



DEPARTMENT OF THE ARMY  
OFFICE OF THE CHIEF OF ENGINEERS  
2600 ARMY PENTAGON  
WASHINGTON, DC 20310-2600

2 JUN 2023

DAEN

SUBJECT: Gulf Intracoastal Waterway, Coastal Resilience Study, Brazoria and Matagorda Counties, Texas

THE SECRETARY OF THE ARMY

1. I submit for transmission to Congress my report on inland navigation recommendations for the Gulf Intracoastal Waterway (GIWW), Brazoria and Matagorda Counties, Texas. It is accompanied by the Final Integrated Feasibility Report and Environmental Assessment (FIFR-EA) of the Galveston District and Southwestern Division Engineer. This report is a final response to the authorization in Section 1201 of Water Resources Development Act (WRDA) of 2016 (P.L. 114-322). The authorization allowed the Secretary of the Army to conduct a feasibility study for the following projects for water resources development and conservation and other purposes, as identified in the reports titled: "Report to Congress on Future Water Resources Development" submitted to Congress on January 29, 2015, and January 29, 2016, respectively, pursuant to section 7001 of the Water Resources Reform and Development Act of 2014 (33 U.S.C. 2282d) or otherwise reviewed by Congress: "...(25) GULF INTRACOASTAL WATERWAY, TEXAS, BRAZORIA AND MATAGORDA COUNTIES, TEXAS – Project for navigation and hurricane and storm damage reduction, Gulf Intracoastal Waterway, Brazoria and Matagorda Counties, Texas." Preconstruction engineering and design activities will continue under the study authority cited above.

2. Construction of the GIWW channel in Matagorda and Brazoria Counties was completed in the 1940's. The main channel of the GIWW was designated as part of the Inland Waterways System by Section 206 of the 1978 Inland Waterways Revenue Act (Public Law 95-502). The main channel of the GIWW in Matagorda and Brazoria Counties was originally constructed adjacent to the Texas coastline. Channel excavation material was side cast on the bayside of the channel, creating a barrier system. Since original construction that barrier system has served as a protective feature to the navigation channel from coastal storm events, and erosive forces of the Gulf of Mexico. Over time, coastal storms, natural erosion, and anthropogenic disturbances (e.g. erosion due to vessel traffic) have caused this barrier system to almost disappear in some reaches in the study area. In other reaches, the barrier system is expected to significantly erode in size over the 50-year period of analysis. Projected sea level rise exacerbates the erosion concerns. The feasibility study findings show that if no action is taken to restore the barrier system, the GIWW navigation channel in the study area is expected to become vulnerable, affecting its reliability, resiliency, safety, environmental sustainability, and resulting in a reduction of economic efficiency.

3. The reporting officers recommend authorizing a plan that will improve navigation, significantly reduce the maintenance requirement, and provide resiliency along the GIWW in Matagorda County. The Recommended Plan is the Resilience Plan which is the *National Economic Development (NED) Plan* plus additional resiliency features in Zone 13. The Assistant Secretary of the Army (Civil Works) (ASA(CW)) approved an exception to the requirement that

DAEN

SUBJECT: Gulf Intracoastal Waterway, Coastal Resilience Study, Brazoria and Matagorda Counties, Texas

the U.S. Army Corps of Engineers (USACE) recommend the NED Plan. The NED exception approval allows the USACE to incorporate the resiliency features in Zone 13 into the Recommended Plan because these features provide operational resiliency to the system while providing important navigation, coastal storm damage and environmental benefits. The Recommended Plan is pursuant to the Federal Standard for placement of dredge material. The action of placing dredge material adjacent to the breakwater and barrier island is consistent with the Federal Standard since the cost of the Recommended Plan over a 50-year period of analysis costs less than continuing to utilize upland confined placement areas along the GIWW. The Recommended Plan includes the following features for construction:

a. Zone 12 improvements include 6,133 linear feet of interior channel-side breakwater with a crest elevation of 5 feet NAVD88 for barrier island shoreline stabilization;

b. Zone 13 improvements include 24,200 linear feet of interior channel-side breakwater with a crest elevation of 5 feet NAVD88, 20,566 linear feet of bayside breakwater with a crest elevation of 3 feet NAVD88, and 19,833 linear feet of earthen berm with a crest elevation of 8 feet NAVD88;

