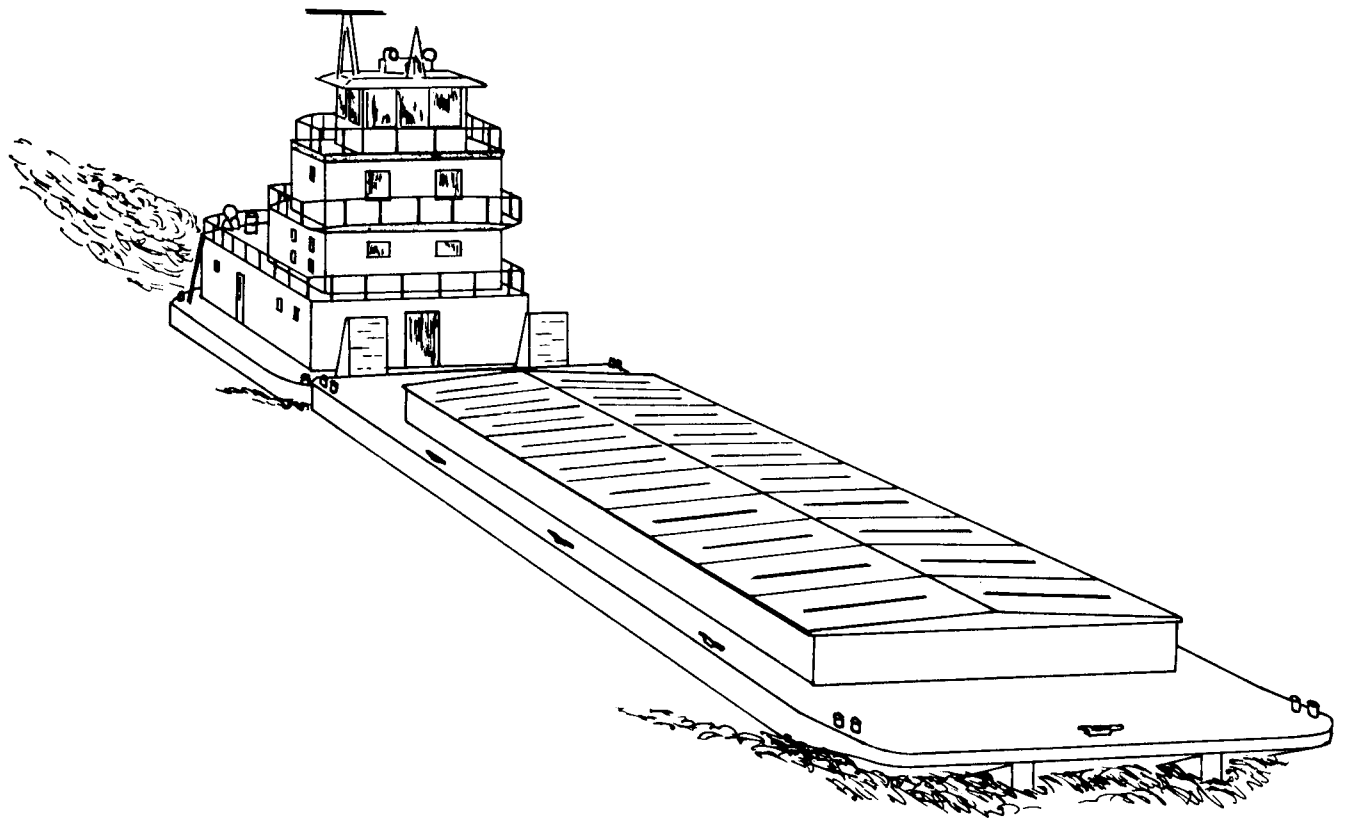


MS-4614  
TTS

000 100

# THE GULF INTRACOASTAL WATERWAY IN TEXAS



## 1992

Prepared By

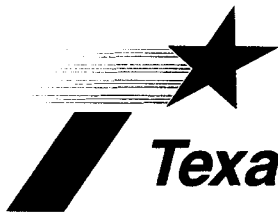
*Texas Department of Transportation*

THE GULF INTRACOASTAL WATERWAY  
IN TEXAS

PRESENTED IN RESPONSE TO  
THE TEXAS COASTAL WATERWAY ACT OF 1975  
AND  
SUBMITTED TO  
THE SEVENTY-THIRD SESSION  
OF THE TEXAS LEGISLATURE

PREPARED BY THE  
TEXAS DEPARTMENT OF TRANSPORTATION  
DIVISION OF TRANSPORTATION PLANNING

1992



# Texas Department of Transportation

DEWITT C. GREER STATE HIGHWAY BLDG. • 125 E. 11TH STREET • AUSTIN, TEXAS 78701-2483 • (512) 463-8585

Governor Ann Richards

Lieutenant Governor Bob Bullock

Members of the Seventy-third Legislature

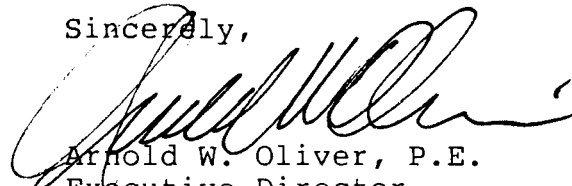
Prior to 1975, the need existed for a single, local, nonfederal sponsor of the Gulf Intracoastal Waterway in Texas. The Texas Coastal Waterway Act of 1975 filled that need by appointing the State Highway and Public Transportation Commission, now the Texas Transportation Commission, to act as agent for the State of Texas as the nonfederal sponsor of the Gulf Intracoastal Waterway in Texas.

The act also instructed the commission to evaluate the Gulf Intracoastal Waterway as it related to Texas, including an assessment of the importance of the waterway, an identification of principal problems and significant modifications to the waterway, and specific recommendations for legislative action, if any.

The evaluation mandated by the act has been conducted and a report prepared; it represents information based upon available data and reflects the current status of waterway-related matters, as well as the possible future of these matters. It also reiterates the desire of the commission to foster the growth of shallow-draft navigation in Texas, while simultaneously fostering the protection and enhancement of the coastal environment.

The report is hereby submitted to the Seventy-third Legislature in accordance with the Texas Coastal Waterway Act of 1975.

Sincerely,



Arnold W. Oliver, P.E.  
Executive Director

# T A B L E O F C O N T E N T S

	Page
EXECUTIVE SUMMARY	ix
PREFACE	xix
CHAPTER ONE            THE TEXAS WATERWAY STORY	1
CHAPTER TWO            THE ACQUISITION PROCESS	13
CHAPTER THREE         ACQUISITION OF DISPOSAL SITES	21
CHAPTER FOUR         A THREAT TO THE WATERWAY	33
CHAPTER FIVE         BENEFICIAL USE PROJECTS	43
CHAPTER SIX            LEGISLATIVE RECOMMENDATIONS	51
BIBLIOGRAPHY	55

EXECUTIVE SUMMARY

## EXECUTIVE SUMMARY

The work program in 1990-1991 for the Texas Department of Transportation, as nonfederal sponsor to the Gulf Intracoastal Waterway, has been concentrated in the Baffin Bay area of the Lower Laguna Madre coastline. A budget of \$1.35 million has been ear-marked for the purchase of four disposal sites totaling 750 acres. Penascal Point in Kenedy County was selected by a task force for the location of a 250-acre site. This site has been surveyed and is in the process of being appraised. Soon after the appraisal is received by the department, a formal offer for purchase of the site will be forwarded to the landowner.

In Kleberg County, three sites totalling 500 acres were located on the King Ranch. Subsequent discussions with the ranch managers indicated that a donated easement for use of these sites is a strong possibility, if at the termination of use the sites would revert back to the ranch. Topography of the sites is conducive to sheet disposal of dredged material which lets the land more readily return to natural pastureland.

With the strong possibility of the monetary savings from those donations, it was possible to pursue the acquisition of an 89-acre site in the Redfish Bay area of Aransas County. This property was being offered by the Federal Deposit Insurance Corporation after a bankruptcy had been declared. Property in this area had been researched before, but a "windshield appraisal value" of \$18,000-\$20,000 per acre precluded any purchase of a reasonably sized site. A purchase of one tract at those costs would have been more than the budget allocation for two bienniums.

This page replaces an intentionally blank page in the original.

-- CTR Library Digitization Team

The department was able to acquire the 89 acres for \$200,000 or \$2,247 per acre. This was a tremendous savings compared to the previous market price and furnished the U. S. Army Corps of Engineers a disposal site in a very critical area.

The department was instrumental in acquiring an easement for a one-time use of 150 acres near Jones Bay in Galveston County. This previously designated disposal site was at one time to be an integral part of an extensive residential and recreational development. Financial backing for the development has since fallen through and the department will pursue the acquisition for a permanent site.

Erosion along the Texas coastline is continually active, and in the Sargent, Texas, Matagorda County area, is threatening to breach the Gulf Intracoastal Waterway. A breach would subject the waterway to gulf wave and current action. This action would interrupt service of the waterway to the detriment of users who depend on its existence. The Corps of Engineers has concluded reconnaissance and feasibility studies on solutions to the erosion situation. Study findings were submitted to Congress for authorization and funding to construct a protective wall system to stop this occurrence. Authorization for the project occurred in November, 1992. Funding will be from federal dollars and from the Inland Waterways Trust Fund which is a fund accumulated by a marine fuel tax and set aside for rehabilitation of the nation's inland waterway system. This is a fully federal controlled project and the state is not expected to participate unless the proposed funding is not authorized.

Governor Ann Richards has assured all concerned that the state will help in any way necessary. However, it is expected that due to certain



This page replaces an intentionally blank page in the original.

-- CTR Library Digitization Team

federal land acquisition powers, fast-tracking of the project can best be accomplished through full federal control.

The Corps of Engineers is placing more emphasis on beneficial uses for the materials dredged from the waterway. Ten broad categories for beneficial uses are habitat development; beach nourishment; aquaculture; parks and recreation; agriculture; forestry and horticulture; strip mine and erosion control; construction and industrial use; material transfer (fill, dikes, levees, parking lots, roads); and multiple purposes. As this list indicates, dredged material can be construed as a resource rather than an undesirable by-product of maintaining the waterway. Notable beneficial use projects proposed and accomplished along the Gulf Intracoastal Waterway are as follows:

1. The Laguna Madre Seagrass project will transplant seagrasses onto open-water disposal sites.
2. A West Bay demonstration project that rebuilt an emergent barrier island to retard erosion and protect the waterway using different erosion protection methods.
3. The Pelican Spit project has created a marsh in a shallow, open-water disposal site by placing dredged material in shallow waters and planting aquatic vegetation.
4. The Sundown Island project renourished a bird rookery island as a protection against erosion of the island.
5. A Long Reef and Deadman Island renourishment project provided the same benefits as those for Sundown Island.

The Texas Transportation Commission, as directed by the Texas Coastal Waterway Act of 1975, continually evaluates the waterway with

This page replaces an intentionally blank page in the original.

-- CTR Library Digitization Team

respect to the promotion and continuance of the waterway, and the protection of coastal resources. As such the following recommendations are submitted for legislative consideration and action.

The state continues to recognize and promote the Gulf Intracoastal Waterway as an integral and valuable part of the state's multimodal transportation system.

