ENGINEERING APPENDIX A

APPENDIX 9

O&M DMMP – COMPARISON AND REVIEW FOR BENEFICIAL USE

Comparison and Review for Beneficial Use of GRR New Work Dredged Material for Determination of Least Cost Method

Objective

The purpose of the document is to compare the potential Beneficial Use (BU) site alternative to the recommended plan of upland confined placement and offshore placement to determine what proposal would be the least cost.

Study and Placement Options

The recommended plan at both the Brazos and Colorado Rivers results in increases in the amount of maintenance dredging that will be required at the river crossings, along the GIWW and in the Freeport Harbor throughout the life of the project. Areas along the GIWW near the Brazos River Floodgates that will see increases in maintenance dredging are shown below in Figure 1. The recommended plan at the Brazos River Floodgates requires approximately 400,270 CY, 133,678 CY and 423,828 CY of maintenance dredging annually from the San Bernard River to the Brazos River Crossing, at the Brazos River Crossing and from the Brazos River Crossing to Port Freeport respectively.

Potentially viable options in the project vicinity for BU could include either beach nourishment or marsh nourishment. Due to low sand content of the dredged material, only marsh nourishment projects appear viable. For this exercise, three potential BU sites were identified and shown in Figure 1. No BU sites were identified in the vicinity of the Colorado River Locks. The first BU site is located northeast of the Brazos River Floogates at the intersection of Texas State Highway 332 and Casko Road. The second BU site is located north of the Brazos River Floodgates, south of Texas State Highway 36 and to the east of Levee Road. Finally, the third site is located south of the Brazos River Floodgates on the west side of the river to the south of the existing placement areas. All sites were selected based on their proximity to the dredge site. No data (geotechnical, biological or survey) information has been collected and no real estate coordination has been conducted for the site.

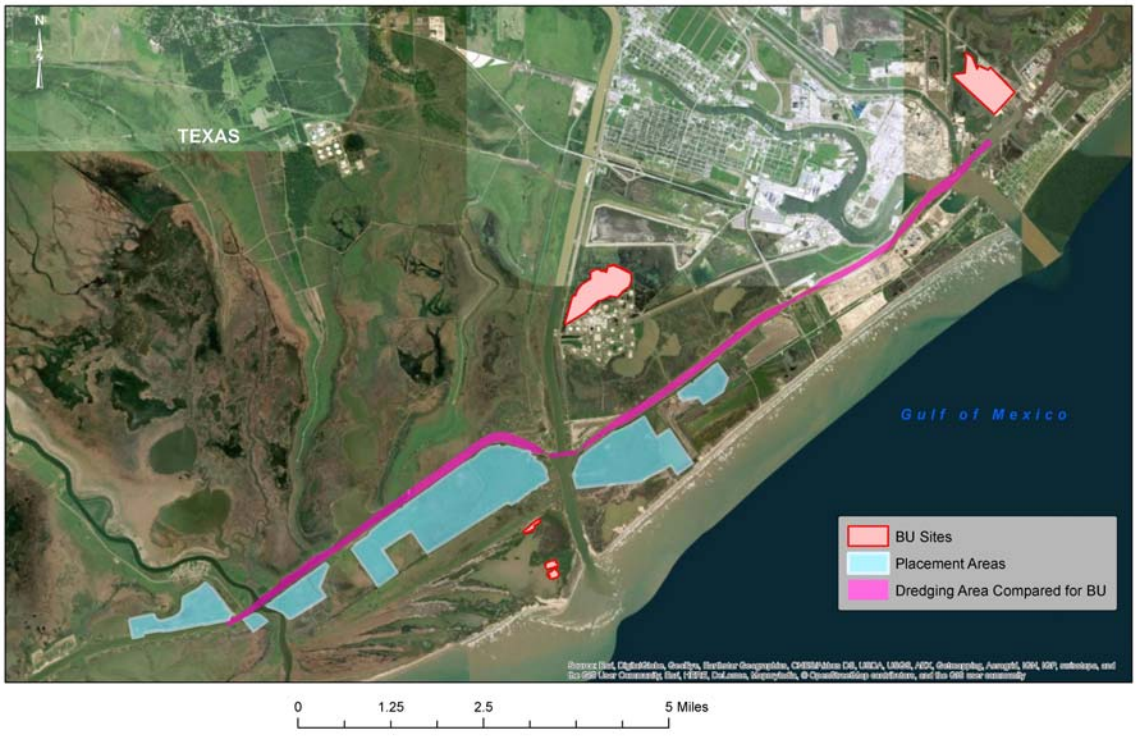


Figure 1 – Project features, placement area, and potential BU site

Yearly Dredge Quantities for Sediment Deposition Areas

A comparison of the historical dredge quantities was made versus the sediment deposition predicted by the AdH models. Because the AdH models output total of channel deposition included quantities from top of bank to top of bank and do not account for the consolidation that may occur in the deposited material, the yearly historical dredge quantities were less than those predicted by the AdH model. Therefore, the yearly expected dredge quantity was developed by pro-rating the quantities predicted by the AdH model by the ratio of the AdH predicted sediment values for the existing condition to the actual historical dredge quantities. A summary of the estimate of the yearly dredge quantities for the sediment deposition areas where BU may be used is presented below in Table 1.

Table 1 – Cost Estimate for Disposal of Dredged Material in PAs

Sedimentation Deposition Area (From AdH Model)	Yearly Dredge Quantity (CY)
Freeport to Brazos	400,270
Brazos River Crossing	133,678
West of Brazos	423,828

Cost Required for Placement of Material at Adjacent PAs

Using the above quantities, a dredge frequency of 2 years was assumed for this cost comparison based on input from Galveston District Operations Division. For all adjacent disposal in existing PAs, a mobilization cost of $1,000,000 and unit cost of $4/CY were assumed for the dredge disposal based on historical contractual data. The perimeter of each PA was examined to calculate the cost of a 3 foot dike raise for each PA. Table 2 below summarizes the complete estimated cost for disposal of dredged material in each PA.

Table 2 – Cost Estimate for Disposal of Dredged Material in PAs

Placement Area	Sedimentation Deposition Area (From AdH Model)	Remaining Capacity (CY)	Perimeter of PA (ft)	Cost to Dredge ($/CY)	Mobilization Cost ($/CY)	Cost to Raise PA Dike ($/CY)	Total Unit Cost ($/CY)
86/87	Freeport to Brazos	1,543,040	20,234	$3.00	$1.24	$0.72	$4.96
88	Freeport to Brazos	1,479,056	15,205	$3.00	$1.24	$0.68	$4.92

89	Brazos River Crossing/East or West GIWW$	8,024,720	34,920	$3.00	$1.24	$0.36	$4.60
90	West of Brazos	575,960	11,016	$3.00	$1.18	$1.57	$5.75
92	West of Brazos	2,976,600	17,602	$3.00	$1.18	$1.06	$5.24

Cost Required for Placement of Material Offshore

Similar to the analysis for the adjacent placement areas, a dredge frequency of 2 years was assumed for this cost comparison based on input from Galveston District Operations Division. Once all upland confined placement is exhausted, offshore disposal is the planned method of dredge disposal unless additional upland disposal can be identified. For offshore disposal, a mobilization cost of $3,500,000 and unit cost of $16/CY were assumed for the dredge disposal. It was assumed for this cost comparison that offshore disposal would not be utilized for the dredging of the Brazos River Crossing as those quantities are too small to justify the large cost for mobilization for offshore disposal.

Table 3 – Cost Estimate for Disposal of Dredged Material Offshore

Sedimentation Deposition Area (From AdH Model)	Cost to Dredge ($/CY)	Mobilization Cost ($/CY)	Total Unit Cost ($/CY)
Freeport to Brazos	$16.00	$4.37	$20.37
West of Brazos	$16.00	$4.03	$20.03

Cost Required for Beneficial Use

The existing elevations within the BU sites are unknown. For the purposes of this work comparison, an average fill height of 2 feet was assumed. Based on this fill height the table below lists the theoretical capacities of the potential BU sites.

Table 4 – Approximate BU Capacities

BU Area	Perimeter (LF)	Area (Acres)	Estimated Capacity (CY)
Bryan Mound	12,400	150	500,000
East of Freeport	11,800	140	450,000
SW of BRFG 1	2,750	6.5	21,000
SW of BRFG 2	2,200	6.3	20,500
SW of BRFG 3	2,200	6	19,500

It was assumed that a containment dike with 3 feet of freeboard would be needed during dredged material placement at the BU sites. Similar to the placement in the confined upland disposal, a dredge frequency of 2 years was assumed for this cost. Because of the limited capacity of the BU sites identified, only one dredge cycle could be utilized for BU. Because of the increased distance for dredge disposal pipes, a mobilization cost of $2,500,000 was assumed for each dredge contract.

