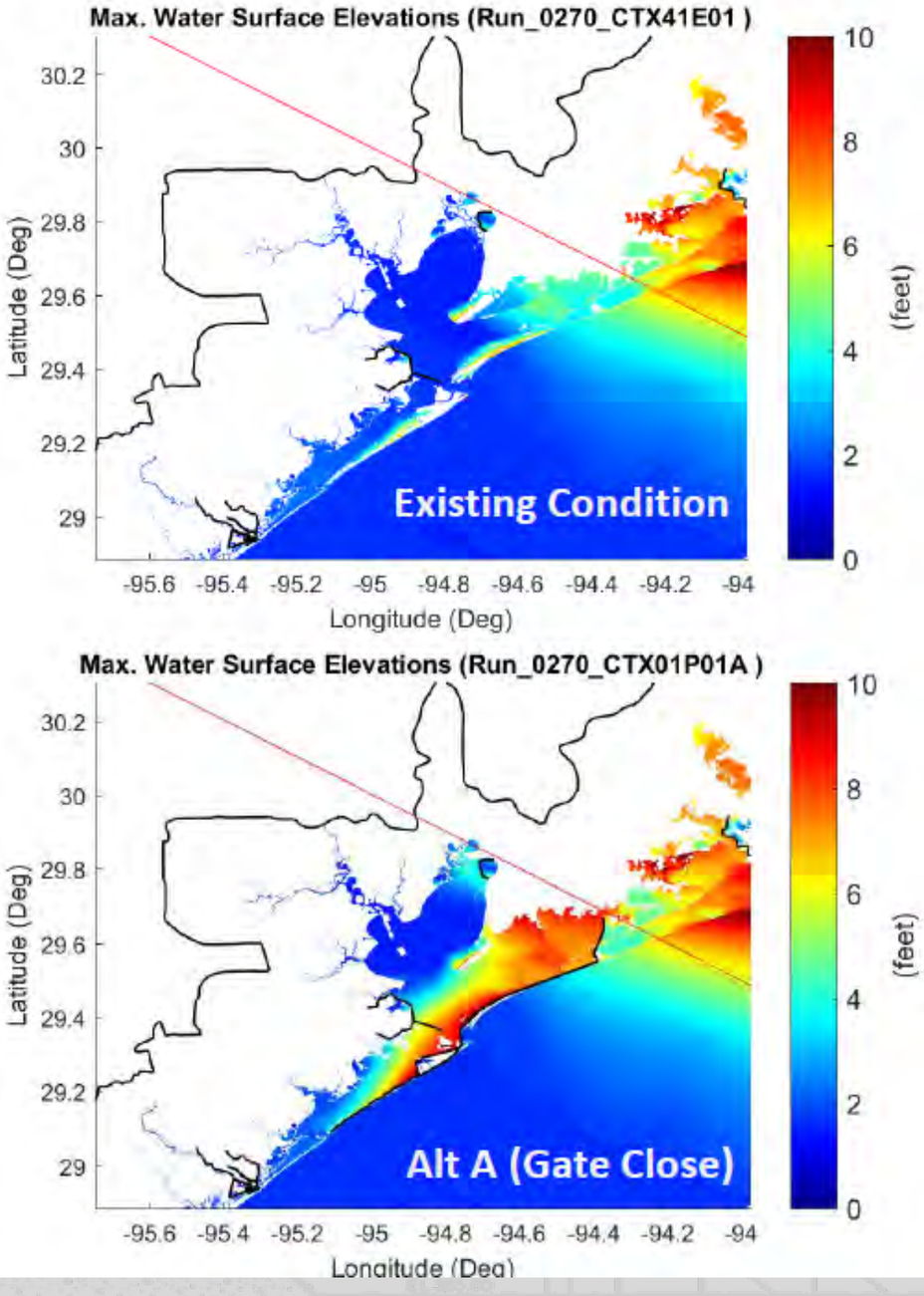
Difference (Alt D1 – Base)