The state continues to accept the responsibility as nonfederal sponsor for the Gulf Intracoastal Waterway and increases funding to support projects using dredged material for beneficial purposes and to support disposal management techniques.

Services be acquired to inventory existing upland disposal sites and recommend disposal management procedures to increase storage capacity.

A master plan be authorized to prepare for disposal needs for a minimum period of fifty years.

This page replaces an intentionally blank page in the original.

-- CTR Library Digitization Team

P R E F A C E

This page replaces an intentionally blank page in the original.

-- CTR Library Digitization Team

## PREFACE

Prior to 1975, the Gulf Intracoastal Waterway in Texas had no single, local, nonfederal sponsor. Various navigation districts, river authorities, and port authorities located along the reaches of the Gulf Intracoastal Waterway attempted to coordinate local management efforts with those of the federal sponsor, the United States Army Corps of Engineers.

In 1975, the state legislature passed the Texas Coastal Waterway Act. This act authorized the State of Texas to act as local, nonfederal sponsor to the Gulf Intracoastal Waterway in Texas and designated the State Highway and Public Transportation Commission, now the Texas Transportation Commission, to act as agent for the state in fulfilling the responsibilities of the nonfederal sponsor.

The nonfederal sponsor works closely with the United States Army Corps of Engineers to provide local cooperation and input into federal projects. Local sponsorship requirements may vary as different projects are authorized by the United States Congress. It is usually the responsibility of the nonfederal sponsor to provide all land needed for construction and maintenance of the project at no cost to the federal government. Many projects also require that the local sponsor make any necessary alterations to pipelines, cables, and other utilities which may be located in the project area. The local sponsor also may be required to construct and/or maintain containment facilities for disposal material. Whatever the particular requirements of the local, nonfederal sponsor may be, it is a general requirement that the federal government be held free from any damage that might



This page replaces an intentionally blank page in the original.

-- CTR Library Digitization Team

result from construction and maintenance of the project. In the case of state sponsorship, this requirement can be fulfilled only to the extent permitted by state law.

In addition to serving as the nonfederal sponsor of the Gulf Intracoastal Waterway, the Texas Transportation Commission received a legislative mandate to carry out the coastal policy of the State of Texas. The state has declared its support of the shallow-draft navigation of the state's coastal waterway in an environmentally sound fashion and will strive to prevent the waste of both publicly and privately owned natural resources while preventing or minimizing adverse impacts to the environment. The state has also pledged itself to maintaining, preserving, and enhancing wildlife and fisheries. Much of the state's coastal policy emphasizes the importance of protecting the environment, while supporting navigation functions at the same time.

To carry out the mandate and to further discharge the duties of the nonfederal sponsor, the commission was instructed to continually evaluate the Gulf Intracoastal Waterway as it relates to Texas. Such an evaluation involves the consideration of both tangible and intangible values. If the state is to prevent the waste of its coastal resources and minimize adverse environmental impacts, while simultaneously fostering an efficient system of navigation, it is first necessary to identify existing conditions and needs. This report, the ninth in the series as required by the act, is submitted to the Seventy-third Legislature to assist in achieving usage of the Gulf Intracoastal Waterway to its full potential, while protecting coastal resources.

CHAPTER ONE

THE TEXAS WATERWAY STORY

## THE TEXAS WATERWAY STORY



### INTRODUCTION

The Gulf Intracoastal Waterway is a canal that parallels the Gulf of Mexico's coastline from the southernmost tip of Texas at Brownsville to St. Marks, Florida. This man-made channel, authorized by the United States Congress, is maintained by the U. S. Army Corps of Engineers at a bottom width of one hundred twenty-five feet and a minimum depth of twelve feet. In nautical terms the waterway is defined as a shallow-draft canal, because it is less than twenty-five feet deep. It capably carries a large variety and a great number of vessels and tons. The Gulf Intracoastal Waterway is an integral part of the total inland transportation system of the United States, relative to the systems of the Atlantic Coast, Mississippi River and Antilles, Great Lakes, Pacific Coast, Alaska, and Hawaii. The Gulf Intracoastal Waterway is a vital link in the transportation network that moves many of the commodities called for by this nation and foreign markets as well.

### DEVELOPMENT OF THE GULF INTRACOASTAL WATERWAY IN TEXAS

The onset of an inland transportation system in Texas began in 1850, just five years after Texas was admitted to the Union. Local business interests, who pioneered inland navigation in Texas, connected portions of the state's coastline by dredging links between the natural bays, lakes, rivers, and bayous. The construction of Texas' first navigable segment, the Galveston and Brazos Canal, was completed around 1853. This canal's depth ranged from three to six feet and connected West Galveston

Bay and the Brazos River. The Rivers and Harbors Act of 1873 was the first federal step toward construction of a continuous marine transportation system west of the Mississippi River. This act appropriated funds for a survey to "connect the inland waters along the margin of the Gulf of Mexico from Donaldsonville, Louisiana, to the Rio Grande River in Texas by cuts and canals."<sup>1</sup>

The expansion of the inland system throughout the coastline of Texas was not accomplished in one effort, but rather by the construction of segments through a series of congressional acts passed between 1925 and 1942. By 1941, the Gulf Intracoastal Waterway in Texas extended from the Sabine River to Corpus Christi and was 100 feet wide by 9 feet deep. Improvement of the canal to its current status was authorized by legislation passed in 1942; construction was completed by 1949. The result was an extended route from the Sabine River to Brownsville, Texas, with the new dimensions of 125 feet wide by 12 feet deep.

#### THE PATH OF THE WATERWAY

The length of the Texas Gulf Intracoastal Waterway is 426 miles and its course encounters a variety of sights along the way. Dunes, flats, fishing cabins, bays, rivers and streams, farm and ranch lands, wetlands, wildlife and marine life, parks, refuges, and historic landmarks can be seen from the canal. Other widespread features along the waterway include industrial, recreational, and residential developments.

The path of the waterway is etched through many shallow bays and often lies on the landward side of the natural barrier islands that

---

<sup>1</sup>Rivers and Harbors Act of 1873, "House Document 1491, 62nd Congress," Volume 1.

protect most of the Texas coastline. This inward course gives the waterway its "inland" classification. Many creeks and streams empty into the Gulf Intracoastal Waterway, but only two major rivers flow directly into it, enroute to the Gulf of Mexico. These rivers, the Colorado and the Brazos, have currents strong enough to require protective flood control gates for the waterway during high-water stages.

The route of the Gulf Intracoastal Waterway leads through some of the most productive, yet sensitive, areas of the Texas coast. These areas, or wetlands, are widely recognized as the nurseries for the finfish and shellfish, so valuable to the commercial and recreational industry. The environmentally delicate wetlands are also the nesting or feeding grounds for vast numbers of waterfowl, mammals, and reptiles. The native vegetation of wetlands is important for its ecological contributions to the coastal system. The vegetation provides sustenance for the animal inhabitants and also retards erosion by holding onto the unstable soil that is common among coastal regions. Much has been learned in recent years about the importance of maintaining a balanced relationship between the delicate nature of wetlands and the effects on them from man-made water management projects. As a result, there are many state and federal agencies to administer the necessary regulations that protect the fragile wetlands and the coastal environment.

#### A BUSY TRANSPORTATION ARTERY

One of the initial functions of the Gulf Intracoastal Waterway was to provide protected inland transportation of goods and troops during World War II. It has since evolved into a multipurpose waterway with a wide assortment of users. To many individuals, the Gulf Intracoastal Waterway

is largely associated with recreation. Sport fishing and boating are very popular along the Texas coast, and many facilities have been established on or near the waterway. However, it is the commercial trade link that the waterway provides, and the subsequent economic prosperity for the Texas coastal region and the state as a whole, that should speak for much of the waterway's value.

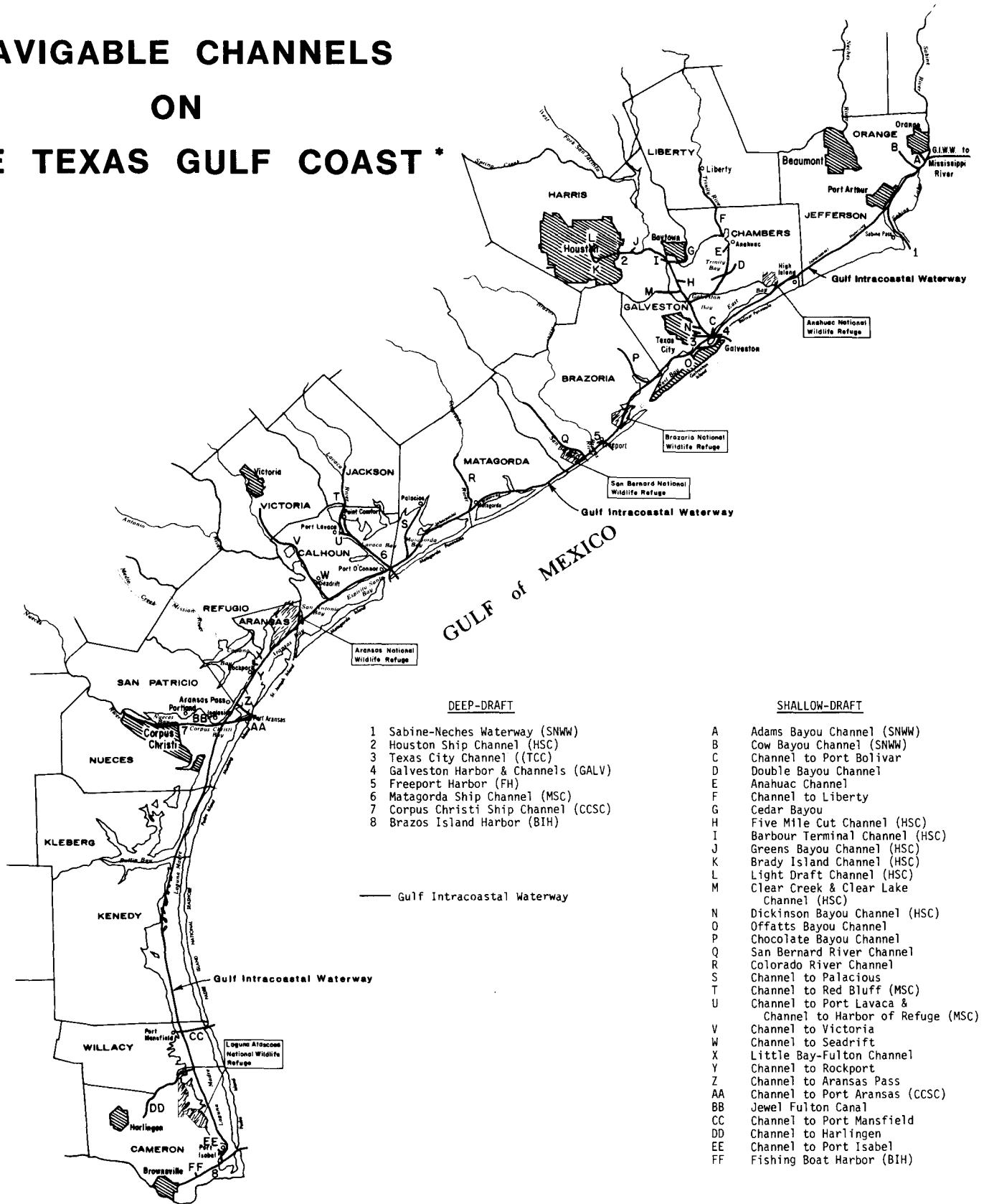
Many industries have concentrated in the coastal region of Texas to capitalize on the economic benefits of water transportation efficiency. Thousands of jobs are directly and indirectly linked to the waterway, and almost 75% of all goods shipped in Texas are moved by water.<sup>2</sup> The transfer of goods by water is second only to pipelines in cost efficiency, but is not limited by specialization as pipelines are.<sup>3</sup> The commercial trade between Texas ports and other port centers of the United States, as well as foreign trade markets, is strongly facilitated by the Gulf Intracoastal Waterway. The waterway is directly linked with Texas' twelve deep-draft port channels, and it greatly increases the level of access and level of service to many tributary channels and private channels. The deep-draft port channels in Texas are Sabine Pass Harbor, Port Arthur Canal, Beaumont, Orange, Galveston Ship Channels, Houston Ship Channel, Texas City Channel, Freeport Ship Channel, Matagorda Ship Channel, Corpus Christi Ship Channel, Port Isabel Ship Channel, and Brownsville Ship Channel. Figure 1 depicts the Gulf Intracoastal Waterway in Texas and other channels maintained by the Corps of Engineers, Galveston District.

