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## ALTERNATIVES

To ensure that the Project Development Team (PDT) developed a comprehensive set of risk reduction alternatives along the Texas Coast.

To investigate Coastal Storm Risk Management (CSRM) for the Galveston Bay area, the PDT created alternatives based on the problems facing the upper coast region and the opportunities to reduce storm surge damage to the area. Currently PDT is researching the following Alternatives:

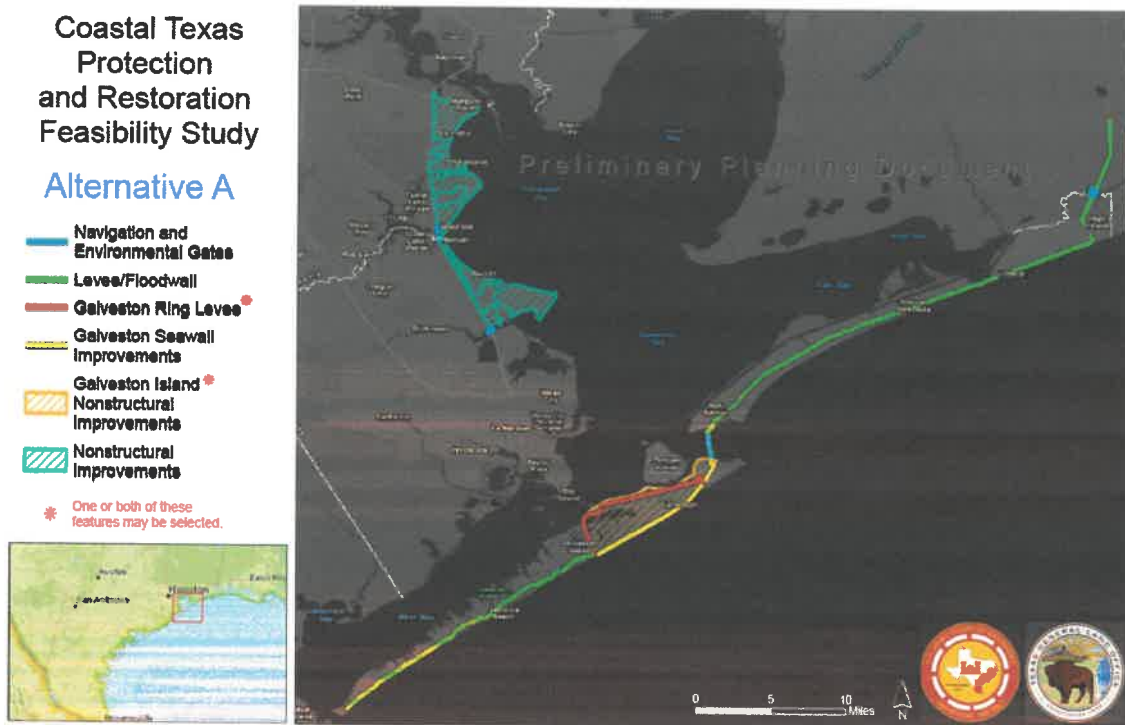
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### Coastal Storm Risk Management

To ensure that the Project Development Team (PDT) developed a comprehensive set of risk reduction alternatives to investigate for the central region of Galveston Bay, the PDT created a list of Coastal Storm Risk Management (CSRM) alternatives based on the problems facing the coastal region and the opportunities to restore and protect that area. Currently PDT is researching the following Alternatives:

#### ➤ **Alternative A: Coastal Storm Surge Barrier**

This alternative was developed to address storm surge flooding at the Gulf interface and also to include the highest number of structures and critical facilities within the project area. This would provide risk reduction to the critical Gulf Intracoastal Water Way (GIWW), by maintaining the existing geomorphic features along Bolivar Peninsula and Galveston Island. A strategy included preventing storm surge from entering the Galveston Bay with a barrier system across Bolivar Peninsula, a closure at the pass at Bolivar Roads, improvements to the Galveston Seawall and a barrier along the west end of Galveston Island. To address wind-driven surges in the bay, which could impact both the back side of Galveston Island and the upper reaches of the bay, nonstructural measures, ring levees and closures on key waterways are also being investigated. Although the Ecosystem Restoration (ER) and CSRM alternatives will be evaluated for separate benefits, the different Alternatives provide some nexuses between the features. By linking into the beach and dune restoration features along Bolivar Peninsula and Galveston Island, the ER features should also increase the resiliency of the CSRM feature.