It was assumed that two separate contracts would be used for disposal in Bryan Mound site. One contract would cover the eastern half of the GIWW from the Brazos River Crossing to the San Bernard River. The second contract would cover the western half of the GIWW from the Brazos River to Port Freeport. For the BU east of Freeport, one contract would be utilized for the eastern half of the GIWW from the Brazos River to Port Freeport. Disposal to the 3 BU sites Southwest of the Brazos River Crossing would be accomplished in one contract.

A summary of approximate costs for disposal in the BU sites for the aforementioned contracts is listed below.

Table 5 – Approximate BU Disposal Costs

BU Contract	Cost to Dredge ($/CY)	Cost to Build Dike ($/CY)	Mobilization Cost ($/CY)	Total Unit Cost ($/CY)
Bryan Mound Contract 1	$8.39	$1.20	$10	$19.59
Bryan Mound Contract 2	$9.02	$1.20	$10	$21.23
East of Freeport	$9.89	$1.33	$11.10	$22.32
SW of BRFG	$10.89	$3.28	$40.98	$55.15

Conclusion

While the BU sites are a potential placement area, they cannot handle the required volume for more than one dredging cycle, nor is there any other potential BU area in the proximity for use. A comparison of just the dredge disposal costs shows that disposal in the BU sites is substantially more expensive than disposal in the upland confined disposal sites (adjacent PAs). Disposal in the BU sites is comparable in cost to offshore disposal once the upland disposal is exhausted, but the cost for acquiring the land for the BUs, if able to do so, would likely exceed the cost of the offshore disposal. Use of the identified BU sites is not recommended.

GIWW High Island to Brazos River Dredged Material Management Plan

US Army Corps of Engineers®
Galveston District

Gulf Intracoastal Waterway, Texas
High Island to Brazos River

Dredged Material Management Plan

Final Preliminary Assessment

U.S. Army Engineer District, Galveston
Southwestern Division

March 2012

Table of Contents

List of Figures

List of Tables

Acronyms and Abbreviations

BU	Beneficial Use
CEQ	Council on Environmental Quality
CZMA	Coastal Zone Management Act
DMMP	Dredged Material Management Plan
EA	Environmental Assessment
EPA	Environmental Protection Agency
EO	Executive Order
ER	Engineering Regulation
FAA	Federal Aviation Administration
FONSI	Finding of No Significant Impact
GIWW	Gulf Intracoastal Waterway
HGNC	Houston-Galveston Navigation Channels, Texas
MOA	Memorandum of Agreement
NED	National Economic Development
NEPA	National Environmental Policy Act
NWR	National Wildlife Refuge
PA	Placement Area
PPA	Project Partnership Agreement
TxDOT	Texas Department of Transportation
1975 FES	Final Environmental Statement, Maintenance Dredging Gulf Intracoastal Waterway Texas Section, Main Channel and Tributary Channels, October 1975.

Gulf Intracoastal Waterway, Texas
High Island to Brazos River Preliminary Assessment

STUDY AUTHORITY AND PURPOSE

This Preliminary Assessment pursued under the authority of Section 216 of the Flood Control Act of 1970 complies with Engineering Regulation (ER) 1105-2-100; page G-2 of the Planning Guidance Notebook, dated April 22, 2000. The purpose of this assessment is to establish whether a more detailed Dredged Material Management Plan (DMMP) study is required, and if so, to provide information necessary to recommend its prioritization in the District's budgetary process.

PROJECT INFORMATION

General Description

The Gulf Intracoastal Waterway (GIWW) is an inland waterway system that stretches from Brownsville, Texas, along the entire Gulf of Mexico to St. Marks, Florida. The GIWW provides over 1,300 miles of protected waterway for all types of shallow-draft vessels. The Texas section of the GIWW is a 12-foot deep by 125-foot wide channel that spans 423 miles along the Texas coast (Figure 1) from Brownsville to the Texas-Louisiana border and ties Texas ports to the national waterway network. The study area (Figure 2) involves about 85 miles of the GIWW in Chambers, Galveston, and Brazoria Counties extending from High Island, Texas to the Brazos River crossing.

Figure 1 – Texas Section of Gulf Intracoastal Waterway

Figure 2 - Map Overview of GIWW, High Island to Brazos River Reach

Non-Federal Sponsor

The State of Texas acts as the local non-Federal sponsor for the main channel of the GIWW from the Sabine River to the Brownsville Ship Channel. The Texas Department of Transportation (TxDOT) acts as a representative to the State of Texas in fulfilling the duties of the non-Federal sponsor.

PROJECT AUTHORIZATION

Table 1 provides dates and descriptions of authorized project features for the High Island to Brazos River Reach of the GIWW. The 16-foot by 150-foot channel from Sabine River to the Houston Ship Channel authorized in 1962 was never constructed.

There have been two major modifications to the alignment since construction of the GIWW to its present depth and width. The first was an alternate channel across south Galveston Bay between Bolivar Peninsula and the Galveston Causeway. This segment, which allowed traffic to bypass Galveston Channel, was completed in 1954. The second modification, an alternate route avoiding Christmas Bay and San Luis inlet, was constructed in 1963.

Table 1 -Authorized Project Features		
Date Authorizing Act	**Project and Work Authorized**	**Documents**
03 Mar 1925	Channel 9 by 100 feet, Sabine River to Galveston Bay. Including passing lanes, widening at bends, locks or guard locks, and railway bridges over artificial cuts, as are necessary.	House Document 238, 68th Congress, 1st Session.
21 Jan 1927	Channel 9 by 100 feet, Galveston Bay to Corpus Christi	House Document 238, 68th Congress, 1st Session.
23 Mar 1939	Enlarge waterway to a depth of 12 feet and a width of 125 feet from Sabine River to Corpus Christi	House Document 230, 76th Congress, 1st Session.
17 May 1950	Provided an alternate route for the main channel across the southern part of Galveston Bay, between Bolivar Peninsula and the Galveston causeway.	House Document 196, 81st Congress, 1st Session.
23 Oct 1962[1]	Improve main channel 16 feet deep and 150 feet wide from Sabine River to Houston Ship Channel; with two relocations; relocate main channel in Matagorda Bay and Corpus Christi Bay; and maintaining existing Lydia Ann Channel.	House Document 556, 87th Congress, 2nd Session.
Nov 8, 2007	Construct a 24-acre sediment trap at Rollover Pass; widen the west approach opening at Sievers Cover from 125 feet to 200 feet; abandon the existing turning Channel of the Texas City Wye; widen the Texas City Channel at the intersection with the Gulf Intracoastal Waterway; remove navigational aids; widen the Pelican Island Mooring Basin on the north side from 75 feet to 155 feet and combine this feature with the Texas City Wye; and construct a single 24-foot circumference, 10,000-foot long geotube barrier between the GIWW and the West Bay. The costs of construction of the project are to be paid ½ from amounts appropriated from the general fund of the Treasury and ½ from amounts appropriated from the Inland Waterways Trust Fund.	Water Resources Development Act (WRDA) 2007, Section 1001 (42), Public Law 110-114, 110th Congress, 121 Statute 1041, H.R. 1495.

[1] *Portion of 16-foot by 150-foot channel from Sabine River to Houston Ship Channel is inactive. Relocation of channel in Matagorda Bay deauthorized under Section 12 of Public Law 93-251 (1986 Deauthorization list).*

PLACEMENT AREAS AND DREDGING

Placement Areas

Of the 61 placement areas (PA) designated for use along the GIWW, Texas, High Island to Brazos River Reach, 28 are confined upland, 14 are upland partially confined, 18 are open water, and one is unconfined upland. See Figure 3 through Figure 8, for approximate locations of the PAs authorized for the High Island to Brazos River Reach of the GIWW.

These PAs were coordinated in the Final Environmental Statement, Maintenance Dredging Gulf Intracoastal Waterway Texas Section, Main Channel and Tributary Channels, October 1975 (1975 FES). PAs 86 and 87 have since been combined into one confined upland PA. One additional confined upland PA (58A) has been constructed since the 1975 FES. Based on historic dredging volumes and PA usage, and projected dredging estimates and dredge material placement, 19 confined upland PAs, 7 upland partially confined PAs, and 12 open water PAs will be used over the 20-year period of analysis. Projects that have been completed, but are not included in the National Economic Development (NED) plan such as beach nourishment at Rollover Pass, and marsh creation at multiple West Bay beneficial use (BU) sites were not included in this analysis because there is no long-term plan to continue their use.