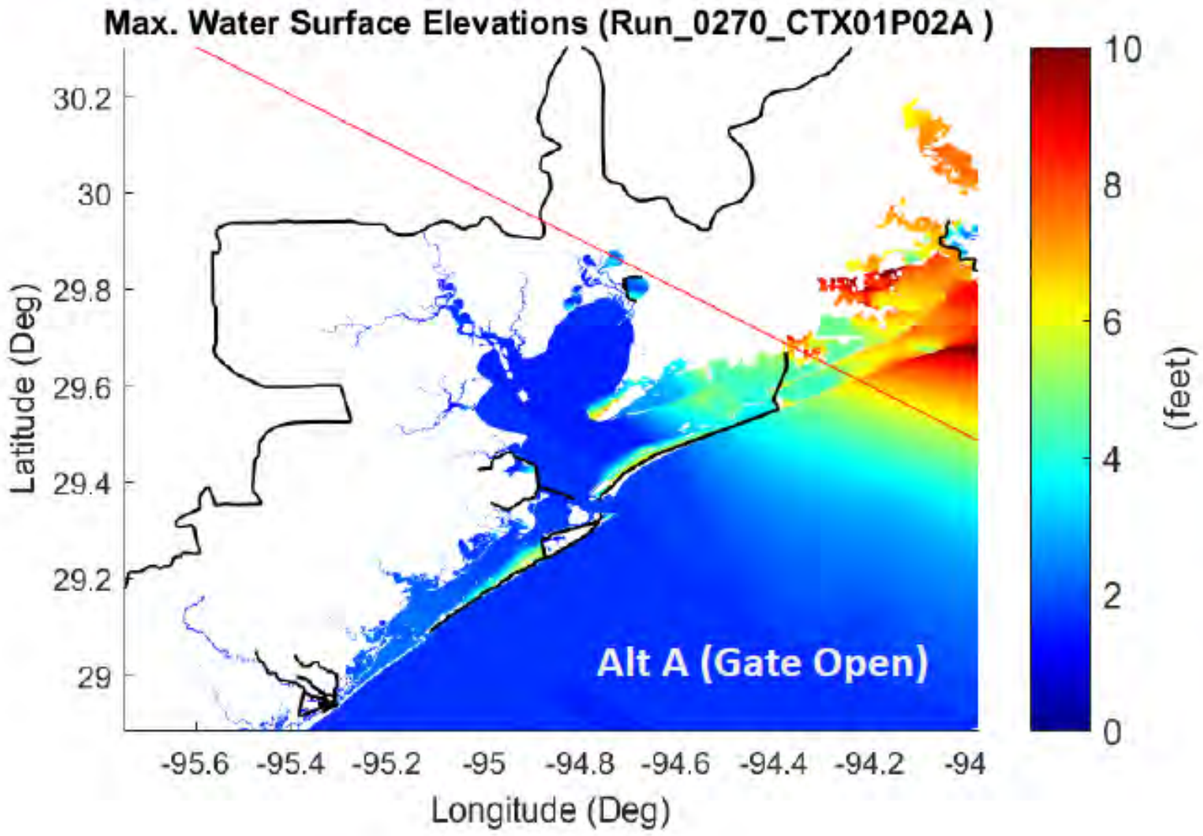


Difference (Alt D2 – Base)

GATE CLOSURE TIMING

Storm 270 (Cat 4, Eastward Track)





East Landfalling tracks have adverse impact on gate closure
As internal/back bay surge have resonance creating
Stress on the back side of the levee.