---

<sup>2</sup>Sea Grant Program, Texas A & M University. Primary Economic Impact of the Gulf Intracoastal Waterway in Texas. College Station, Texas, 1974, p. 128.

<sup>3</sup>State Department of Highways and Public Transportation, The Gulf Intracoastal Waterway in Texas, 1976. p. 8.

# NAVIGABLE CHANNELS ON THE TEXAS GULF COAST \*



\*These are channels maintained by the U.S. Army Corps of Engineers, Galveston District, SWGCO-M, 1992.

Figure 1



The Gulf Intracoastal Waterway is most effectively used by barge traffic, and according to waterborne commerce statistics compiled by the Corps of Engineers, an annual average of 70.8 million tons of goods has been barged along the Texas Gulf Intracoastal Waterway between 1980 and 1990. Petroleum products, chemicals and crude petroleum account for approximately 90% of the 1990 average tonnage moved on the waterway. Other bulk materials such as minerals, metals, grains, shell, and miscellaneous materials account for the remaining annual percentage. Commercial fishing boats and various work boats associated with the oil and gas drilling industry in the Gulf of Mexico also use the waterway.

Recreation is another important factor contributing to the traffic on this busy canal. The gulf coast is one of Texas' largest playgrounds and boats are a favored access to coastal recreation. Not only is the Gulf Intracoastal Waterway used by boaters as a reliable highway to other coastal regions, but it is also used for skiing, fishing, and cruising. For small and less seaworthy vessels, the waterway offers protected passage from the stormy nature of the Gulf of Mexico, and moorings are located periodically along the canal for those who may need them. Larger vessels use the waterway, because it has sufficient depth for their deeper draft hulls. The various uses of the waterway have been studied by the Texas Department of Transportation, revealing that recreational use of the Texas Gulf Intracoastal Waterway is quite extensive.

In 1980, the department conducted a random survey of recreational boat owners in Texas and determined that 2.4 million recreational boat trips originate in Texas coastal waters annually.<sup>4</sup> The survey also

---

<sup>4</sup>State Department of Highways and Public Transportation, The Gulf Intracoastal Waterway in Texas, 1982.

revealed that 1.9 million, or 79% of the total 2.4 million recreational trips, utilize the Gulf Intracoastal Waterway. (These trip figures are used to describe the total number of trips made by each boat. If one boat is put in coastal waters ten times in a year, it would equal ten trips annually.) Over 65% of the recreationists surveyed, reportedly use the Gulf Intracoastal Waterway as a major thoroughfare between coastal bays, and most of the trip lengths on the waterway are between 5 and 50 miles each.

#### OVERVIEW OF 1990

In 1990, 82.3 million short tons of goods moved on the Texas Gulf Intracoastal Waterway. The estimated value of those goods transported in a safe, efficient, and economic manner amounted to 23.9 BILLION DOLLARS.<sup>5</sup> Texas handled approximately 70% of the 1990 total short tons moved on the waterway between Brownsville, Texas and St. Marks, Florida. The United States Army Corps of Engineers compiles tonnage statistics<sup>6</sup> and also provides estimates for evaluating the commercial impact of the waterway. Revised estimates for the average number of tons per barge, show that about 38,279 barges were used to move the 82.3 million tons in Texas during 1990. If the same volume of goods were moved via railroad transportation, approximately 574,185 railroad carloads would have been required. If moved via truck transportation on the state highway system, it would have required 2,296,740 semitrailer truckloads resulting in

---

<sup>5</sup>Texas Transportation Institute, Policy and Management Division, Texas A & M University System, College Station, Texas. 1990 values determined by updating a 1982 Data Resources, Inc. Study for the U. S. Army Corps of Engineers. (See Bibliography.)

<sup>6</sup>U. S. Army Corps of Engineers. Waterborne Commerce of the United States. Part 2 and Part 5, 1990.

considerable wear and tear on the roadway surfaces.<sup>7</sup> Safe transportation of barged materials, many of which are hazardous, is recorded in Table 2-23 of the U. S. Office of Technology Assessment's 1986 report, "Transportation of Hazardous Materials." For the period from 1976 to 1984, the total number of documented, hazardous spills in Texas included 48 by air transportation; 2,854 by truck; 1,265 by rail; 6 by water transportation; and 18 by other.

In addition to safely transporting goods and serving recreational boaters, the Gulf Intracoastal Waterway also provides access to the prime fishing areas for the commercial industry and sport fishing boats. This group produced a 1990 catch of 98.8 MILLION POUNDS of shrimp, oysters, crabs, and finfish amounting to an ex-vessel value (value received at wholesaler's dock) exceeding 175.5 MILLION DOLLARS.<sup>8</sup> The Gulf Intracoastal Waterway itself is a prime fishing area as it is part of the migratory route of schools of fish as they move in, out, and between the different bay systems.

## CONCLUSION

The early settlers of Texas colonized along natural water routes, because they knew that a close proximity to water transportation would bring many advantages. Since the dredging of Texas' first segment, the

---

<sup>7</sup>Average estimated number of tons per barge was provided by the Galveston District Corps of Engineers, Economic and Social Analysis Branch. 1990. Translations from barges to railroad cars and semi-trailer trucks calculated from figures given by Kelly, Brig. General Patrick, U. S. Army Corps of Engineers. Speech. Presented at the meeting of the American Military Engineers in Houston, Texas, September 22, 1988.

<sup>8</sup>Texas Parks and Wildlife Department, Trends in Texas Commercial Fishery Landings, 1977-1990.

waterway's service, value, and subsequent effect of economic prosperity have grown significantly. The Gulf Intracoastal Waterway is extensively used by a wide variety of people and imparts many benefits both directly and indirectly to the state. All these benefits, plus the waterway's importance to the nation's defense, account for the wisdom of protecting and maintaining this transportation mode.

This page replaces an intentionally blank page in the original.

-- CTR Library Digitization Team

CHAPTER TWO

THE ACQUISITION PROCESS

This page replaces an intentionally blank page in the original.

-- CTR Library Digitization Team

## THE ACQUISITION PROCESS

### INTRODUCTION AND GENERAL SUMMARY



For the 1992-1993 biennium, the Texas Legislature appropriated 1.35 million dollars for acquiring disposal sites to facilitate maintenance dredging of the Gulf Intracoastal Waterway. It is estimated that approximately 900 acres can be purchased with that funding, depending on the number of sites that may go to condemnation court. In order to continue support of the waterway in an environmental manner, the state as nonfederal sponsor of the Gulf Intracoastal Waterway, will continue to acquire upland disposal sites when feasible. Efforts are underway to identify additional sites for acquisition in the 1994-95 biennium. Additional state funding will be needed to continue this method of disposing of materials dredged from the waterway.

To acquire the needed disposal sites, the Texas Department of Transportation coordinates with its appropriate divisions and districts to handle land acquisitions. Several items are important in making acquisitions for disposal sites, including an understanding of applicable state and federal laws, identification of suitable sites, coordination of required environmental clearances, public involvement, site-specific authorization, and promulgation of appropriate acquisition procedures. The department's standard right-of-way acquisition procedures fully comply with the federal requirements of the nonfederal sponsor, and these procedures are followed in acquiring the sites.



Through the U. S. Army Corps of Engineers, the department has access to information on dredging frequencies, volumes of materials removed, and various disposal methods that are environmentally and operationally suitable for maintenance of the Gulf Intracoastal Waterway in Texas. The department also consults with natural resources agencies regarding disposal-related environmental concerns. All these factors determine the need for disposal, location, size, and design of disposal sites.

#### STEPS TO SITE-SPECIFIC AUTHORIZATION

##### Selection of Proposed Sites

The department has organized a state agency advisory committee, the Gulf Intracoastal Waterway Advisory Committee (GIWAC), to help address problems and recommend solutions concerning the waterway. To physically investigate coastal areas that need new or additional disposal capacity, the department appointed members from the advisory committee and representatives from federal agencies, including the National Marine Fisheries Service, U. S. Army Corps of Engineers, and U. S. Fish and Wildlife Service, to serve on a task force. This task force of engineers and resource experts makes preliminary selections of environmentally and operationally suitable sites in the areas of need. After this selection and with the concurrence of the advisory committee, the Corps of Engineers proceeds to obtain the environmental clearance for use of the proposed sites. Only after environmental clearance has been assured will the Texas Department of Transportation conduct the required public hearings on specific sites. As part of the hearing process, the Texas Transportation Commission must grant authorization to the department for proceeding with site-specific acquisitions.

### Environmental Clearance

In order for any area to be used for disposal of dredged materials, there are federal and state laws which mandate that such use be environmentally acceptable. The National Environmental Policy Act sets federal guidelines which the Corps of Engineers must follow in making environmental evaluations of proposed sites. The Texas Coastal Waterway Act of 1975 requires that the Texas Transportation Commission determine whether proposed sites can be used without unjustifiable waste of public or privately owned natural resources and without permanent, substantial, adverse impact on the environment, wildlife, or fisheries.

Agencies involved with protecting natural and historical resources (the National Marine Fisheries Service, Texas General Land Office, Texas Parks and Wildlife Department, Texas Historical Commission, Texas Water Commission, and U. S. Fish and Wildlife Service) assist in developing facts and recommendations during the environmental evaluation. After the environmental evaluation is completed and the proposed site has been found to be acceptable for disposal use, the Corps of Engineers documents the analysis in an environmental assessment and issues a finding of no significant impact (EA/FONSI). The environmental assessment and finding of no significant impact is filed with the Environmental Protection Agency.

A final review of the environmental assessment and findings is conducted by the Texas Department of Transportation. If the department determines the disposal site can be used in an environmentally acceptable manner, the environmental clearance process is complete, and the department proceeds with the required public hearings on the site.

The environmental documents are available for viewing at the Texas Department of Transportation and the Corps of Engineers, Galveston District.