Several PAs were not included in the capacity calculations for various reasons as described in this paragraph. PAs 29 and 31 were not used for capacity calculations because they have no remaining capacity. PA 44 (Pelican Island) has historically been utilized for the Galveston Harbor Channel Reach of the Houston Galveston Navigation Channels, Texas Project (HGNC). Open water PAs 53 through 57, and 59 were not considered because of environmental issues that preclude their use. PA 66 has eroded and very little of the originally emergent land upon which it stands remains. PAs 73 through 82 have not been used since 1968. The reach (Station 146+000 to Station 213+000) which they serve has not historically shoaled nor are there changes to the channel planned that would cause this reach to begin shoaling. The land on which PAs 80, 81, and 82 are located has been developed and is in use by others. PAs 83, 84, and 85 have been set aside for the Freeport Harbor dredging.

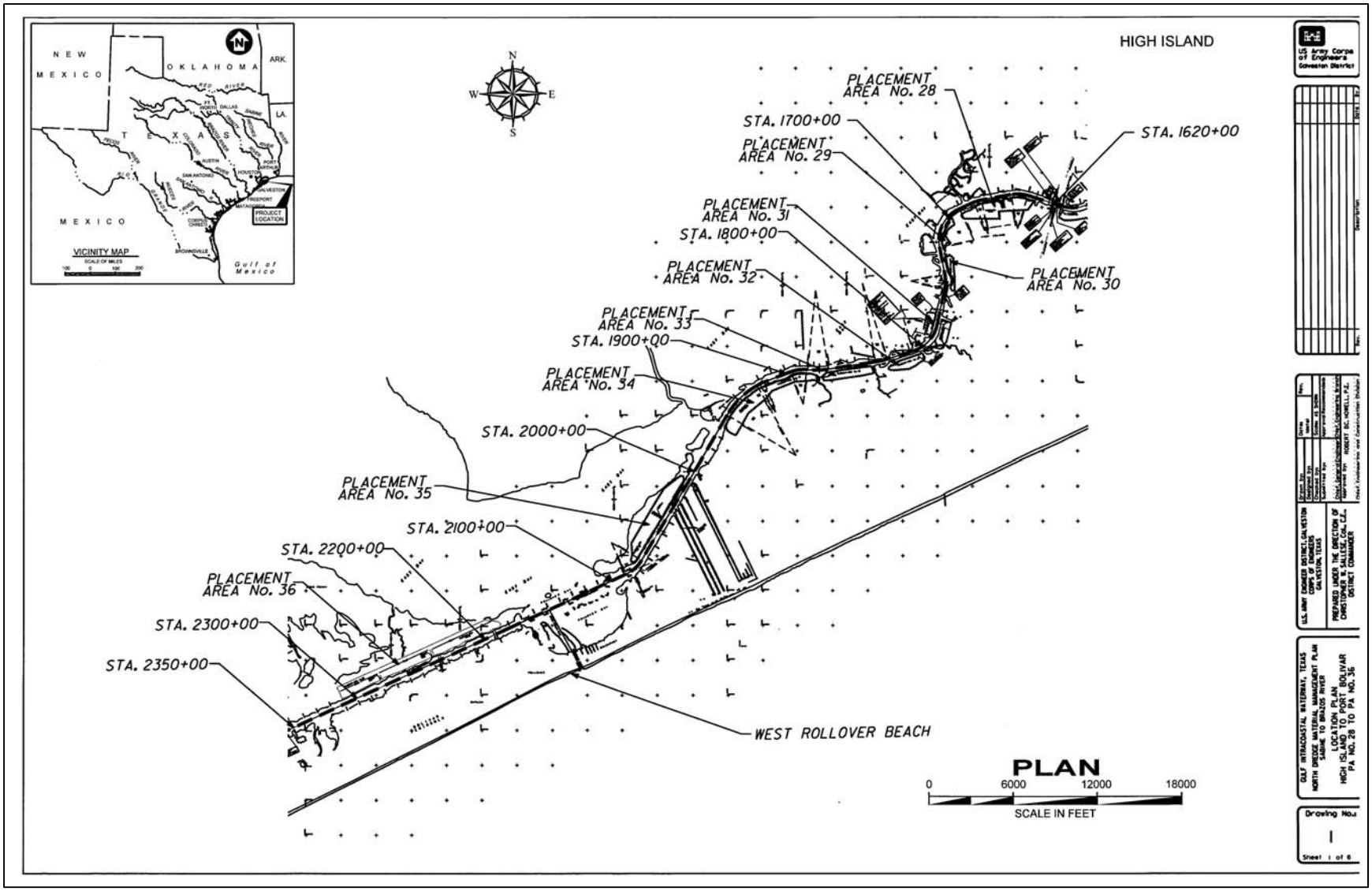


Figure 3 – Placement Areas 28 – 36 Designated for Use for the High Island to Brazos River Reach of the GIWW

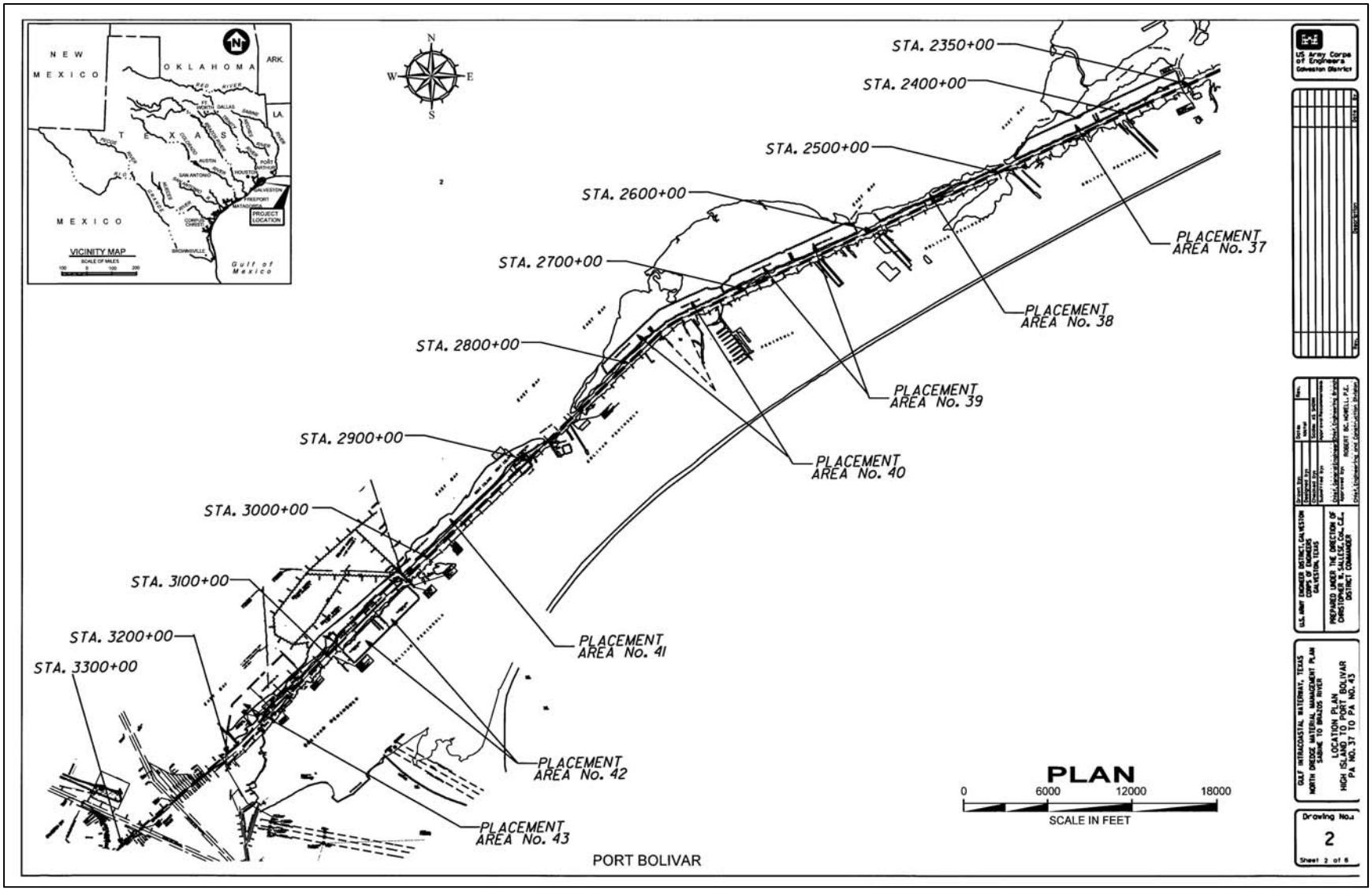


Figure 4 – Placement Areas 37 - 43 Designated for Use for the High Island to Brazos River Reach of the GIWW