Opening gates in such scenario is beneficial relieving stress

SALINITY, SEDIMENT & TIDAL PRISM MODELING WITH ADH

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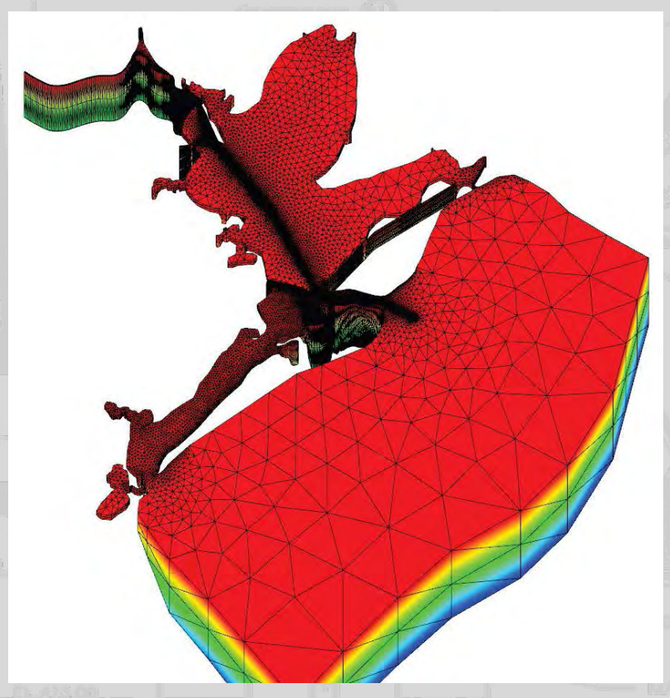
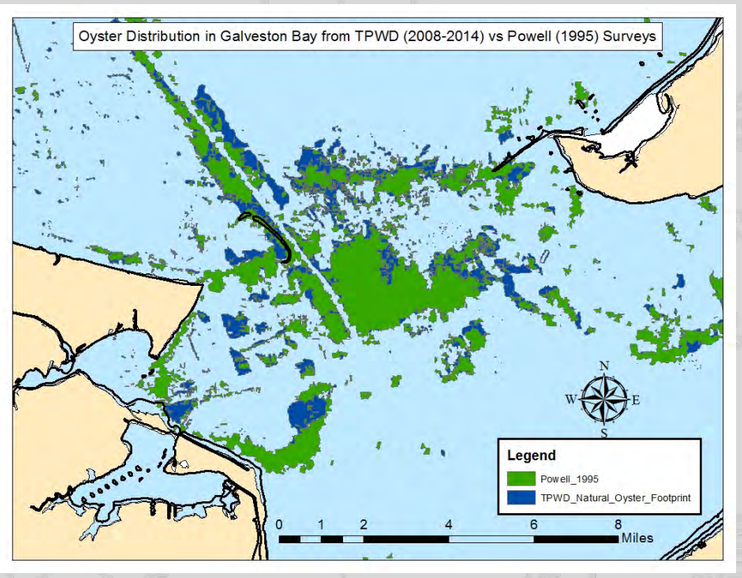
Estuarine Impacts

- Estuarine Screening Analysis – 3 Dimensional Shallow Water Adaptive Hydraulics
- Applied to each Alternative
- Threshold for significant impacts:
  - 40% to 50% reduction in existing area
  - Verified with other independent modeling



- **Oyster Distribution Impacts:**
  - Direct Impacts a concern with Alt C.
  - Impacts to oysters minimal based on average changes in salinity and velocity
  - Shorter term changes in salinity maybe a concern
  - Concerns with increased retention times allowing algal blooms to occur or hypoxic zones to develop



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ENVIRONMENTAL EVALUATIONS

Fishery Access Impacts

- Gates may impede aquatic organism movement
  - Reduction in tidal prism due to constriction created by support structures
  - Higher velocities through structures
  - Creation of eddies or other trapping mechanisms
- On-going consultations with key Interagency members to document and mitigate impacts (Design Changes)
- Reviewing fisheries friendly design and operation considerations - Developed by NMFS
- Fish Larval Transport Model can be coupled with 3-D AdH model to evaluate impacts of navigation/environmental gates on fish larval transport