c. Zone 14 improvements include 6,205 linear feet of interior channel-side breakwater with a crest elevation of 5 feet NAVD88, 3,614 linear feet of bayside breakwater with a crest elevation of 3 feet NAVD88, and 2,498 linear feet of earthen berm with a crest elevation of 8 feet NAVD88;

d. Zone 16 improvements include 6,882 linear feet of bayside breakwater with a crest elevation of 5 feet NAVD88, 20,883 linear feet of bayside breakwater with a crest elevation of 3 feet NAVD88, and 1,491 linear feet of earthen berm with a crest elevation of 8 feet NAVD88;

e. Zone 18 improvements include 55,780 linear feet of interior channel-side breakwater with a crest elevation of 5 feet NAVD88, and 36,080 linear feet of bayside breakwater with a crest elevation of 3 feet NAVD88; and

f. Within Zones 13, 14, 16, and 18 the breakwaters would be designed with intermittent gaps where a single row of reef balls would be placed to provide circulation and tidal exchange between Matagorda Bay and the Gulf of Mexico through the GIWW.

The Recommended Plan includes a total of approximately 180,343 linear feet of breakwaters and 23,822 linear feet of earthen berms for construction. The Recommended Plan protects approximately 12 miles of channel across all zones. Construction of the Recommended Plan allows for a resilient navigation barrier system at initial construction and supplies future disposal sites for operation and maintenance dredge material and secondary benefits of marsh creation for additional resilience. Dredging cycles are expected to occur every three years with the dredge material being disposed in the areas created by the Recommended Plan in the five zones described above. With each dredge cycle, dredge placement cells would need to be created and areas seeded with marsh plantings. Over the 50-year period of analysis, an estimated total of 2,105 acres of barrier islands would be protected or restored for additional resilience to the navigation barrier system. The barrier islands are a combination of vegetated earthen berms, breakwaters, and transition marshes. The emergent earthen berms were designed to mimic existing system barrier island elevations, but with additional protection

DAEN

SUBJECT: Gulf Intracoastal Waterway, Coastal Resilience Study, Brazoria and Matagorda Counties, Texas

provided by breakwaters and marsh. As the barrier islands are restored utilizing dredge material over time, it is estimated that 1,027 acres of marsh would be created.

The Recommended Plan would have adverse impacts to approximately 6.7 acres of oyster reef and 42.4 acres of sea grasses. All practicable means to avoid and minimize impacts to the environment were taken. Compensatory mitigation is required to offset the impacts to seagrass meadows and oyster reef. The mitigation plan includes the creation of 43.5 acres of seagrass meadow in East Matagorda Bay and nine acres of oyster reef in Matagorda Bay. The estimated total cost of mitigation is \$19,700,000, including monitoring and adaptive management.

4. The goals and objectives of this study align with the USACE 2021 Climate Action Plan. Resilience is characterized by a project's ability to prepare, absorb, recover, and adapt to disruptive events. Disruptive events identified in the study include coastal storms, Relative Sea Level Change (RSLC) and associated shoaling. These disruptive events threaten the reliability of the GIWW navigation channel in the study area and the overall GIWW navigation system. Since major oil and gas discoveries in West Texas in 2012, the GIWW navigation channel has been a reliable system providing cost effective transportation, allowing billions of dollars in economic activity to be realized. Events like Hurricane Harvey threaten the GIWW reliability by depositing service-interrupting-amounts of material into the navigation system. The Recommended Plan provides resilience to the navigation system in the following ways:

a. Prepare: The project area is projected to have 2.12 feet of sea level rise under the 50-year intermediate scenario and is also in an area of high vulnerability to storm generated waves and surge. The Recommended Plan is proactive in preparing the GIWW navigation channel in the study area for these potential disruptive events.

b. Absorb: The Recommended Plan is designed to restore a barrier island system that can physically absorb threatening storms, winds, waves, and shoaling (exacerbated by RSLC) to the navigation channel. Breakwaters and island/marsh features were selected based on their ability to initially absorb the anticipated sea level rise and storm impacts.

c. Recover: A resilient system recovers quickly and can resume normal operations. When potential disruptive events identified in the study are realized, the Recommended Plan reduces recovery time, making the navigation channel reliable.

d. Adapt: The Recommended Plan is designed to be adaptable for RSLC and storm events. Operation and maintenance material from the GIWW can be used to recover initial dimensions of the barrier system should a storm event occur and are adaptable in elevations and widths for changing conditions. A resilient navigation channel is the most adaptable transportation mode to adjust to changes in market demand.