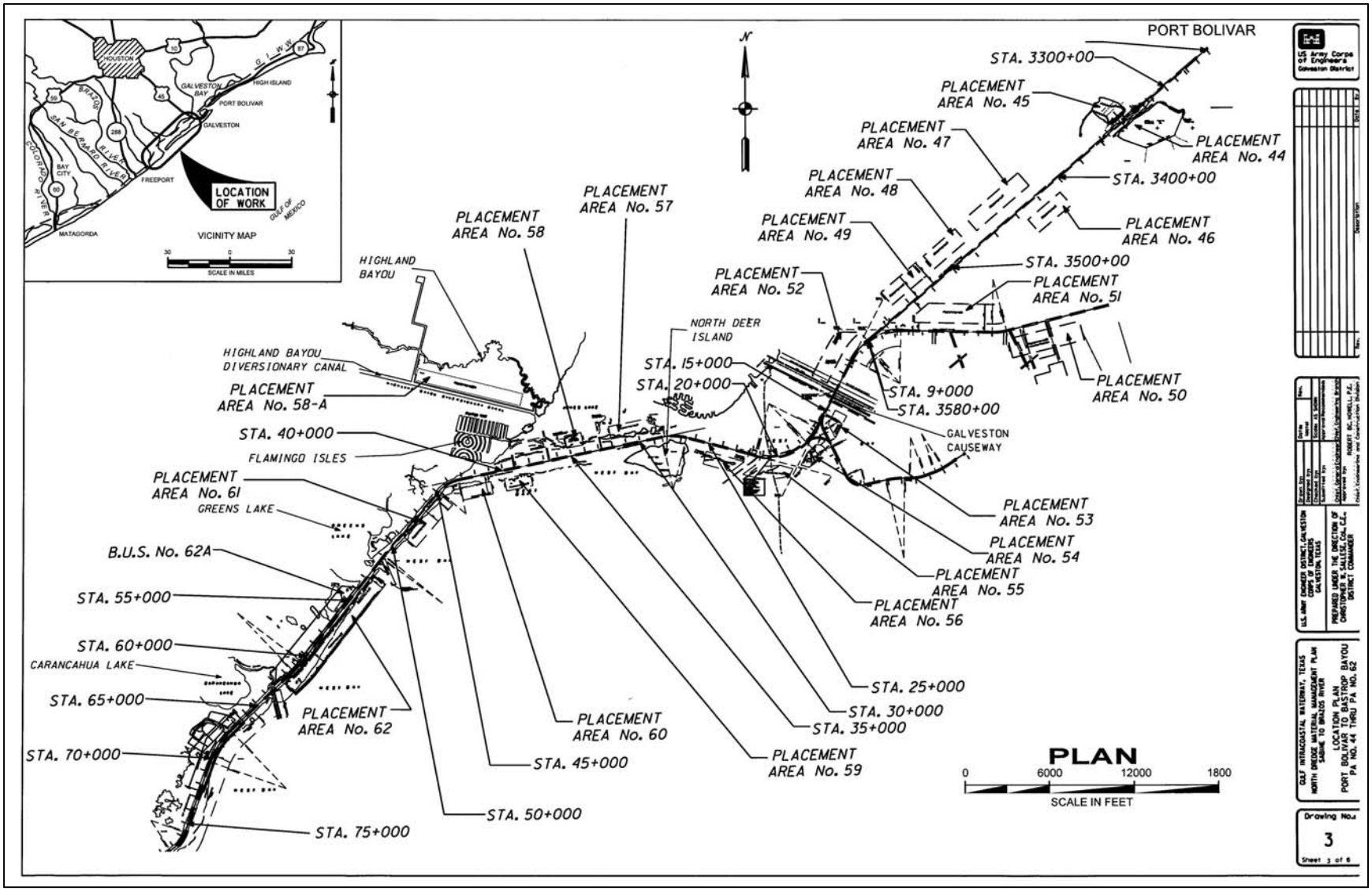


Figure 5 – Placement Areas 44 - 62 Designated for Use for the High Island to Brazos River Reach of the GIWW

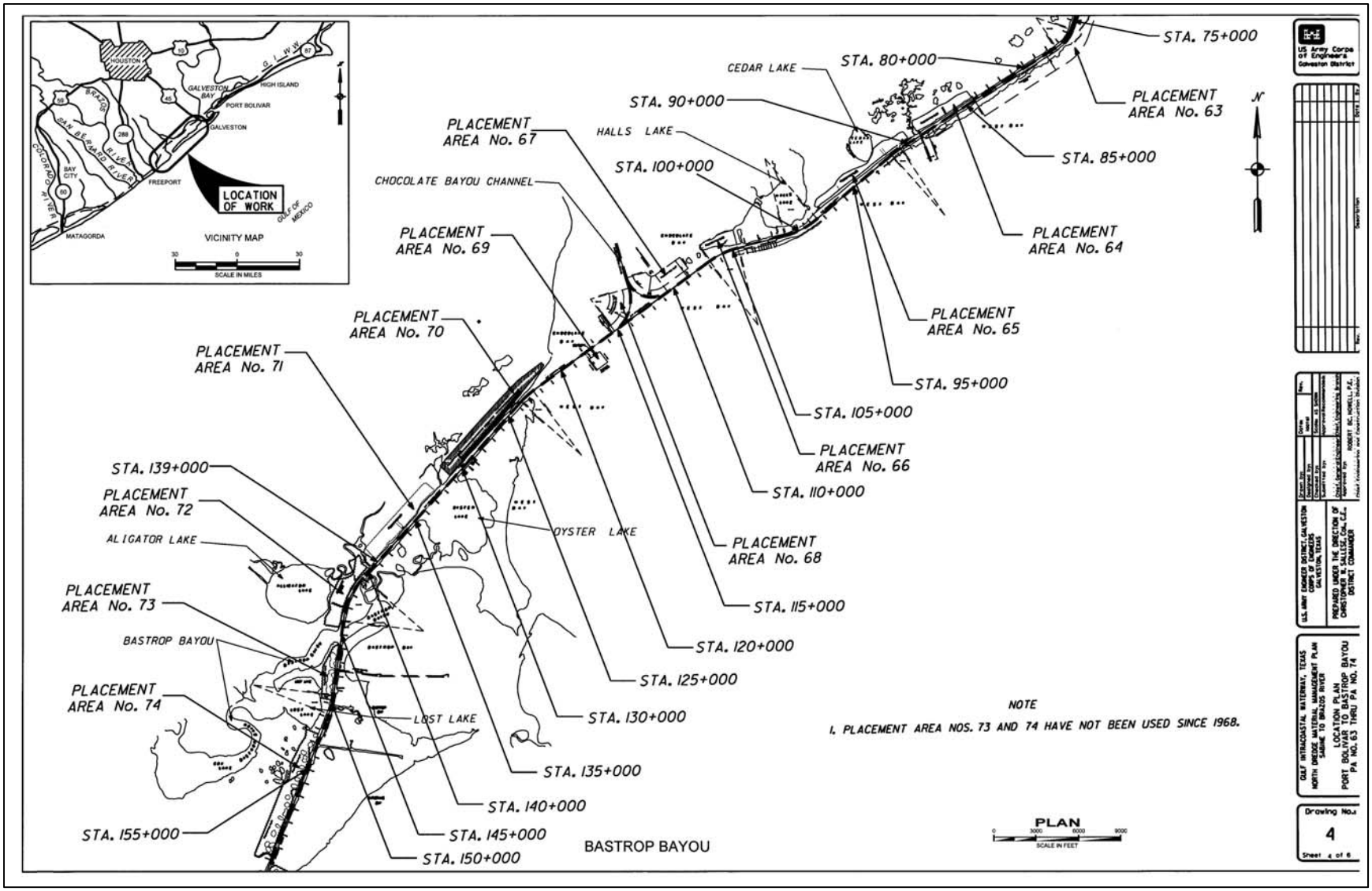


Figure 6 – Placement Areas 63 - 74 Designated for Use for the High Island to Brazos River Reach of the GIWW