#### Public Involvement

The 1975 Texas Coastal Waterway Act requires the Texas Transportation Commission to hold public hearings for the purpose of receiving evidence and testimony concerning the desirability of proposed dredged material disposal sites. If the commission determines that use of the sites is acceptable, the commission then authorizes the department to proceed with acquisition. To better inform communities of the proposed use of an area, the department often conducts public meetings prior to the official public hearings. Public meetings are held in cities located near the proposed sites; the public hearings are held in Austin.

Local public meetings and the required public hearings are both advertised as specified in the 1975 Texas Coastal Waterway Act. Legal notices are published in newspapers that are circulated in the involved counties for three consecutive weeks before the public meetings and hearings. Legal notices are similarly published in the Texas Register. In addition, landowners, local public officials, and radio stations are notified.

Environmental documents and aerial displays regarding the proposed sites are exhibited at the public meetings and hearings. The proceedings of each are documented and become part of an official record. During these public forums, the department explains the state's nonfederal responsibility for the Gulf Intracoastal Waterway, describes the waterway's maintenance program and disposal needs, and identifies the proposed sites. The public is given the opportunity to comment.

### Commission Authorization

After due consideration of all evidence, testimonies, and environmental findings, the commission determines whether each proposed site can be used without unjustifiable waste of public or privately owned natural resources and without permanent, substantial, adverse impact on the environment, wildlife, or fisheries. Acting through commission minute orders, the commission then authorizes the department to proceed with acquiring the approved sites.

### ACQUISITION STEPS

#### Surveying

After commission authorization, the acquisition process begins with obtaining a survey of the site. Most landowners agree to allow access to their property, and the areas are then surveyed to accommodate the size and design needed for a site. Aerial surveys may be used if a landowner does not grant access to the property.

Surveyors draw plats of the sites showing ownership, area, the disposal site perimeter, property access, and improvements, if any, such as pipelines or structures. The department does not intend to encumber habitable structures or dedicated roads. Legal descriptions, called metes and bounds, are written to be recorded with the plats.

Since erosion is widespread along the Texas coastline, surveys of some properties may determine some boundaries to be under water. To provide access for disposal operations, the state may acquire property to the Gulf Intracoastal Waterway's right-of-way line. Eroded acreage between the waterway right-of-way and the bank is considered in the appraisal process with the approved values for purchases reflecting this condition.

### Appraisal

In the initial stages of the appraisal process, the department notifies landowners of a proposed acquisition. The Uniform Relocation Assistance And Real Property Assistance and Real Property Acquisition Policies Act of 1970, as amended, requires such notice. Landowners are further notified by the department of an appraiser's upcoming contact with the landowner. Landowners are entitled to accompany an appraiser's inspection of the site. Correct legal and appraisal procedures are strictly adhered to in determining the fair market value of the sites.

### Negotiations

After appraisals are completed, a negotiator from the department personally contacts landowners and furnishes them a written offer. A departmental negotiator explains the acquisition process and the landowners' alternatives should they not accept the proposed offer. Details on the proposed use of the land as a disposal site are explained when requested. If landowners choose to donate the use of their property, they become eligible for ad valorem tax breaks under the Legislative Law, S. B. 982, while retaining title to their land.

### Acquisition

The department's preferred acquisition method is to purchase in fee, since the leasing of the land over an extended period could approach the fee cost. Landowners are given not less than one month to consider offers. If an owner is dissatisfied and chooses to refuse the offer, the state may negotiate, or may initiate eminent domain, or condemnation proceedings.

CHAPTER THREE

ACQUISITION OF DISPOSAL SITES

This page replaces an intentionally blank page in the original.

-- CTR Library Digitization Team

## ACQUISITION OF DISPOSAL SITES



During 1991, the Texas Department of Transportation obtained approval from the Texas Transportation Commission to proceed with acquiring five new sites for upland disposal. Currently, these sites are at different stages in the acquisition process. A sixth site will be taken through the approval process in the near future after a temporary, one-time use of the site is completed. Each of the six upland disposal sites will provide a minimum of thirty years storage capacity and will substantially reduce impacts to aquatic ecosystems. Three of the sites also have recycling potential for continued future use.

The department's preferred method of acquiring these sites is to obtain them in fee simple, or an unencumbered ownership. To achieve fee simple ownership, the department can either pay an approved value, receive a donation, or if negotiations stalemate, implement eminent domain, or condemnation proceedings.

In 1992, the department purchased one of the five approved sites in fee simple; another is scheduled for 1993. For the remaining three approved sites, the landowner will donate them in fee simple for as long as the state may need them. The department expects to seek commission approval of the one-time use site in 1993 and then proceed with that acquisition.



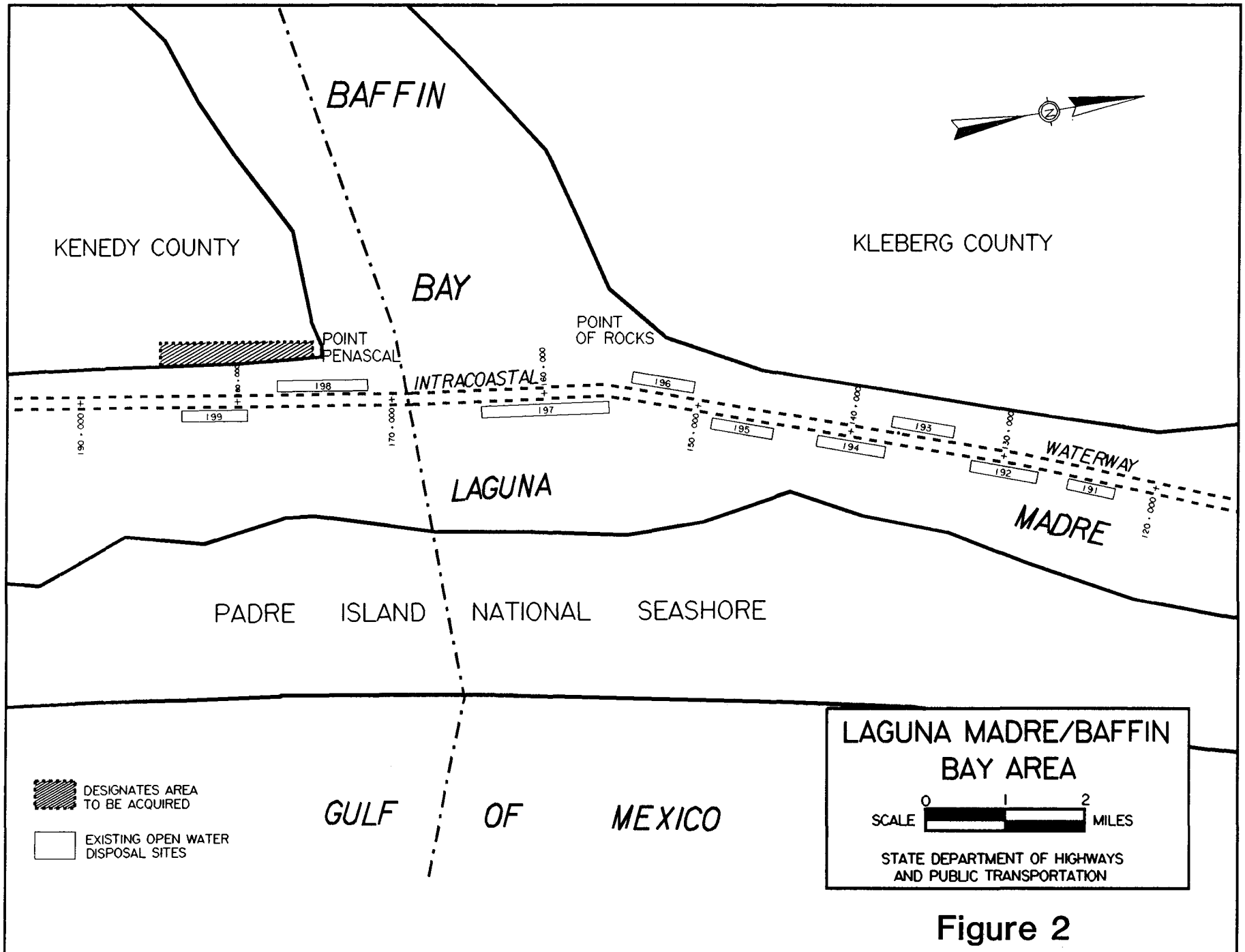


Figure 2

## KENEDY COUNTY - POINT PENASCAL SITE

On May 29, 1991, the Texas Transportation Commission approved the acquisition of a 250-acre site in Kenedy County on Point Penascal. (Figure 2) The site will be leveed for contained disposal and will last at least 30 years. Afterwards, the site can be recycled for use by excavating the dried material. Replacing open-water disposal sites with this upland site will relieve impacts on valuable seagrass beds and benthic communities in the Laguna Madre. In addition, halting open-water disposal here will prevent the undesirable effect of forming compartments which restricts circulation and increases salinity. Very little disturbance (about three acres) will occur from discharge pipes reaching from the waterway over to the disposal site.

The first step in the department's acquisition process is obtaining a survey of the site. A survey of the Kenedy County Point Penascal site has been completed, and a metes and bounds description prepared. An appraisal of the site is scheduled for late 1992. After the approved appraisal is obtained, the negotiating process will begin. Department officials will meet with each landowner to try and agree on a purchase price. Should they not accept the state's offer, the state may negotiate on certain conditions other than the value. However, if the offer is finally refused, the Attorney General will initiate condemnation proceedings on behalf of the department. Once the state acquires fee title, the state will then convey use to the Corps of Engineers.