- ⊕ **Alternative B: Coastal Storm Surge Barrier (Modified)**
- ⊕ **Alternative C: Mid Bay Storm Surge Barrier**
- ⊕ **Alternative D1: Upper Bay Storm Surge Barrier (146 alignment)**
- ⊕ **Alternative D2: Galveston Bay Rim Storm Surge Barrier**

\* All Alternatives also include a ring barrier around the City of Galveston to reduce risk from back bay flooding due to tropical storms. For all Alternatives, the PDT is also investigating the nexuses between ER features and CSRSM features by reviewing the beach and dune restoration features along Bolivar Peninsula and Galveston Island. The ER features should also increase the resiliency of the CSRSM features.

**Matagorda Levee System Improvements** - Improvements to the existing Matagorda levee system have been investigated. It has been determined that improvements are needed for interior drainage and not for storm surge risk; therefore, it will be recommended for investigation under another study with that authority.

**South Padre Island** - The Coastal Storm Risk Management measure proposed for South Padre Island consists of a beachfill template with an equilibrium dune height of 12.5' NAVD88, dune width of 20' and berm width of 100' and berm height of 4' NAVD88 along a portion of the island with a renourishment interval of 10 years. The exact extent of the beach and dune restoration that meets the USACE CSRSM criteria is being investigated.

## Ecosystem Restoration

An ecosystem restoration management measure (ER measure) is a structural element that requires construction or assembly on-site or an activity that can be combined with other management measures to form alternative plans. ER measures were specifically developed to address the problems related to the ecosystem degradation throughout the coastal Texas area.

The ER measures will achieve two primary 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; and
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

The ecosystem restoration projects in the Coastal Texas Study will benefit areas along the entire Texas coast. In addition to the ecosystem values, secondary goals were considered for the ecosystem restoration. The measures were combined into alternatives to meet those secondary goals as stated within each alternative below. The multiple lines of defense strategy was also employed in developing the alternatives and measures. Islands, shorelines and headlands form the Texas coastal barrier systems, which are the first line of defense for coastal communities during storms and hurricanes. These critical geomorphic features reduce the effects of wind, waves and storm surge by absorbing storm energy. Barrier systems provide essential and critical habitats for terrestrial and aquatic species. These landforms also maintain an important boundary between the more saline conditions of the marine ecosystem and the fresher estuarine ecosystem. The ecosystem measure went through multiple levels of preliminary screening with an interagency team. The final 9 individual measures, referenced below (names are based upon the counties in which they occur), remained after the screening and were designed to meet area-specific goals to restore the coastal habitat and provide resiliency to coastal storms

**⊕ G-5: Bolivar Peninsula/Galveston Island Gulf Beach and Dune Restoration**

**⊕ G-28: Bolivar Peninsula and West Bay Gulf Intracoastal Waterway (GIWW) Shoreline and Island Protection**

**⊖ B-2: Follets Island Gulf Beach and Dune Restoration**

**Project Description:** Restore, protect, and/or enhance beach and dune complex on approximately 10 miles of Gulf shoreline on Follets Island in Brazoria County.