Marine Mammal Impacts - Bottlenose Dolphins

- Largest concern is noise during construction
- Possible placement of noise reduction devices
  i.e. bubble curtains, silt fence to keep them out of restricted areas
- Dolphins resilient to stationary structures and will adapt to go through and under something in time

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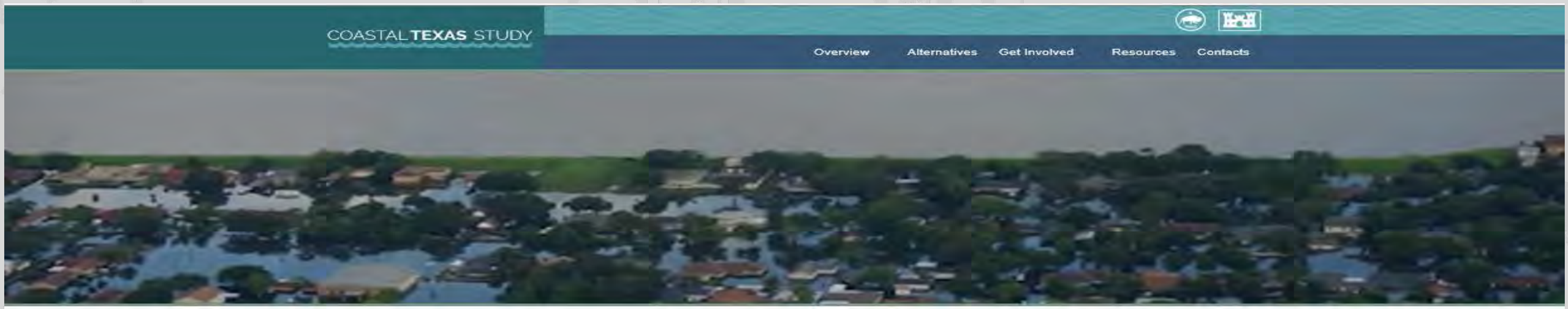
http://CoastalStudy.Texas.gov



Coastal Texas Protection & Restoration Feasibility Study

The U.S. Army Corps of Engineers, in partnership with the Texas General Land Office, began an examination in November 2015 of the feasibility of constructing projects for coastal storm risk management and ecosystem restoration along the Texas coast. The Coastal Texas Protection and Restoration Feasibility Study, also known as the Coastal Texas Study, will involve engineering, economic and environmental analyses on large-scale projects, which may be considered by Congress for authorization and funding. The feasibility study and report will be complete in 2021. The Coastal Texas Study also will include a Comprehensive Plan to provide a long-term approach to enhance resiliency in coastal communities and improve our capabilities to prepare for, resist, recover and adapt to coastal hazards.

COASTAL STORM RISK MANAGEMENT

Develop and evaluate coastal storm risk management solutions to reduce the damage from tropical storms and hurricanes incurred by coastal Texas residents, small businesses and industries.

MORE

ECOSYSTEM RESTORATION

Increase the net quality and quantity of coastal ecosystem resources by maintaining, protecting and restoring coastal Texas ecosystems, and fish and wildlife habitat.

MORE

COMPREHENSIVE PLAN

The Comprehensive Plan will provide an overarching, long-term strategic vision of a resilient Texas coast that supports, protects and sustains the environment, economy and culture of the region.