The goals and objectives of this study also align with USACE goals to advance the practice of beneficial use of dredge material. The Recommended plan is a productive and positive use of dredge material generated from the GIWW.

5. There is no non-Federal sponsor for this project. Texas Department of Transportation (TxDOT) is a non-Federal partner and proponent of the project.

6. Section 102(a) of WRDA 1986, P.L. 99-662, (33 U.S.C. 2212(a)), provides that the construction of inland waterway projects should be at 100 percent Federal cost, shared between appropriations and amounts derived from the Inland Waterways Trust Fund (IWTF). The IWTF

DAEN

SUBJECT: Gulf Intracoastal Waterway, Coastal Resilience Study, Brazoria and Matagorda Counties, Texas

was originally established by Sections 203 and 204 of the Inland Waterways Revenue Act of 1978, P.L. 95-502. The original authorization was modified by Section 1405 of WRDA 1986, which also repealed Sections 203 and 204 of the Inland Waterways Revenue Act of 1978. Specifically, expenditures from the IWTF may be made available, as provided by Appropriation Acts, for making construction and rehabilitation expenditures for navigation on those Inland Waterways described in Section 206 of P.L. 95-502, as amended, including the GIWW. Consistent with Section 109 of WRDA 2020 (Div. AA of P.L. 116-260), IWTF funds will provide 35 percent of costs associated with construction of the project if the project receives an appropriation of funding for construction before 2031. If the appropriation for funding is received after 2031, IWTF will provide 50 percent of costs associated with construction in accordance with Section 1405.

a. Based on October 2022 price levels, the estimated project first cost is \$314,221,000, allocated to the inland navigation purpose. The estimated first cost includes the value of lands, easements, rights-of-way, and relocations (LERR), including the real property interests required for dredged material placement facilities. Total LERR costs are estimated to be \$229,000.

b. The USACE share of the project first cost for initial construction is estimated at \$204,244,000 and the IWTF share is estimated at \$109,977,000 in accordance with Section 109 of WRDA 2020.

c. The annual cost of operation, maintenance, repair, replacement, and rehabilitation (OMRR&R) for the Recommended Plan (new work) is a federal cost in accordance with Section 102(b) of WRDA 1986 (33 U.S.C. 2212(b)) and is estimated to be \$784,000 to maintain the new work breakwaters, marsh plantings and dike construction to contain future dredge material placement associated with the barrier island creation. The Recommended Plan and associated new dredge material placement strategy has an overall annual OMRR&R savings to USACE of \$8,461,000.

7. Based on a 2.50 percent discount rate and a 50-year period of analysis, the equivalent average annual benefits, equivalent average annual costs, equivalent average annual net benefits and benefit-to-cost ratio are estimated for the NED Plan and the Resilience Plan:

a. NED Plan: the equivalent average annual benefits are estimated at \$10,046,000 and equivalent average annual costs are estimated at \$8,648,000, with equivalent average annual net benefits of \$1,398,000 and a benefit-to-cost ratio (BCR) of 1.16 to 1.00.

b. Resilience Plan: the equivalent average annual benefits are estimated at \$11,775,000 and equivalent average annual costs are estimated at \$12,028,000, with equivalent average annual net benefits of -\$253,000 and a benefit-to-cost ratio (BCR) of 0.98 to 1.00. The Resilience Plan creates twenty percent more acres of barrier island and protects thirty percent more linear feet of the navigation channel than the NED Plan.

8. In accordance with USACE Sea Level Change guidance, Engineer Regulation 1110-2-8162, the study evaluated potential impacts due to sea level change in its plan formulation and engineering of the Recommended Plan. The Recommended Plan was designed using the 50-year intermediate curve. The project site is in an area vulnerable to storm generated waves and surge. The hard (rock) breakwaters and soft (earthen) berm features were selected based on their ability to initially absorb the anticipated sea level rise and storm impacts in terms of their crest elevations and dimensions and supplemented with OMRR&R strategies such as beneficial

DAEN

SUBJECT: Gulf Intracoastal Waterway, Coastal Resilience Study, Brazoria and Matagorda Counties, Texas

use of dredged materials to assist with recovery and adaptation.