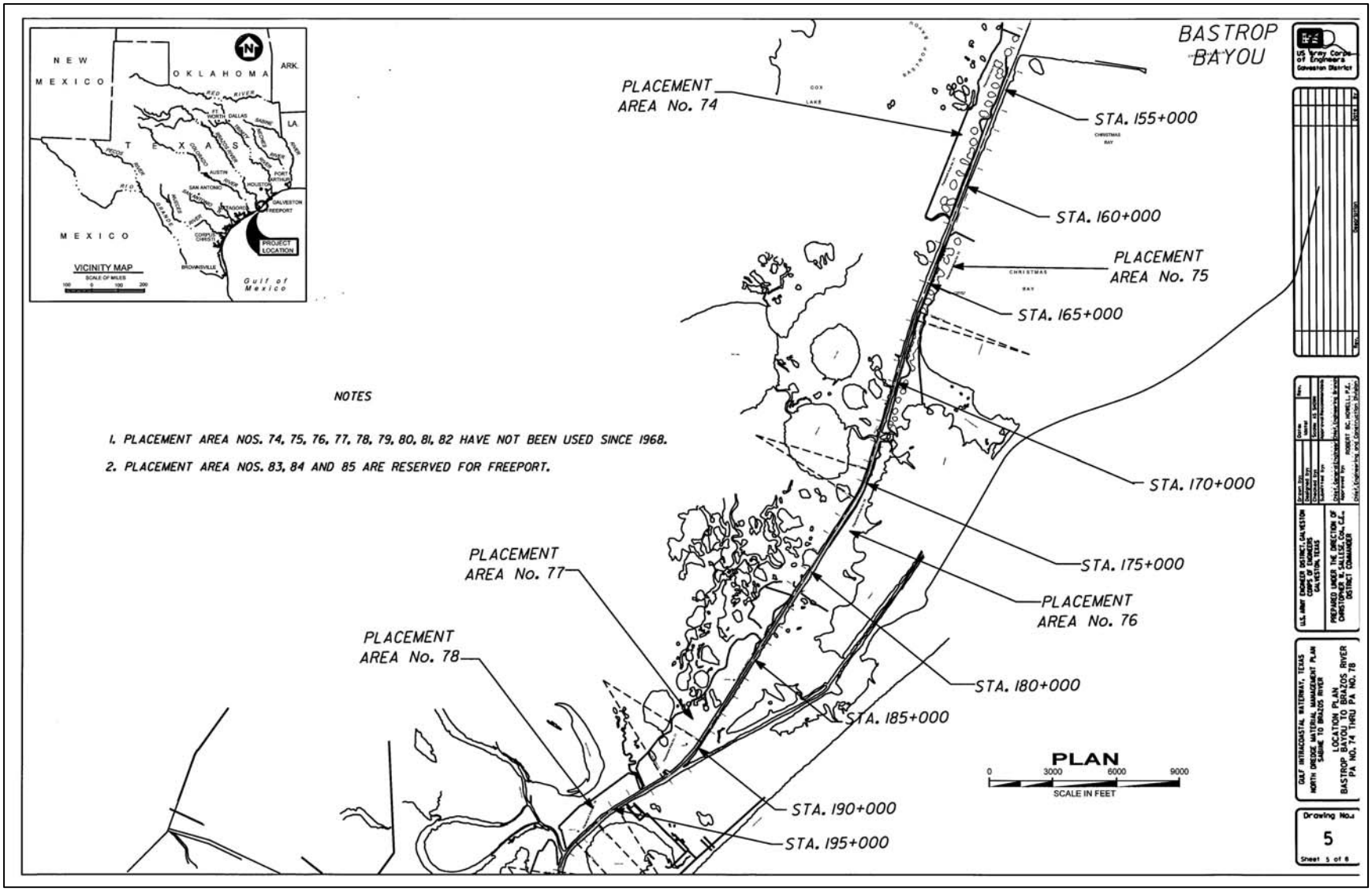


Figure 7 – Placement Areas 74 - 78 Designated for Use for the High Island to Brazos River Reach of the GIWW

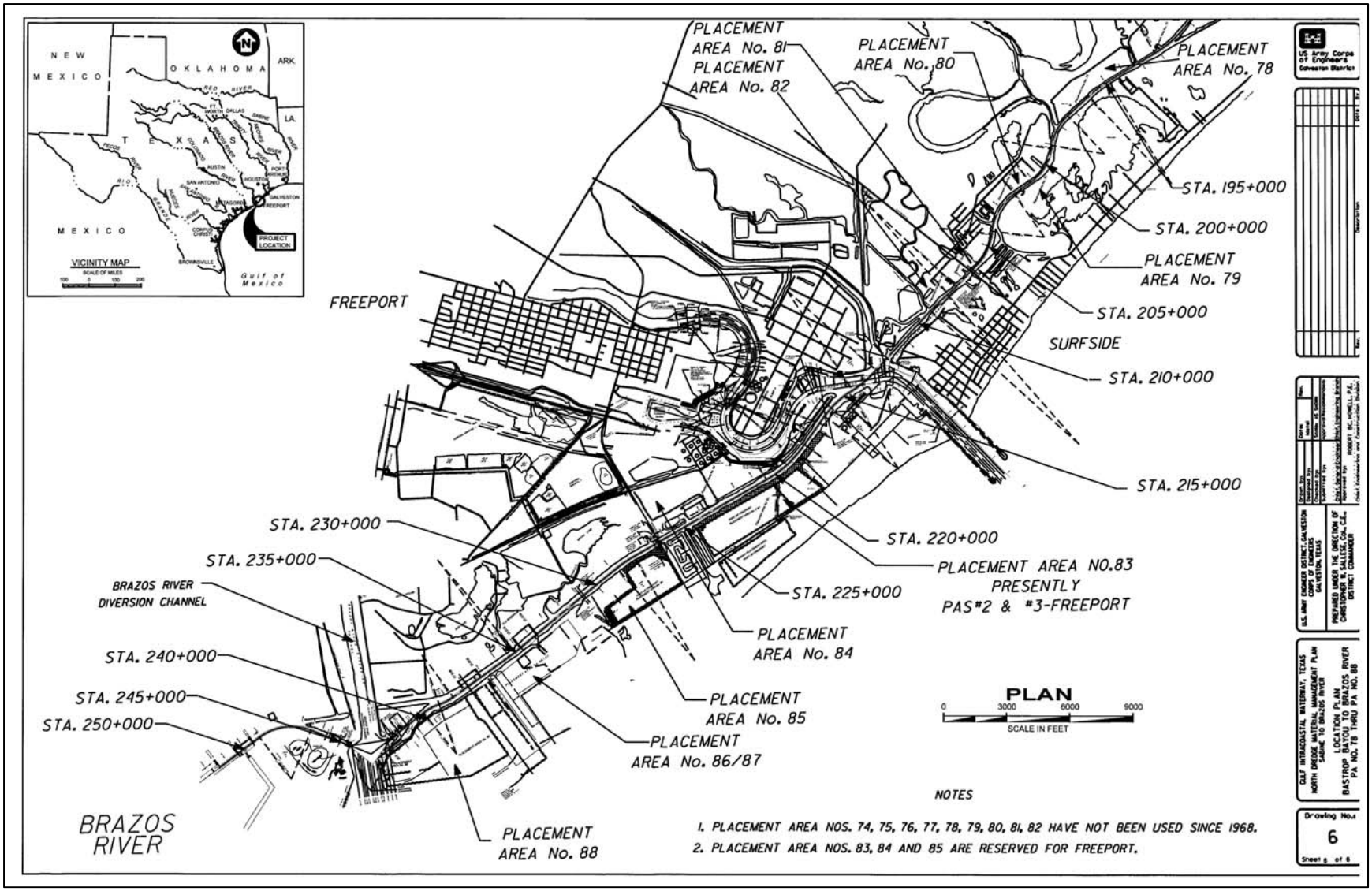


Figure 8 – Placement Areas 78 - 88 Designated for Use for the High Island to Brazos River Reach of the GIWW

Table 2 includes data for each PA including PA type, approximate reach served, size, and estimated maximum capacity for dredged maintenance material. Also included in Table 2 are projected dredged material volume estimates for each PA including volume per dredging cycle, cycle length, and total projected volume over the 20-year period of analysis considered for this study. Remaining usable life was calculated for each PA by dividing the estimated maximum PA capacity by the volume of maintenance material per dredging cycle and then rounding the result down to the nearest whole number. The rounded result was then multiplied by the length in years of each dredging cycle. This method eliminates partial dredging cycle maintenance volume that would not be placed into the PA until after the completion of the 20-year period of analysis. For the purposes of this calculation the maintenance material volume was reduced by a factor of 0.80 to account for estimated consolidation within the PAs following placement and prior to the next dredging cycle. Capacities of the upland partially confined and open water PAs were assumed to have no engineering limitation to capacity for this study.