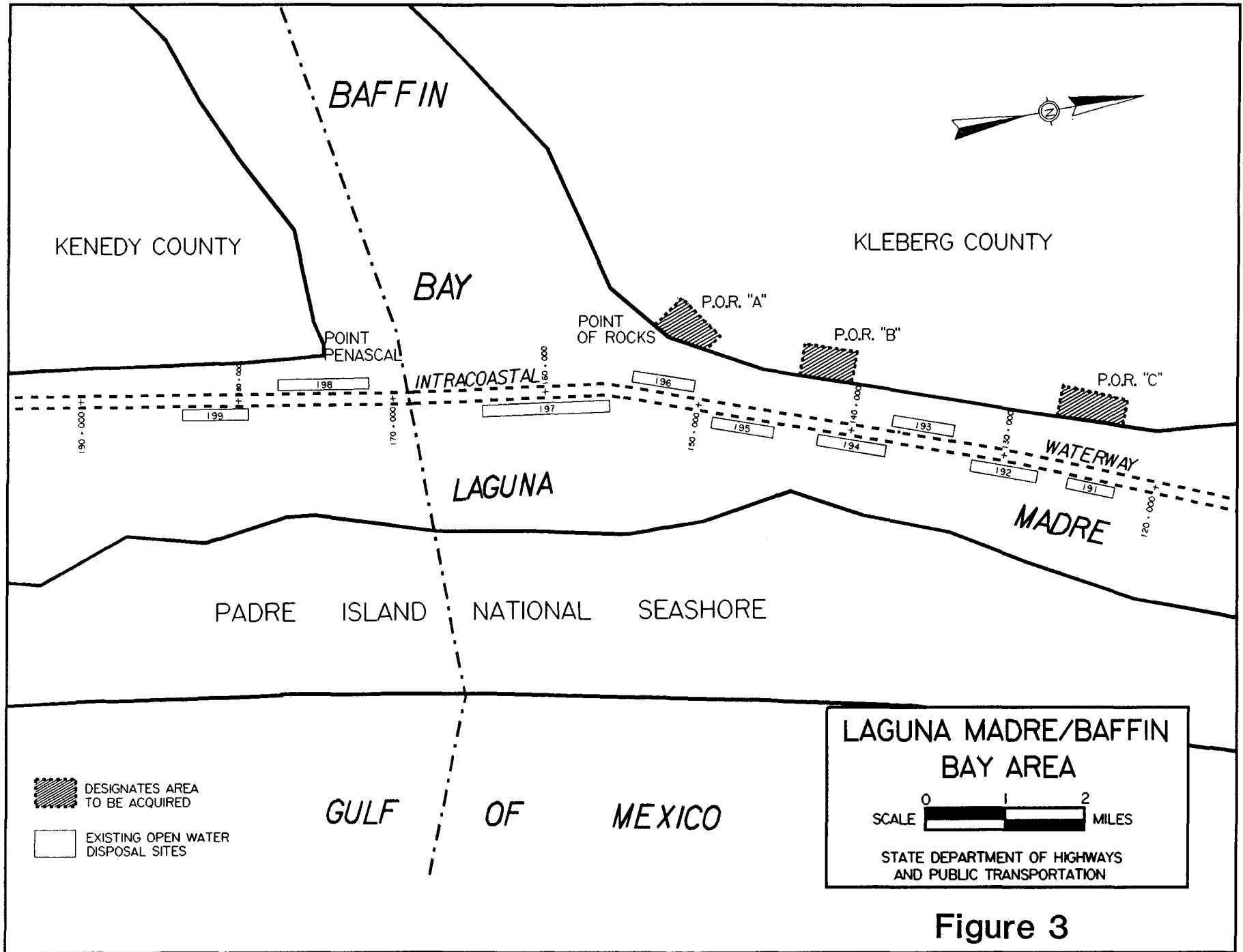
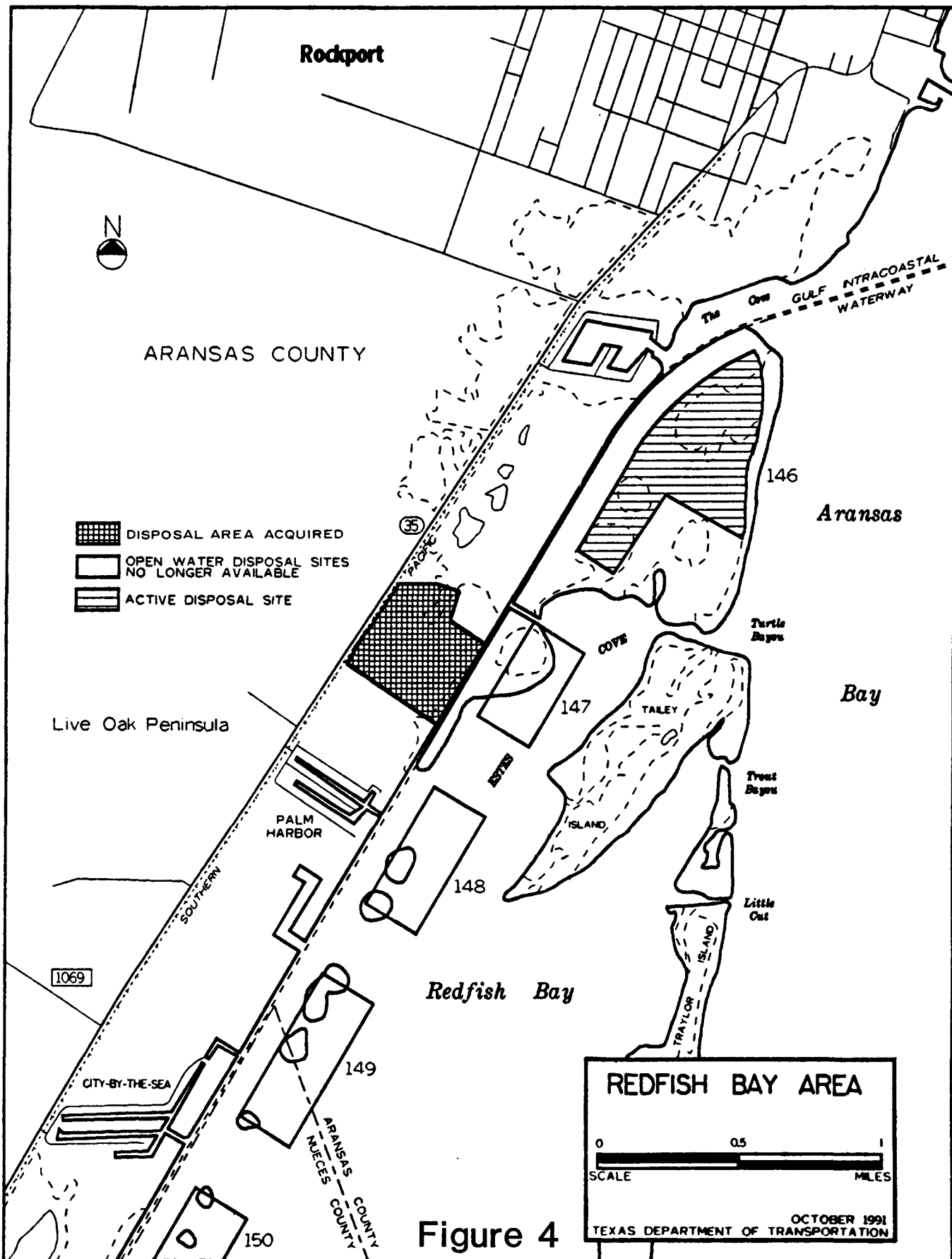


Figure 3

## KLEBERG COUNTY - POINT OF ROCKS SITES

The Texas Transportation Commission approved three sites in Kleberg County for acquisition on May 29, 1991. Situated near the Point of Rocks along the upper Laguna Madre, the three sites are 140 acres, 160 acres, and 200 acres in size. (Figure 3) Because the areas slope down toward the Laguna Madre, a sheet-flow method of disposal can be used. If necessary, wing levees will be constructed to eliminate lateral spread outside the designated sites. Future buildup of dredged material may dictate a front levee and spillway to prevent materials from flowing back into the waterway. The storage capacity for each site should last at least 50 years. These upland sites will eliminate the use of seven open-water sites, thus protecting 772 acres of valuable seagrass beds and associated marine life. Some disturbance of about 44 acres will occur from discharge pipes reaching from the waterway to the sites.

The landowner of these three sites has chosen to donate them in fee simple. Surveys of the sites are complete, and as the transaction is to be a donation, appraisals will not be necessary. The landowner's attorneys will draft a donation instrument, proposing certain conditions on conveying the sites to the state. One condition requires fencing the sites. The state will pay a reasonable amount for fencing costs, while fence maintenance will be the responsibility of the donating landowner. Once the donation instrument is agreed upon and signed, the acquisition will be complete. Within another six months, the governor will convey use to the Corps of Engineers.



**Figure 4**

## ARANSAS COUNTY - REDFISH BAY SITE

On December 19, 1991, the Texas Transportation Commission approved the acquisition of an 89-acre site located in Aransas County along Redfish Bay. (Figure 4) Redfish Bay functions as a nursery for many commercial and sport fishery species. Concern over open-water disposal into this valuable aquatic habitat has dictated that two emergent disposal areas receive the region's dredged material. Use of the new upland site will relieve pressure on those two areas which are filling prematurely. Additionally, in the event that a storm shoals the waterway, the site will provide storage capacity for an emergency dredging. The site will be leveed for confined disposal and employ a manually controlled discharge structure for water-return flow. Although some of the 89 acres will not be used due to environmental considerations, the site is expected to last a minimum of 50 years. After filling to capacity, the dried material can be removed and the site recycled for use.

In June, 1992, the department acquired this site in fee simple from the Federal Deposit Insurance Corporation. Before the site was foreclosed on by a lender, this property and others in the general vicinity were valued at \$20,000 per acre. At that price, this 89-acre site would have cost \$1.78 million plus expenses. Instead, it cost taxpayers only \$200,000 plus title expenses of \$1,700. Because the seller was cooperative, the acquisition required only six months time. Title policy and original deed have been obtained by the state and the governor's conveyance to the Corps of Engineers is expected around the end of 1992.