9. Compliance with all required applicable environmental laws and regulations has been completed. In the Final Fish and Wildlife Coordination Act Report (Final CAR), the U.S. Fish and Wildlife Service (USFWS) expressed concern about the uncertainty associated with predicting resource impacts to various habitat types in the study area, adopting design parameters and conducting sufficient monitoring. The existing barrier islands are actively eroding, and habitat types are expected to continue to erode and transition in type by the time construction is complete in 2030. To address this issue, the USFWS recommended in the Final CAR that additional involvement during preconstruction engineering and design and construction phases be conducted. USACE will continue to work with the USFWS during all future phases of project development to refine the impact analysis to ensure the avoidance of important habitat types in the study area. If impacts cannot be avoided, they will be minimized to the extent possible, and a revised mitigation plan would need to be coordinated. The National Marine Fisheries service (NMFS) also recommended USACE continue to coordinate with NMFS on mitigation design efforts. Specifically, to ensure the Essential Fish Habitat (EFH) mitigation plan design is refined appropriately and to assist USACE in developing designs for fishery access gaps in the breakwater features at least every 500 feet. Compliance with Section 106 of the National Historic Preservation Act was completed with the signing of a Programmatic Agreement by the Galveston District Commander and the Texas State Historic Preservation Officer on August 25, 2021.

10. In accordance with USACE policy on the review of decision documents, all technical, engineering, and scientific work underwent an open, dynamic, and rigorous review process. The comprehensive review process included District Quality Control Review, Agency Technical Review, and Headquarters USACE Policy and Legal Compliance review to confirm the planning analyses, alternative design and safety, and the quality of decisions. A Type I IEPR exclusion was approved by Southwestern Division in October 2020. Washington-level review indicates that the plan recommended by the reporting officers complies with all essential elements of the U.S. Water Resources Council's Economic and Environmental Principles, Requirements, and Guidelines for Water and Land Related Resources Implementation Studies, as well as other administrative and legislative policies and guidelines. The views of interested parties, including federal, state, and local agencies, were considered and all comments from public reviews have been addressed and incorporated into the final report documents where appropriate.

11. USACE decision documents recognize cost risk and uncertainty surrounding implementation. Estimated total project first cost for the Recommended Plan is \$314,221,000 at a Class 3 level of technical information and design which includes a contingency value of \$88,144,000, approximately 39 percent of the estimated base project cost of \$226,077,000. The cost contingencies reflect an 80 percent confidence level in estimated total project first cost and are intended to cover unknowns and/or unanticipated conditions in project scope based on their probability of occurrence. An 80 percent confidence level carries some degree of uncertainty. For the Recommended Plan project first costs, the uncertainty drivers are the following: 1) limited survey data may result in quantity changes for breakwater construction materials; 2) inflation estimates may be lower than actual inflation; and 3) variation in major material cost and bid assumptions. As the project moves into the next phases, USACE will focus risk management and mitigation on primary cost risk drivers to the extent within USACE control.

DAEN

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Considering these risks, I concur with the findings, conclusions, and recommendation of the reporting officers. Accordingly, I recommend that the Gulf Intracoastal Waterway, Coastal Resilience Study, Brazoria and Matagorda Counties, Texas be authorized in accordance with the reporting officers' Recommended Plan at an estimated cost of \$314,221,000 with such modifications as in the discretion of the Chief of Engineers may be advisable.

12. The recommendation contained herein reflects the information available at this time and current departmental policies governing formulation of individual projects. It does not reflect program and budgeting priorities inherent in the formulation of a national civil works construction program or the perspective of higher review levels within the Executive Branch. Consequently, the recommendation may be modified before it is transmitted to the Congress as a proposal for authorization and implementation funding. However, prior to transmittal to Congress, the non-Federal proponent, interested federal agencies, and other parties will be advised of any significant modifications and will be afforded an opportunity to comment further.

A handwritten signature in black ink, appearing to read "Scott A. Spellmon". The signature is fluid and cursive, with a long horizontal flourish extending to the right.

SCOTT A. SPELLMON  
Lieutenant General, U.S. Army  
Chief of Engineers