A review of the PA capacities relative to projected dredging volumes indicates there are capacity limitations within the GIWW, Texas, High Island to Brazos River Reach over the next 20 years. PA 30 is considered full, therefore, any projected maintenance volumes slated for that PA must be pumped to either PA 28 or PA 32, resulting in additional pumping distances ranging from about 4,000 to 8,000 feet. PA 45 (Pelican Island Spit) has a theoretically unlimited capacity; however, is now used only when renourishment of the created wildlife habitat is required. PA 45 is the only upland site within economic pumping distance in a large reach of the GIWW. Alternative PAs within pumping distance in this reach are open water PAs 46 and 47 to the west and PA 43 to the east, however, much greater pumping distances are required. The combined confined upland PA 86/87 has 12 years remaining capacity and requires pumping distances up to about 19,000 feet because of the reserve of PAs 83, 84, and 85 for Freeport Harbor.

Dredging Reaches

High Island to Brazos River Reach is divided into four dredging reaches. The High Island to Port Bolivar Reach historically covers Stations 1620+00 through 3260+00 and is dredged on an average of every four years. Station 1620+00 to Station 1780+00 was dredged on an average of every three years. Station 1780+00 to Station 1820+00 was dredged on an average of every four years. Station 1820+00 Station 1980+00 was dredged on an average of every three years and Station 1980+00 to Station 2120+00 was dredged on an average of every two years.

The Rollover Bay to Port Bolivar Reach covers approximate Stations 2120+00 to 3260+00. Station 2120+00 to 2330+00 was dredged on an average of every two years. Station 2330+00 to Station 2490+00 was dredged on an average of every five years. Station 2490+00 to Station 2710+00 was dredged on an average of every seven years. Station 2710+00 to Station 2860+00

was dredged on an average of every four years. Station 2860+00 to Station 3090+00 was dredged on an average of every three years. Station 3090+00 to Station 3260+00 was dredged on an average of every two years.

The Port Bolivar Peninsula to Galveston Causeway Reach historically covers Stations 3260+00 through 3580+00 and is dredged on an average of every eight years. The Galveston Causeway to Bastrop Bayou Reach historically covers Stations 14+000 through 139+000 and is dredged on an average of every seven years.

The Bastrop Bayou to Brazos River Reach covers Stations 139+000 through 244+300 and is dredged on an average of every four years. Between 1990 and 2010, the High Island to Brazos River Reach has been dredged and maintained 18 times. The amount of material dredged from these reaches during this period is approximately 28,781,653 cubic yards.

The historical dredged material quantity by year and reach is shown in Table 3. The majority of the material dredged was pumped to the designated PAs located adjacent to the reaches. Historical dredging records were analyzed from the Dredging History Database and used to establish maintenance quantities, shoaling rates and future project dredging quantities for the channel reaches.

Table 2 - Placement Area Usage and Capacities											
PA	**Type[1]**	**Reach**	**PA Size[2] (ac)**	**Levee Height (ft)**	**Max Levee Height[3] (ft)**	**PA Capacity[3] (cy)**	**Historic Dredge Cycle (yr)**	**Historic Dredge Quantity/ Cycle (cy)**	**Future Dredge Quantity[4] (cy)**	**Remaining PA Life[5] (yr)**	**Comments**
28	CU	1620+00 - 1700+00	89	22	27	1,434,405	3	117,570	705,420	45	
29	CU		9	21	21	0	NA	NA	0	0	PA Full
30	CU	1700+00 - 1780+00	9	21	25	41,257	3	67,749	406,494	0	PA Full
31	CU		14	20	20	0	NA	NA	0	0	PA Full
32	CU	1780+00 - 1820+00	36	15.5	27	815,249	4	29,040	145,200	140	
33	CU	1820+00 - 1880+00	39	16.5	30	898,980	3	29,445	176,670	114	
34	CU	1880+00 - 1980+00	119	21	34	3,068,668	3	109,044	654,264	105	
35	CU	1980+00 - 2120+00	119	28.5	33	2,098,725	2	212,122	2,121,220	24	
RP1	BU	2090+00 - 2170+00	NA	NA	NA	See Comments	NA	NA	0	See Comments	Rollover Pass Beach No Engineering Limit
36	CU	2120+00 - 2330+00	226	15.5	32	4,887,268	2	267,008	2,670,080	44	
37	CU	2330+00 - 2490+00	256	7.5	22	5,087,137	5	66,710	266,840	475	
38	UPC	2490+00 - 2600+00	202	NA	NA	See Comments	7	81,312	162,624	See Comments	No Engineering Limit
39	CU	2600+00 - 2710+00	209	12	20	2,831,510	7	59,731	119,462	413	
40	CU	2710+00 - 2860+00	196	11	22	3,349,944	4	67,588	337,940	244	
41	UPC	2860+00 - 3010+00	240	NA	NA	See Comments	3	93,429	560,574	See Comments	No Engineering Limit
42	CU	3010+00 - 3090+00	194	27.5	30	3,637,674	3	108,681	652,086	123	
43	UPC	3090+00 - 3260+00	290	NA	NA	See Comments	2	310,248	3,102,480	See Comments	No Engineering Limit
44	CU		NA	NA	NA	NA	NA	NA	0	See Comments	Galveston Channel
45	UPC	3260+00 - 3380+00	58	NA	NA	See Comments	4	150,212	751,060	See Comments	No Engineering Limit
46	OW	3380+00 - 3430+00	96	NA	NA	See Comments	4	104,092	520,460	See Comments	No Engineering Limit
47	OW	3430+00 - 3470+00	138	NA	NA	See Comments	4	88,972	444,860	See Comments	No Engineering Limit

[1]CU - Confined Upland; UPC - Upland Partially Confined; UU - Upland Unconfined; OW - Open Water; BU - Beneficial Use
[2]PA size based on a horizontal plane bounded by the estimated levee centerline alignment.
[3]PA capacity based on maximum levee height determined for the 2000 Preliminary Project Assessment.
[4]Quantity is only that identified for the 20-year period of analysis.
[5]Remaining PA life determined using the following formula: [PA capacity divided by dredging quantity per cycle x 0.80 (rounded down to the nearest whole number)] times the dredging cycle length. The dredging quantity is reduced by a factor of 0.8 to account for shrinkage of dredged material in the PA. Partial maintenance cycles are discounted in the calculation.

Table 2 - Placement Area Usage and Capacities (continued)											
PA	**Type[1]**	**Reach**	**PA Size[2] (ac)**	**Levee Height (ft)**	**Max Levee Height[3] (ft)**	**PA Capacity[3] (cy)**	**Historic Dredge Cycle (yr)**	**Historic Dredge Quantity/ Cycle (cy)**	**Future Dredge Quantity[4] (cy)**	**Remaining PA Life[5] (yr)**	**Comments**
48	OW	3470+00 - 3510+00	83	NA	NA	See Comments	4	90,860	454,300	See Comments	No Engineering Limit
49	OW	3510+00 - 3560+00	83	NA	NA	See Comments	5	73,620	294,480	See Comments	No Engineering Limit
50	OW	-1+000 - 7+400	191	NA	NA	See Comments	10	141,220	282,440	See Comments	No Engineering Limit
51	OW	-8+000 - -1+000	168	NA	NA	See Comments	10	322,220	644,440	See Comments	No Engineering Limit
52	OW	3560+00 - 3580+00 7+400 - 14+000	109	NA	NA	See Comments	10	105,400	210,800	See Comments	No Engineering Limit
53	OW	14+000 - 17+000	30	NA	NA	See Comments	NA	NA	0	See Comments	No Engineering Limit
54	OW	17+000 - 19+000	34	NA	NA	See Comments	NA	NA	0	See Comments	No Engineering Limit
55	OW	19+000 - 22+000	59	NA	NA	See Comments	NA	NA	0	See Comments	No Engineering Limit
56	OW	22+000 - 27+000	50	NA	NA	See Comments	NA	NA	0	See Comments	No Engineering Limit
57	OW	27+000 - 33+000	64	NA	NA	See Comments	NA	NA	0	See Comments	No Engineering Limit
58	OW	33+000 - 36+000	25	NA	NA	See Comments	10	138,600	277,200	See Comments	No Engineering Limit
58A	CU	36+000 - 41+000	155	10.5	22	2,843,917	10	157,700	315,400	220	
59	OW		39	NA	NA	See Comments	NA	NA	0	See Comments	No Engineering Limit
60	OW	41+000 - 44+000	40	NA	NA	See Comments	10	158,630	317,260	See Comments	No Engineering Limit
61	UPC	44+000 - 51+000	100	NA	NA	See Comments	5	114,785	459,140	See Comments	No Engineering Limit

[1]CU - Confined Upland; UPC - Upland Partially Confined; UU - Upland Unconfined; OW - Open Water; BU - Beneficial Use

[2]PA size based on a horizontal plane bounded by the estimated levee centerline alignment.