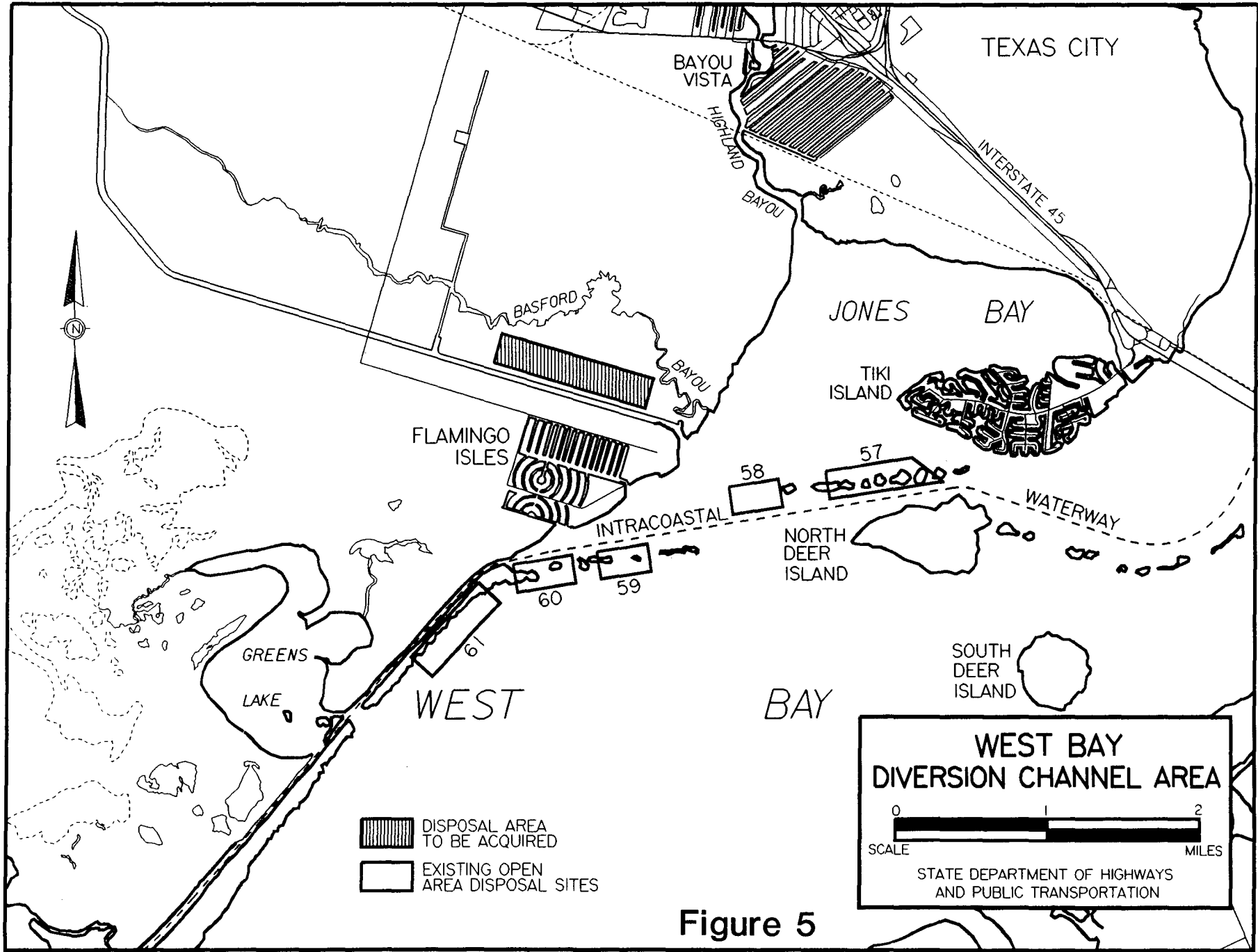


Figure 5

## GALVESTON COUNTY - FLAMINGO ISLES SITE

An estimated 150-acre, previously-used disposal site is located in Galveston County in the vicinity of Jones Bay and referred to as the Flamingo Isles site. (Figure 5) The fully leveed disposal site was once an integral part of a proposed community and recreational development. Financial backing for the developers never materialized and the property and disposal site eventually reverted to a bank. In the fall of 1991, the bank agreed to give the Corps of Engineers a one-time use of the disposal site for an upcoming maintenance dredging of the GIWW. The department worked with the Corps of Engineers and the bank to help arrange for the one-time use.

Resource agencies have voiced increasing concerns about disposal impacts to the Jones Bay and West Bay bottoms, in particular the oyster beds. Using the upland site would provide a minimum of thirty years of disposal capacity and preempt the need for open-water disposal in the immediate area. Some impacts to existing oysters in Jones Bay could occur from the discharge pipeline route; however, use of the upland site will have an overriding beneficial impact on the fishery. The department anticipates a fee simple acquisition of this existing upland disposal site in the near future. But first, commission approval must be obtained before proceeding with any acquisition steps.



This page replaces an intentionally blank page in the original.

-- CTR Library Digitization Team

CHAPTER FOUR

A THREAT TO THE WATERWAY

This page replaces an intentionally blank page in the original.

-- CTR Library Digitization Team

## A THREAT TO THE WATERWAY



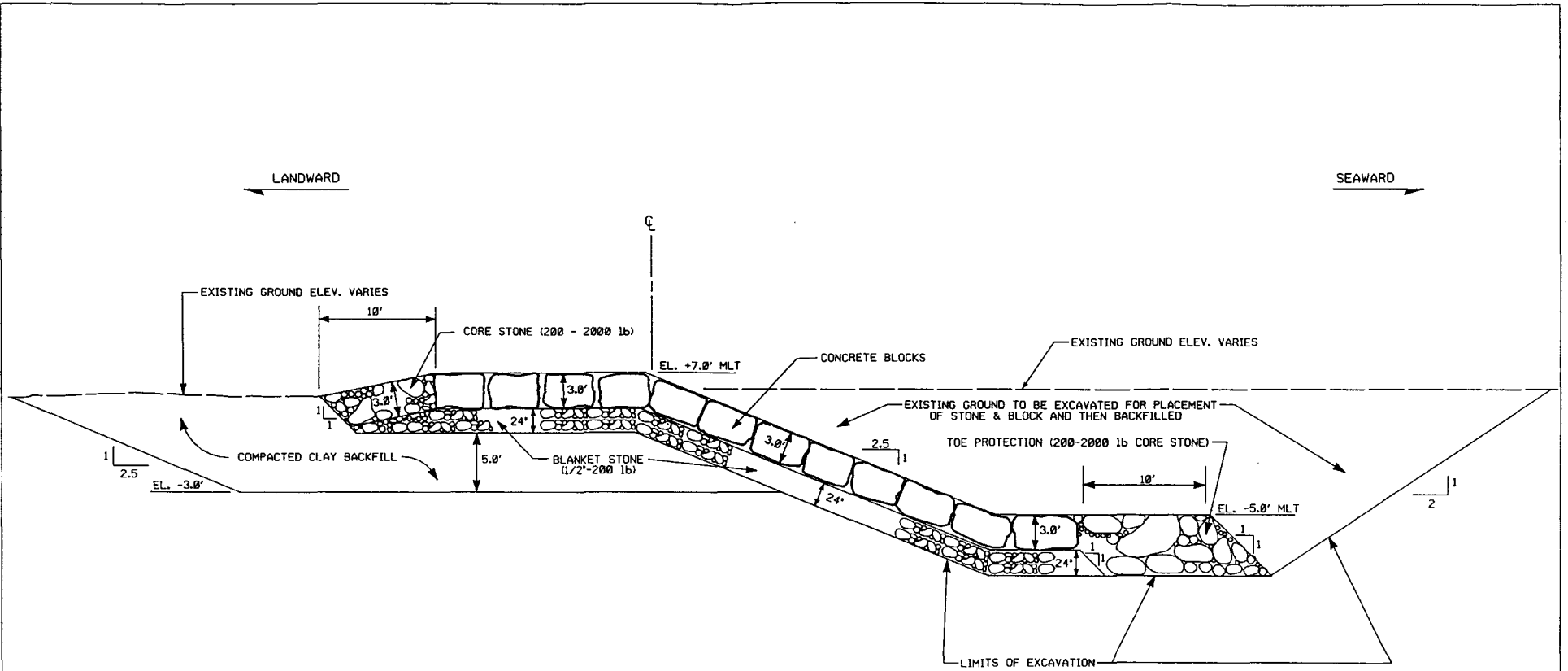
The imminent threat of gulf waters breaching a narrow strip of land in Matagorda County and interrupting the service of the Gulf Intracoastal Waterway becomes greater with each passing day. As gulf wave and current action erode away this valuable coastland it has become expedient that federal legislation be authorized and expedited to provide protection for the waterway. The U. S. Army Corps of Engineers (COE) has concluded reconnaissance and feasibility studies of the coastal erosion problem at Sargent, Texas, Matagorda County, and proposed a combination rock revetment and concrete sheetpile wall to be constructed gulfward and parallel to the waterway. (See Figures 6 & 7)<sup>9</sup> This project is to be presented to congress for authorization in November of 1992.

Various protective measures were studied and numerous feasibility reviews conducted by the Corps of Engineers, then refined to select the construction of an eight-mile long wall approximately 300 feet in front of the waterway to halt the erosion. (See Figure 8)<sup>10</sup> Construction cost is estimated to be about 85 million dollars. Construction of the wall would be divided into three separate contracts in order to address the two most seriously eroded areas that would be the first to be breached. The project is scheduled to be completed by 1998.

---

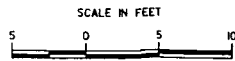
<sup>9</sup>U. S. Army Corps of Engineers, Galveston District. Gulf Intracoastal Waterway (Section 216 Study) Sargent Beach, Texas Feasibility Report and Final Environmental Impact Statement (Galveston, Texas, February, 1992). pp. 201, 117.

<sup>10</sup>Ibid. p. 215.



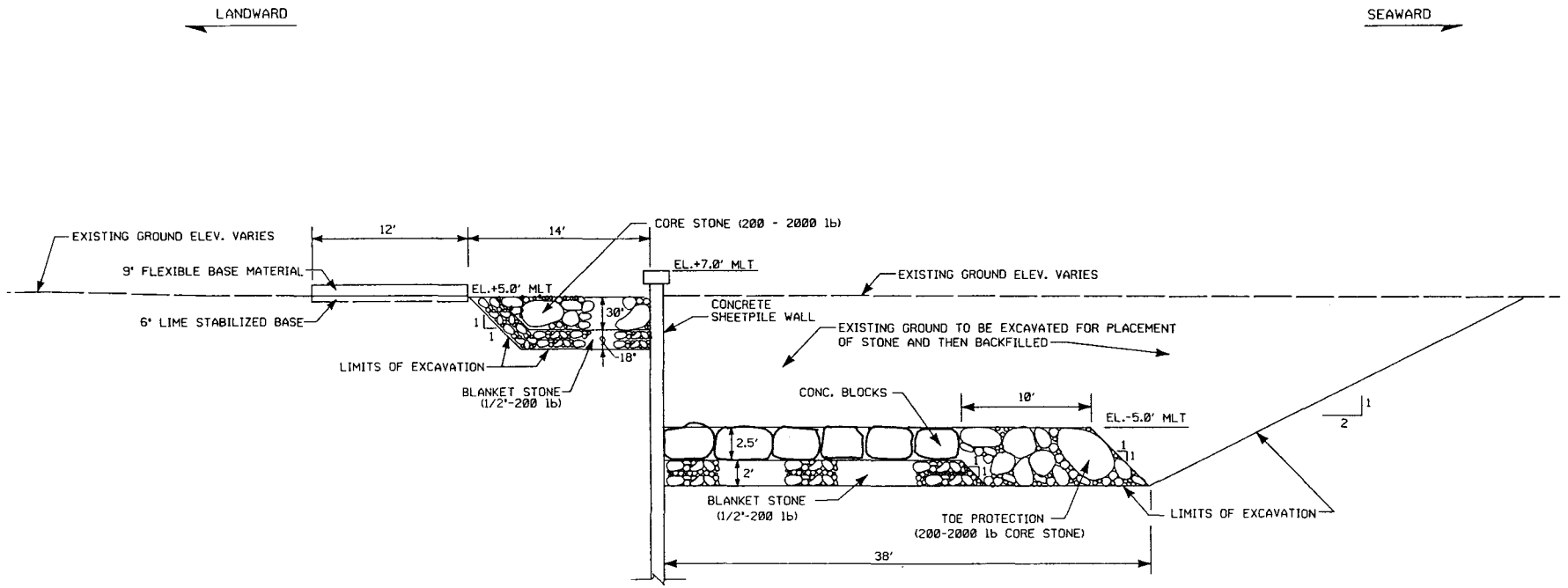
**CONCRETE - BLOCK REVETMENT**

STA. 320+00 TO 332+00  
STA. 356+00 TO 377+00

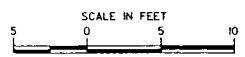


GIWW-SARGENT BEACH, TEXAS (SECTION 216) STUDY
<b>SELECTED PLAN CONCRETE-BLOCK REVETMENT</b>
U. S. ARMY ENGINEER DISTRICT, GALVESTON, TEXAS