**Project Benefits:** A restored shoreline on Follets Island will guard against beach and dune breaches caused by erosion, storm surge and sea level rise. This will protect inland wetlands, seagrass meadows and other habitats. The beach, dune, wetland and seagrass meadow ecosystems along Follets Island are the first line of defense for Bastrop, Christmas, and Drum bays, and the Brazoria National Wildlife Refuge and various residential developments on the mainland. Christmas Bay is a designated Gulf Ecological Management Site because of its relatively undeveloped shorelines, high water quality, and unique mix of seagrass meadows, oyster reefs, and smooth cordgrass marsh; it is also a Texas Parks and Wildlife Department Coastal Preserve. These habitats also shield State Highway 257 from the effects of storm surge, the only road accessing and providing evacuation capability to the east towards Galveston Island and to the west towards Freeport.

**Future Without Project:** The Gulf shoreline in this area is eroding at a rate of 13 feet/year. Over the next 50 years, more than 200 acres of existing beaches and dunes that provide habitat to multiple organisms including threatened and endangered species, protect habitat, homes, and infrastructure may be washed away due to erosion and severe storms. A Gulf-water breach of Follets Island into Christmas Bay would substantially affect its unique ecological features. On addition, the critical evacuation route of State Highway 257 will be substantially threatened because of its proximity to the shoreline. Currently, some sections of the highway are within 180 feet of the shoreline.

**Coastal Texas  
Protection  
and Restoration  
Feasibility Study**

**Ecosystem Restoration  
Measure B2  
Follets Island  
Gulf Beach and  
Dune Restoration**

Dune/Beach Restoration 

Measure B2 is in Alternatives 1, 2, 3 and 5



**+ B-12: Bastrop Bay, Oyster Lake, West Bay, and GIWW Shoreline Protection**

**+ CA-5: Keller Bay Restoration**

**+ CA-6: Powderhorn Shoreline Protection and Wetland Restoration**

**+ M-8: East Matagorda Bay Shoreline Protection**

**+ SP-1: Redfish Bay Protection and Enhancement**

**+ W-3: Port Mansfield Channel, Island Rookery, and Hydrologic Restoration of the Laguna Madre System**

The alternatives were created by combining individual measures into combinations that restore the various natural lines of defense against coastal storms. The individual measures are described above, and the combination of measures for each alternative are presented in maps and summaries.

**No Action Alternative – Required for Comparison**

This alternative provides a baseline for comparison of with and without project conditions, and supports the identification of specific benefits to be achieved as a result of each alternative.

**Alternative 1 – Coastwide All-Inclusive Restoration**

This alternative proposes all 9 of the measures. This is the largest alternative which would restore natural features which provide habitat along the Texas coast and support natural conditions to withstand coastal storm conditions that cause land and habitat loss.

**Alternative 2 – Coastwide Restoration of Critical Geomorphic Features**

Measures included in Alternative 2 were combined because they would restore or protect critical landscape features of the coastal ecosystem, such as barrier islands, barrier and bay shorelines, etc. The features prevent land loss over time to sustain a natural line of defense against coastal storms.

**Alternative 3 – Coastwide Barrier System Restoration**

Measures included in Alternative 3 were combined because they would prevent coastal barrier system degradation, fragmentation or loss, which would expose interior bay shorelines and marshes to high energy gulf forces. The barrier features prevent interior land loss over time.

**Alternative 4 – Coastwide Bay System Restoration**

The combination of features in Alternative 4 protects bay shorelines, inlets and estuarine marshes which preserve habitat, as well as slow down waves and sediments.

**Alternative 5 – Coastwide ER Contributing to Infrastructure Protection**

Alternative 5 includes the restoration features which will defend the natural line of defense around existing infrastructure, such as navigation routes, industrial centers, or community resources.

**Alternative 6 – Top Performers**

Alternative 6 includes the combination of measures that meet the goals to be included in at least 4 of the other alternatives and scored highest in preliminary screening against project goals.

To develop the Tentatively Selected Plan (TSP) a combination of an Upper Coast CSR, South Padre CSR, and an Ecosystem Restoration alternative were combined.

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