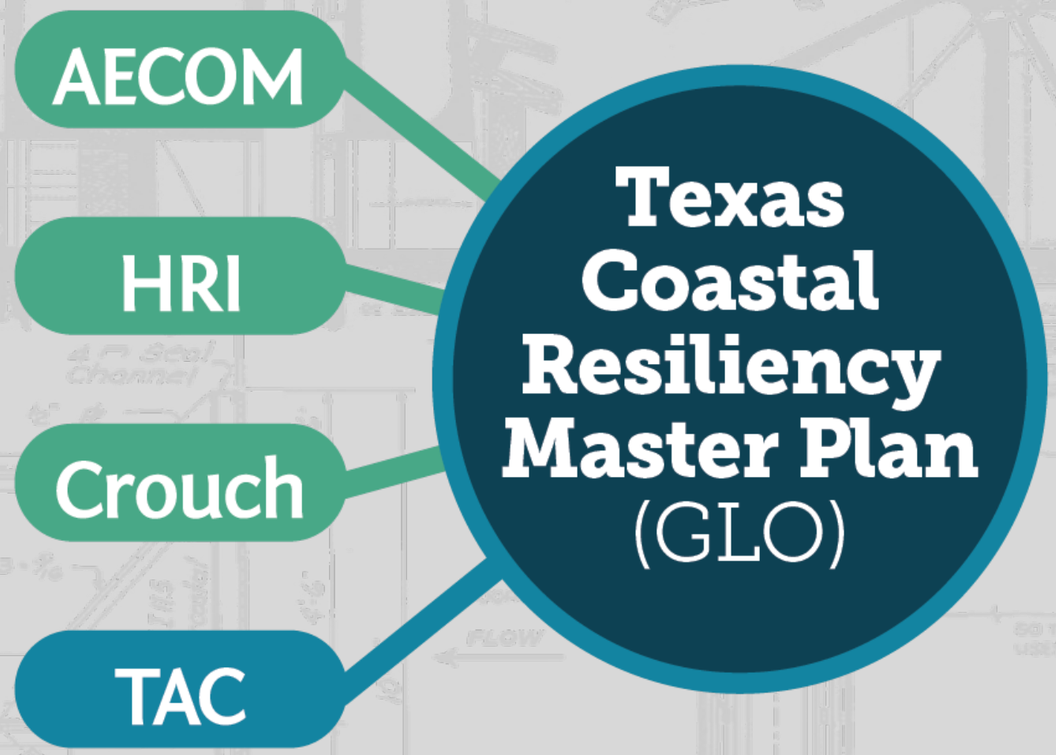
MORE

2017 TEXAS COASTAL RESILIENCY MASTER PLAN

- Described the state of the coast and a path forward toward resiliency
- Outlined Coastal Issues of Concern
- Defined Ecological Resiliency Strategies
- Identified Tier 1 projects for the coast

PLANNING TEAM

- GLO contracted with AECOM for engineering services, HRI for data analysis and Crouch Environmental for education and outreach.
- The Technical Advisory Committee (TAC) is made up of more than 200 coastal experts.



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THE NEED FOR THE 2019 TEXAS COASTAL RESILIENCY MASTER PLAN

Texas Coastal Resiliency Master Plan

In support of the General Land Office's legislative authority to restore, enhance and protect the state's coastal natural resources, the Texas Coastal Resiliency Master Plan provides a framework for community, socio-economic, ecological and infrastructure protection from coastal hazards.

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2019 TEXAS COASTAL RESILIENCY MASTER PLAN ENHANCEMENTS

- Enhance 2017 Plan Resiliency Strategies and Framework to incorporate storm surge suppression and infrastructure projects.
- Identify opportunities for multi-faceted actions that utilize both nature-based and traditional infrastructure approaches.
- Conduct gap analysis to identify actions that are needed where projects are not specifically proposed.
- Introduce physical modeling results to ensure the most resilient suite of projects are identified.
- Define adaptive management processes, and identify proposed actions and projects.

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MEETING SCHEDULE FOR 2019 TEXAS COASTAL RESILIENCY MASTER PLAN

October-December 2017

Regional TAC Meetings to Gather Data on Green and Gray Projects to Address Coastal Hazards

February-April 2018

Regional TAC Meetings to Assess and Evaluate Specific Projects and Actions for Inclusion in 2019 Plan

Fall 2018

Regional TAC Meetings to Review Draft 2019 Plan Elements

Early 2019

Public Issuance of 2019 Plan and Associated Documents

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