[3]PA capacity based on maximum levee height determined for the 2000 Preliminary Project Assessment.

[4]Quantity is only that identified for the 20-year period of analysis.

[5]Remaining PA life determined using the following formula: [PA capacity divided by dredging quantity per cycle x 0.80 (rounded down to the nearest whole number)] times the dredging cycle length. The dredging quantity is reduced by a factor of 0.8 to account for shrinkage of dredged material in the PA. Partial maintenance cycles are discounted in the calculation

Table 2 - Placement Area Usage and Capacities (continued)											
PA	**Type[1]**	**Reach**	**PA Size[2] (ac)**	**Levee Height (ft)**	**Max Levee Height[3] (ft)**	**PA Capacity[3] (cy)**	**Historic Dredge Cycle (yr)**	**Historic Dredge Quantity/ Cycle (cy)**	**Future Dredge Quantity[4] (cy)**	**Remaining PA Life[5] (yr)**	**Comments**
62	UPC	51+000 - 64+000	284	NA	NA	See Comments	5	252,070	1,008,280	See Comments	No Engineering Limit
62A	BU		250	NA	NA	See Comments	NA	NA	0	See Comments	No Engineering Limit
63	UPC	64+000 - 83+000	508	NA	NA	See Comments	5	249,515	998,060	See Comments	No Engineering Limit
64	CU	83+000 - 90+000	73	17.5	30	1,744,504	7	122,003	244,006	119	
65	CU	90+000 - 103+000	95	21.5	30	1,939,622	7	253,050	506,100	63	
66	UPC		34	NA	NA	See Comments	NA	NA	0	See Comments	No Engineering Limit
67	OW	103+000 - 113+000	90	NA	NA	See Comments	7	267,211	534,422	See Comments	No Engineering Limit
68	OW	113+000 - 117+000	60	NA	NA	See Comments	7	89,292	178,584	See Comments	No Engineering Limit
69	OW	117+000 - 119+000	22	NA	NA	See Comments	7	79,632	159,264	See Comments	No Engineering Limit
70	CU	119+000 - 132+000	198	16.5	29	4,623,515	7	242,956	485,912	161	
71	CU	132+000 - 139+000	135	15.5	25	2,216,221	7	44,310	88,620	434	
72	CU	139+000 - 146+000	105	15.5	23	1,405,674	7	49,679	99,358	245	
73	CU		51	10	20	863,519	NA	NA	0	NA	Available but not used
74	CU		191	10	20	1,405,674	NA	NA	0	NA	Available but not used
75	UPC		NA	NA	NA	NA	NA	NA	0	0	Replaced by 75A-75C
75A	CU		95	10	20	1,713,653	NA	NA	0	NA	Available but not used
75B	CU		91	10	20	1,624,262	NA	NA	0	NA	Available but not used
75C	CU		102	10	20	1,822,753	NA	NA	0	NA	Available but not used
76	UPC		159	NA	NA	See Comments	NA	NA	0	NA	Available but not used

[1]CU - Confined Upland; UPC - Upland Partially Confined; UU - Upland Unconfined; OW - Open Water; BU - Beneficial Use

[2]PA size based on a horizontal plane bounded by the estimated levee centerline alignment.

[3]PA capacity based on maximum levee height determined for the 2000 Preliminary Project Assessment.

[4]Quantity is only that identified for the 20-year period of analysis.

[5]Remaining PA life determined using the following formula: [PA capacity divided by dredging quantity per cycle x 0.80 (rounded down to the nearest whole number)] times the dredging cycle length. The dredging quantity is reduced by a factor of 0.8 to account for shrinkage of dredged material in the PA. Partial maintenance cycles are discounted in the calculation

Table 2 - Placement Area Usage and Capacities (conclusion of table)											
PA	**Type[1]**	**Reach**	**PA Size[2] (ac)**	**Levee Height (ft)**	**Max Levee Height[3] (ft)**	**PA Capacity[3] (cy)**	**Historic Dredge Cycle (yr)**	**Historic Dredge Quantity/ Cycle (cy)**	**Future Dredge Quantity[4] (cy)**	**Remaining PA Life[5] (yr)**	**Comments**
77	CU		211	10	20	3,807,284	NA	NA	0	NA	Available but not used
78	CU		82	10	20	1,440,311	NA	NA	0	NA	Available but not used
79	UU		29	NA	NA	See Comments	NA	NA	0	See Comments	No Engineering Limit
80	UPC		NA	NA	NA	NA	NA	NA	0	0	Not Available
81	UPC		NA	NA	NA	NA	NA	NA	0	0	Not Available
82	UPC		NA	NA	NA	NA	NA	NA	0	0	Not Available
83	CU		NA	NA	NA	NA	NA	NA	0	See Comments	Port of Freeport
84	CU		NA	NA	NA	NA	NA	NA	0	See Comments	Port of Freeport
85	UPC		NA	NA	NA	NA	NA	NA	0	See Comments	Port of Freeport
86/87	CU	213+000 - 238+000	319	23.5	24	2,170,432	3	558,597	3,351.582	12	
88	CU	238+000 - 243+000	305	20.5	23	3,100,143	4	170,664	853,320	34	
88	CU	242+000 - 244+200	305	20.5	23	3,100,143	2	139,294	1,392,940	34	

[1]CU - Confined Upland; UPC - Upland Partially Confined; UU - Upland Unconfined; OW - Open Water; BU - Beneficial Use

[2]PA size based on a horizontal plane bounded by the estimated levee centerline alignment.

[3]PA capacity based on maximum levee height determined for the 2000 Preliminary Project Assessment.

[4]Quantity is only that identified for the 20-year period of analysis.

[5]Remaining PA life determined using the following formula: [PA capacity divided by dredging quantity per cycle x 0.80 (rounded down to the nearest whole number)] times the dredging cycle length. The dredging quantity is reduced by a factor of 0.8 to account for shrinkage of dredged material in the PA. Partial maintenance cycles are discounted in the calculation

Table 3 - Historical Dredged Material Quantity by Year and Reach				
Year	**Beginning Section (Station)**	**End Section (Station)**	**Total (cy)**	**Reach Total (cy)**
2010	1620+00	1700+00	85,876	
	1700+00	1780+00	20,124	
	1880+00	1980+00	9,500	
	1980+00	2120+00	123,800	
	2120+00	2330+00	78,700	
	3090+00	3260+00	386,000	
	33+000	36+000	9,400	
	36+000	41+000	47,600	
	41+000	44+000	30,000	
	44+000	51+000	79,800	
	51+000	64+000	181,200	
	64+000	83+000	199,200	
	83+000	90+000	73,800	
	90+000	103+000	147,200	
	103+000	113+000	165,200	
	113+000	117+000	53,600	
	117+000	119+00	26,000	
	119+000	132+000	90,000	**1,807,000**
2009	1980+00	2120+00	35,840	
	2120+00	2330+00	309,160	
	3010+00	3090+00	89,000	
	3090+00	3260+00	409,000	
	3260+00	3380+00	172,000	
	3380+00	3430+00	112,000	
	3430+00	3470+00	87,840	
	3470+00	3510+00	82,160	
	3510+00	3560+00	48,000	
	242+100	244+300	74,512	**1,419,512**
2008	1620+00	1700+00	82,547	
	1700+00	1780+00	36,249	
	1820+00	1880+00	11,206	
	1880+00	1980+00	86,159	
	1980+00	2120+00	170,279	
	2120+00	2330+00	122,717	
	2710+00	2860+00	37,561	
	2860+00	3010+00	80,682	**627,400**