**Figure 6**



CONCRETE SHEETPILE WALL



GIWW-SARGENT BEACH, TEXAS  
(SECTION 216) STUDY

CROSS SECTION OF  
CONCRETE SHEETPILE WALL

U. S. ARMY ENGINEER DISTRICT, GALVESTON, TEXAS

Figure 7

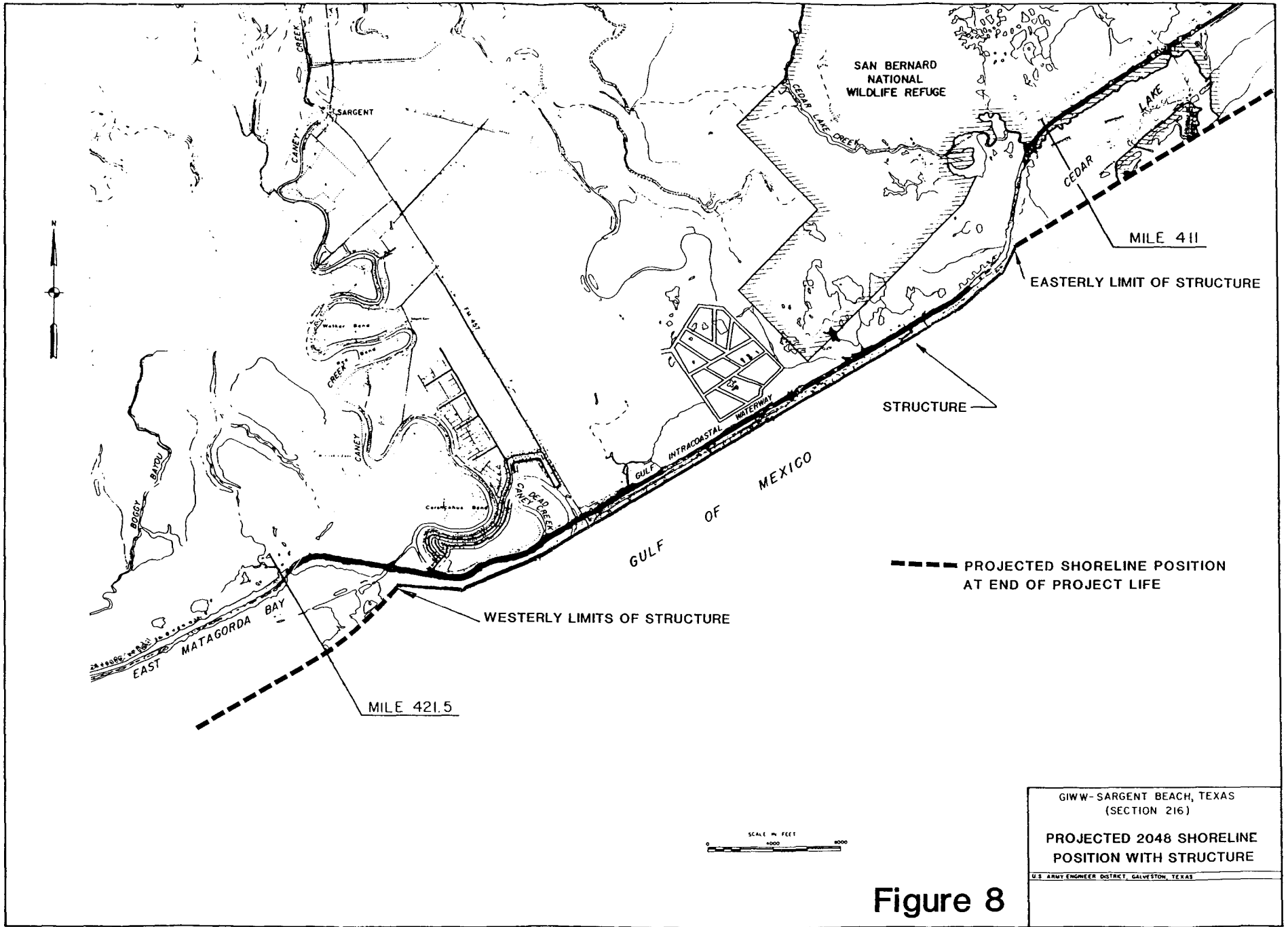


Figure 8

Many factions have been concerned with the projected interruption of waterway traffic. It is a known fact that the waterway provides a tremendous boost to the state's economic picture. So much so, that, Governor Ann Richards has been concerned enough to visit the area and offer the support of the state to the Corps of Engineers should that assistance be needed. Future plans to linkup with a Mexican coastal waterway, and therefore promote greater international trade, is another reason to protect the waterway. Concerned private companies have formed a "Coalition to Save the Gulf Intracoastal Waterway" to help in any way possible. These companies depend on the waterway for the delivery of raw materials for processing in their plants, as well as for delivery of the finished products. Some have stated that if the waterway were closed for more than a few weeks their companies could incur large financial, and possibly crippling, losses. But the closure of the waterway is continually threatened during the hurricane season, and whenever this happens the Corps of Engineers is quick to return the waterway to serviceability. It is expected that they would do so in the event general coastal erosion breached the waterway before the proposed project is begun. Local interests that include the fishing industry and businesspeople who cater to the recreational trade are also very disturbed over the possible interruption of the waterway.

The Corps of Engineers, recognizing these problems, has accelerated its efforts to complete what normally is a seven-year study and authorization period into a much shortened time of three to four years. Those efforts have been so successful that the Galveston District, Corps of Engineers, guided by Colonel Brink P. Miller, has been noted and cited for its excellent efforts in this achievement. The project study is now



complete, a course of action has been recommended, reviews and approvals have been completed and acquired, and the project submitted for congressional authorization and funding.

With congressional authorization and funding, the Corps of Engineers could then proceed to finalize Preconstruction Engineering and Design (PED). Acquisition of rights-of-way would begin in October of 1994 (COE FY '95) with a project completion date scheduled for August, 1998.

As nonfederal sponsor, the Texas Department of Transportation has monitored the project from its inception, and attended all Corps of Engineers in-house reviews in an effort to lend its support wherever possible. In addition, Governor Richards has appointed a task force of several other concerned state agencies to assist the Corps of Engineers and the nonfederal sponsor if called upon so that the project can proceed smoothly.

As proposed to congress, funding is to be provided by federal dollars and money from the Inland Waterways Trust Fund. This trust fund is derived from a tax levied on marine fuel and is set aside for use in keeping the nation's inland waterway system in operation. The Gulf Intracoastal Waterway is a major part of that system. Should congress not authorize funding for the project as proposed, it could be possible that the nonfederal sponsor would be required to assist in the project by acquisition of the rights-of-way.

If called upon to participate in purchasing the real estate, the department's Division of Right of Way has researched the procedure necessary to acquire the estimated 175 properties for the project and has estimated that it will require two to three years to complete the transactions. Possession of the properties and, therefore, construction work

could be delayed by the necessity to condemn some properties if negotiation with the landowner is not successful. This could seriously interrupt the condensed completion schedule proposed by the Corps of Engineers.

If the project is authorized as proposed, the Corps of Engineers is empowered to take possession of the property immediately and negotiate later with the owner. This is the most expeditious path to follow to assure that the project is completed in the earliest possible time.

This page replaces an intentionally blank page in the original.

-- CTR Library Digitization Team

CHAPTER FIVE  
BENEFICIAL USE PROJECTS

This page replaces an intentionally blank page in the original.

-- CTR Library Digitization Team

## BENEFICIAL USE PROJECTS



Every year the U.S. Army Corps of Engineers spends approximately \$13 million to dredge 8 million cubic yards of material from the Texas Gulf Intracoastal Waterway. Open-water and confined upland disposal are the traditional methods for the placement or disposal of the dredged material. However, as open water disposal becomes more restricted and confined upland disposal sites become less available due to technical, economic, and environmental considerations, alternatives to traditional disposal methods must be explored.

In recent years, the Corps of Engineers has focused on the uses of dredged material for productive or beneficial purposes. Broad categories of beneficial uses of dredged material have been identified by the Corps of Engineers. Each category is based on the functional use of the dredged material at the disposal site. There are ten beneficial use categories: habitat development; beach nourishment; aquaculture; parks and recreation; agriculture, forestry, and horticulture; strip mine reclamation and solid waste management; shoreline stabilization and erosion control; construction and industrial use; material transfer (fill, dikes, levees, parking lots, roads); and multiple purpose. As this list indicates, dredged material has the potential to be used in a variety of different projects. As such, dredged material may be considered a resource rather than an unwanted by-product of maintenance dredging.

Over the last two years, several beneficial use projects have been initiated along the Texas Gulf Intracoastal Waterway. These projects

include three habitat creation projects and two habitat replenishment projects. A description of each project is presented below.<sup>11</sup>

#### LAGUNA MADRE SEAGRASS PROJECT

Over the last 30 years, the coverage of valuable seagrass and finfish spawning beds in the lower Laguna Madre has been on the decline. Changes in lagoon circulation, salinity, and increased turbidity have been identified as contributing factors in the decline of the seagrass coverage. As a result, the Corps of Engineers has been asked by public, state, and federal resource agencies to avoid placing maintenance material on seagrasses growing inside designated disposal areas along the Gulf Intracoastal Waterway and use only upland disposal sites. In order to comply with this request, the Corps of Engineers has incurred increased dredging costs by pumping the material to more distant open-water sites. The Corps of Engineers has not used upland sites in the area due to the very long 8 to 10-mile pumping distances involved.

In an effort to offset the decline in seagrass habitat and lessen the need for new upland disposal sites, the Corps of Engineers, with assistance of the department, has initiated the Laguna Madre Seagrass Project.

The Laguna Madre project, developed under Section 1135(b) of the Water Resources Development Act of 1986, will transplant seagrass from nearby natural sources into two, open-water disposal areas adjacent to the Gulf Intracoastal Waterway near Port Isabel. The seagrass will be transplanted after a maintenance dredging operation has placed freshly deposited dredged material into the disposal areas. The development of

---

<sup>11</sup>Information provided by the U. S. Army Corps of Engineers, Galveston District, 1992.

the seagrass habitat and its use by estuarine animals will be monitored for one year to determine the effectiveness of the procedure. If successful, the project will demonstrate that: (1) dredged material can be used to help enhance or restore fishery habitat in open-water disposal sites, and (2) the use of those sites can be continued in conjunction with a re-vegetation program initiated between maintenance dredging cycles.

#### WEST BAY BENEFICIAL USE OF DREDGED MATERIAL PROJECT

Halls Lake is a small bay located approximately 16 miles west-southwest of Galveston in the West Bay region of the Galveston Bay System. At the present time, only a narrow strip of land separates Halls Lake from the waterway and gulf wave action. Halls Lake is considered a valuable estuarine environment due to the salt marsh present along the shorelines. A breach into Halls Lake would open the bay to increased wave and tidal action and reduce its effectiveness as a habitat for young fish and waterfowl.

Recognizing the opportunity to use dredged material in combating the eroding forces threatening Halls Lake, the Corps of Engineers developed the West Bay Beneficial Use of Dredged Material Project. This project will allow the Corps of Engineers to evaluate various erosion control materials and levee construction techniques while creating a wetland-erosion barrier designed to shield the mainland from forces of the wind and waves.

A new 250-foot wide by 5,000-foot long barrier will be created between the waterway and the gulf on the submerged remnants of the original barrier island and original dredged material from the Gulf Intracoastal Waterway. Materials taken from the center of this original barrier will be used to build levees of varying heights around the



perimeter of the new barrier. Dredged maintenance material from the waterway will be placed inside this area to an intertidal level. The interior of the new wetland-erosion barrier will be seeded with saltwater grasses to create a habitat beneficial to birds and fish.

This project will also allow the Corps of Engineers to study which method of levee construction works best against erosion, mechanical or hydraulic. In addition to evaluating levee construction techniques, various erosion control materials will be tested on the new levees. Fiber mats made from coconut shells, geotextile tubes filled with sand, and rip-rap placed in areas where the highest wave energies are expected will be monitored to determine their effectiveness in combating levee erosion. The results of these studies may be applied in other erosion prone locations along the coast.

#### PELICAN SPIT

This project is located adjacent to the Gulf Intracoastal Waterway (GIWW), as it crosses South Galveston Bay between Port Bolivar and the Galveston Causeway.

Marsh was created on unconfined Disposal Area No. 45 at Pelican Spit beginning in 1983, when dredged material from the GIWW was deposited in shallow water and vegetation allowed to invade naturally. In April 1987, a second 6.47-acre site was established near the first site with transplanted vegetation. The 1987 planting was part of the initial 1986 Pilot Study for the Cooperative Agreement between the National Oceanic and Atmospheric Administration and the Department of the Army for a program to restore and create fish habitat. The most recent site received dredged material in January 1992, and 10 acres were planted with transplanted smooth cordgrass in May and July, 1992.

This project now consists of three closely-located salt marshes of varying ages growing on dredged material and will provide a unique scientific opportunity to study the development of fishery habitat value in created salt marshes. Past studies have shown these marshes to be productive, supporting juvenile fishes and crustaceans.

#### SUNDOWN ISLAND

Sundown Island is located in Matagorda Bay near the intersection of the Gulf Intracoastal Waterway and the Matagorda Ship Channel.

The island forms a portion of Disposal Area No. 116-A, an unconfined, partially emergent disposal area. The 50-acre emergent portion of the disposal area supports a variety of waterbird nesting colonies including brown pelicans, herons, egrets, ibises, roseate spoonbills, gulls, terns, and black skimmers. During annual maintenance dredging of the Gulf Intracoastal Waterway, material is placed on the northwest, submerged portion of the disposal area in order to protect the emergent portion from erosion. In September of 1992, 163,000 cubic yards of material will be placed in the disposal area. Precautions to avoid negative impacts to nesting birds during dredged material disposal include restricting disposal operations to the bird's non-nesting season and the exclusion of all personnel and equipment from the emergent island.

#### LONG REEF

Long Reef is a natural reef containing a chain of islands located in Aransas Bay adjacent to the main channel of the Gulf Intracoastal Waterway. The 3-acre northernmost island lies within Disposal Area No. 134. Along with Deadman Island, it provides colonial waterbird nesting habitat for herons, egrets, gulls, terns, and black skimmers.

During maintenance dredging, which is performed approximately every three years, material is deposited uniformly along the island shoreline at the water's edge within the limits of Disposal Area No. 134. The discharge point is relocated as often as necessary to prevent a buildup of the excavated material in excess of 2.0 feet above mean low tide. The dredged material provides protection to the island from erosion. In 1992, 134,000 cubic yards of material were placed adjacent to the island within the disposal area. Precautions to avoid negative impacts to nesting birds during dredged material disposal include restricting disposal operations to the bird's non-nesting season and exclusion of all personnel and equipment from the emergent island.

CHAPTER SIX

LEGISLATIVE RECOMMENDATIONS

This page replaces an intentionally blank page in the original.

-- CTR Library Digitization Team

## LEGISLATIVE RECOMMENDATIONS

With the need of using dredged material for beneficial use projects becoming more apparent, the question of how much the state as nonfederal sponsor will be able to participate in these projects is being asked. The U. S. Army Corps of Engineers' Galveston District is working under budget restrictions for maintaining 426 miles of Texas' intracoastal waterway. The Corps of Engineers has indicated that it will not be able to absorb the additional costs associated with implementing the beneficial use measures which could be employed on all dredge disposal projects. The Corps of Engineers is requesting a sponsor to support the additional funding required to finance beneficial use dredging projects.

Where measures for beneficial use of disposal material is not feasible, alternate methods of disposal must be proposed in sensitive areas. These alternate methods may involve the movement of the material over longer distances to inland disposal sites, or transportation by hopper barge to deepwater in the Gulf of Mexico. These methods are expensive and will incur repetitive costs each dredging cycle. While upland site disposal is still a desirable solution, this method is not advantageous where wetlands or real estate costs preclude the location of an upland site.

One technique for optimizing the capacity of a disposal area is management of the material in the upland site by dewatering and fully drying out the material. Capacity of a disposal site may be increased by as much as fifty percent if managed for dewatering from the time a site is first constructed. Although water decanting and out-flow systems are usually constructed within a contained upland site, those water evaporation systems only get rid of surface water and not the water

trapped below the surface in lenses or pockets. These disposal areas never fully dry out and are continually kept wet by natural rainfall. The useful cycle of these sites can be doubled if this water is removed by trenching or wicking the site through a controlled management program which allows the material to dry out. Although cost-incurring, both for an initial survey and study of existing disposal sites and the cost of dewatering the site, this type of management may prove to be the most cost-effective method of material disposal. This management technique should be particularly considered in areas where any further acquisition of disposal sites will result in the transportation of material for long distances. A dry material is also easily handled by machinery thus making the material more suitable for reuse where fill dirt is needed.

Each alternate method of disposal, disposal material management, or participation in a beneficial use project will necessitate additional funds. These funds would be used for projects which supplement the ongoing efforts of purchasing upland disposal sites, and related efforts, to support the maintenance of the Gulf Intracoastal Waterway.

It is therefore recommended:

The state continues to recognize and promote the Gulf Intracoastal Waterway as an integral and valuable part of the state's multimodal transportation system.

The state continues to accept the responsibility as nonfederal sponsor for the Gulf Intracoastal Waterway and increases funding to support projects using dredged material for beneficial purposes and to support disposal management techniques.

Services be acquired to inventory existing upland disposal sites and recommend disposal management procedures to increase storage capacity.

A master plan be authorized to prepare for disposal needs for a minimum period of fifty years.

B I B L I O G R A P H Y



This page replaces an intentionally blank page in the original.

-- CTR Library Digitization Team

## BIBLIOGRAPHY

### A. WORKS CITED

Data Resources, Inc. The 1982 Estimated Value of Waterborne Commodities. Research Report 84-R-2. Washington, D. C.: For the U. S. Army Corps of Engineers, February 1984.

Kelly, Brigadier General Patrick, Director Civil Works, U. S. Army Corps of Engineers. Speech. Presented at the meeting of the Society of American Military Engineers in Houston, Texas, September 22, 1988.

Laws of the United States Relating to the Improvement of Rivers and Harbors from 1790-1913. Volume 1, (Serial Volume 6396), House Document 1491, 62nd Congress. Washington D. C.: Government Printing Office, 1913.

Miloy, John and Christian Phillips. Primary Economic Impact of the Gulf Intracoastal Waterway in Texas. TAMU-SG-74-221. College Station, Texas: Texas A & M University Industrial Economics Research Division Sea Grant Program, 1974.

Office of Technology Assessment. Transportation of Hazardous Materials. Washington, D. C.: United States Congress, July 1986.

Osburn, Hal R.; Saul, Gary E.; and Hamilton, C. L. Trends in Texas Commercial Fishery Landings, 1977-1990. Management Data Series Number 107. Austin, Texas: Texas Parks and Wildlife Department, Coastal Fisheries Branch, 1986.

Texas Coastal Waterway Act of 1975 - Texas Civil Statutes, Article 5415e-2.

Texas State Department of Highways and Public Transportation, (now the Texas Department of Transportation). The Gulf Intracoastal Waterway, 1976. Austin, Texas: State Department of Highways and Public Transportation, 1976.

Texas State Department of Highways and Public Transportation, (now the Texas Department of Transportation). The Gulf Intracoastal Waterway, 1982. Austin, Texas: State Department of Highways and Public Transportation, 1982.

United States Army Corps of Engineers, Galveston District. Gulf Intracoastal Waterway (Section 216 Study) Sargent Beach, Texas Feasibility Report and Final Environmental Impact Statement. Galveston, Texas: February, 1992.

United States Army Corps of Engineers. Waterborne Commerce of the United States. Waterways and Harbors - Gulf Coast, Mississippi River System and Antilles, Part 2. New Orleans, Louisiana: Waterborne Commerce Statistics Center, 1990.

United States Army Corps of Engineers. Waterborne Commerce of the  
United States. National Summaries, Part 5. New Orleans, Louisiana:  
Waterborne Commerce Statistics Center, 1990.

## B. GENERAL REFERENCES

Alperin, Lynn M. History of the Gulf Intracoastal Waterway. NWS-83-9. Fort Belvoir, Virginia: U. S. Army Corps of Engineers' Institute for Water Resources, National Waterways Study, 1983.

Analysis of the Role of the Gulf Intracoastal Waterway in Texas. TAMU-SG-75-202. College Station, Texas: Texas A & M University Sea Grant Program, Texas Coastal and Marine Council and Texas Ports Association, 1975.

Davenport, Sally S. Texas 1980: Year of the Coast. Austin, Texas: Texas Coastal and Marine Council and General Land Office, 1981.

Delahoussaye, Jim. Dredging on the Texas Coast. Austin, Texas: General Land Office, 1981.

Dredged Material Research Program. Publication Index and Retrieval System, Technical Report DS-78-23. Vicksburg, Mississippi: U. S. Army Corps of Engineers Waterways Experiment Station, 1980.

James, Wesley P.; Giesler, Steven; DeOtte, Robert; and Inoue, Masamichi. Environmental Considerations Relating to Operation and Maintenance of the Texas Gulf Intracoastal Waterway. TAMU-SG-78-204. College Station, Texas: Texas A & M University Sea Grant Program, and National Oceanic and Atmospheric Department of Commerce, 1977.

Kearney Management Consultants. Domestic Waterborne Shipping Market Analysis, Executive Summary. Washington, D. C.: U. S. Department of Commerce Maritime Administration, 1974.

Kearney Management Consultants. Evaluation of the Present Waterways System. Fort Belvoir, Virginia: U. S. Army Corps of Engineers' Institute for Water Resources, National Waterways Study, 1981.

Leggett, Jimmy W. Military Use of the Inland Waterways. Tulsa, Oklahoma: U. S. Army Engineer District, Tulsa, Planning Division, 1986.

Phillips, Christian. Indirect Economic Effect from Gulf Intracoastal Waterway Commerce in Texas. TAMU-SG-74-218. College Station, Texas: Texas A & M University, 1974.

Texas State Department of Highways and Public Transportation, (now the Texas Department of Transportation). The Gulf Intracoastal Waterway in Texas 1976, 1978, 1980, 1982, 1984, 1986, 1988, and 1990. Austin, Texas: State Department of Highways and Public Transportation, 1976, 1978, 1980, 1982, 1984, 1986, 1988, and 1990.

United States Army Corps of Engineers. Beneficial Uses of Dredged Materials. EM 1110-2-5026. Vicksburg, Mississippi: Waterways Experiment Station.

United States Army Corps of Engineers. Final Environmental Statement  
Maintenance Dredging Gulf Intracoastal Waterway Texas Section. Volumes  
1-3. Galveston, Texas: U. S. Army Corps of Engineers, Galveston  
District, 1975.