Table 3 - Historical Dredged Material Quantity by Year and Reach (continued)				
Year	**Beginning Section (Station)**	**End Section (Station)**	**Total (cy)**	**Reach Total (cy)**
2007	44+000	51+000	50,000	
	51+000	64+000	167,763	
	64+000	83+000	118,400	
	83+000	90+000	108,600	
	90+000	103+000	129,000	
	103+000	113+000	222,000	
	113+000	117+000	118,828	
	117+000	119+000	118,828	
	119+000	132+000	182,380	
	132+000	139+000	26,928	
	139+000	146+000	4,984	
	238+000	243+000	133,722	**1,381,433**
2006	1620+00	1700+00	82,479	
	1700+00	1780+00	45,626	
	1780+00	1820+00	15,040	
	1820+00	1880+00	32,875	
	1880+00	1980+00	96,315	
	1980+00	2120+00	194,613	
	2120+00	2330+00	228,172	
	3010+00	3090+00	93,967	
	3090+00	3260+00	318,833	
	3260+00	3380+00	73,850	
	3380+00	3430+00	96,009	
	3430+00	3470+00	82,623	
	3470+00	3510+00	93,050	
	213+000	238+000	247,850	
	238+000	243+000	140,319	**1,841,621**
2005	1980+00	2120+00	49335	
	2120+00	2330+00	172,678	
	2330+00	2490+00	16,577	
	2490+00	2600+00	11,397	
	2600+00	2710+00	11,397	
	2710+00	2860+00	15,541	
	2860+00	3010+00	24,428	
	3090+00	3260+00	320,311	**621,664**

Table 3 - Historical Dredged Material Quantity by Year and Reach (continued)				
Year	**Beginning Section (Station)**	**End Section (Station)**	**Total (cy)**	**Reach Total (cy)**
2003/2004	1620+00	1700+00	79,739	
	1700+00	1780+00	29,054	
	1780+00	1820+00	3,173	
	1820+00	1880+00	4,756	
	1880+00	1980+00	54,375	
	1980+00	2120+00	188,241	
	2120+00	2330+00	343,729	
	2330+00	2490+00	120,785	
	2490+00	2600+00	68,728	
	2600+00	2710+00	73,663	
	2710+00	2860+00	37,397	
	2860+00	3010+00	108,727	
	3010+00	3090+00	113,373	
	3090+00	3260+00	358,653	
	3260+00	3380+00	113,997	
	3380+00	3430+00	80,059	
	3430+00	3470+00	45,529	
	3470+00	3510+00	45,529	
	3510+00	3560+00	86,401	
	213+000	238+000	382,090	
	238+000	243+000	168,566	
	242+100	244+300	100,663	**2,607,227**
2002	1620+00	1700+00	113,087	
	1700+00	1780+00	67,295	
	1780+00	1820+00	35,689	
	1820+00	1880+00	40,110	
	1880+00	1980+00	127,073	
	1980+00	2120+00	275,106	
	2120+00	2330+00	118,743	**777,103**
2001	213+000	238+000	566,673	
	238+000	243+000	189,922	
	242+100	244+300	112,746	**869,341**

Table 3 - Historical Dredged Material Quantity by Year and Reach (continued)				
Year	**Beginning Section (Station)**	**End Section (Station)**	**Total (cy)**	**Reach Total (cy)**
2000	33+000	36+000	46,008	
	36+000	41+000	46,008	
	41+000	44+000	65,454	
	44+000	51+000	46,016	
	51+000	64+000	151,553	
	64+000	83+000	146,963	
	83+000	90+000	77,395	
	90+000	103+000	208,238	
	103+000	113+000	140,666	
	113+000	117+000	23,112	
	117+000	119+000	23,112	
	119+000	132+000	147,580	
	132+000	139+000	37,071	
	139+000	146+000	34,799	**1,193,975**
1999	1620+00	1700+00	73,958	
	1700+00	1780+00	62,400	
	1880+00	1980+00	73,393	
	1980+00	2120+00	341,955	
	2120+00	2330+00	355,500	
	2710+00	2860+00	22,644	
	2860+00	3010+00	73,405	
	3010+00	3090+00	126,598	
	2130+00	2380+00	739,108	
	238+000	243+000	220,791	
	242+100	244+300	154,597	**2,244,349**
1997	1980+00	2120+00	50,940	
	2120+00	2330+00	162,261	
	3090+00	3260+00	24,052	
	44+000	51+000	61,520	
	51+000	64+000	285,956	
	64+000	83+000	311,692	
	83+000	90+000	88,783	
	90+000	103+000	238,570	
	103+000	113+000	235,595	
	113+000	117+000	59,576	
	117+000	119+000	59,576	
	119+000	132+000	274,192	
	132+000	139+000	62,610	
	139+000	146+000	102,149	
	242+100	244+300	139,536	**2,157,008**

Table 3 - Historical Dredged Material Quantity by Year and Reach (continued)				
Year	**Beginning Section (Station)**	**End Section (Station)**	**Total (cy)**	**Reach Total (cy)**
1996	3090+00	3260+00	338,962	
	3260+00	3380+00	152,575	
	3380+00	3430+00	113,064	
	3430+00	3470+00	109,540	
	3470+00	3510+00	114,243	
	3510+00	3560+00	40,749	
	-8+000	-1+000	163,120	
	-1+000	7+400	405,800	
	7+400	14+000	50,736	
	3560+00	3580+00	40,749	
	213+000	238+00	754,630	
	242+100	244+300	165,527	**2,449,695**
1995	1620+00	1700+00	90,912	
	1700+00	1780+00	94,312	
	1780+00	1820+00	29,696	
	1820+00	1880+00	30,751	
	1880+00	1980+00	99,943	
	1980+00	2120+00	259,908	
	2120+00	2330+00	261,865	
	2330+00	2490+00	34,043	
	2860+00	3010+00	105,220	
	3090+00	3260+00	362,073	**1,368,723**
1993	1980+00	2120+00	125,000	
	2120+00	2330+00	229,000	
	3010+00	3090+00	276,000	
	3090+00	3260+00	424,000	
	242+100	244+300	135,192	**1,189,192**
1992	33+000	36+000	221,799	
	36+000	41+000	221,799	
	41+000	44+000	221,799	
	44+000	51+000	221,799	
	51+000	64+000	221,799	
	64+000	83+000	221,799	
	213+000	238+000	1,033,628	
	242+100	244+300	194,451	**2,558,873**

Table 3 - Historical Dredged Material Quantity by Year and Reach (conclusion of table)				
Year	**Beginning Section (Station)**	**End Section (Station)**	**Total (cy)**	**Reach Total (cy)**
1991	3260+00	3380+00	238,646	
	3380+00	3430+00	119,323	
	3430+00	3470+00	119,323	
	3470+00	3510+00	119,323	
	3510+00	3560+00	119,323	
	-8+000	-1+000	119,323	
	-1+000	7+400	238,646	
	7+400	14+000	119,323	
	242+100	244+300	315,707	**1,508,937**
1990	1620+00	1700+00	175,200	
	1700+00	1780+00	96,600	
	1780+00	1820+00	61,600	
	1820+00	1880+00	76,600	
	1880+00	1980+00	180,200	
	1980+00	2120+00	306,200	
	2120+00	2330+00	287,560	
	2330+00	2490+00	95,440	
	2490+00	2600+00	152,200	
	2600+00	2710+00	85,600	
	2710+00	2860+00	224,800	
	2860+00	3010+00	230,400	
	3010+00	3090+00	25,600	
	3090+00	3260+00	160,600	**2,158,600**
Total Dredged from High Island to Brazos River Reach				**28,781,653**

REAL ESTATE EASEMENTS

For the placement of dredged material the following types of easements are utilized: 1) Perpetual; 2) Revocable; 3) Temporary; or 4) Navigation Servitude (in which the Government may utilize open water placement areas). These easements may or may not have conditions that go along with the easement. When there are conditions on the easement they are documented in the Real Estate instrument or Deeds. All easements are either conveyed from the land owner(s) or the non-Federal sponsor to the Government. The costs for the easements are the fair market value at the time of conveyance. The Underlying Fee Owner(s) information is available from the respective County Appraisal Districts.

- A Perpetual Easement is an easement that is to last without any limitation of time; the easement holder has a right on the property of another person which to an extent is permanent.

- A Revokable Easement means that the Underlying Fee Owner(s) has the capability to revoke the Government's right to use the land; however, there is a process that must be followed in order to revoke the easement. As an example, the Underlying Fee Owner(s) would have to submit a letter to the District Engineer requesting the release of the easement. A minimum 30-day advanced notice is required and no release can happen during a dredging cycle.

- Temporary Easements are easements where the Government has the right to use the land, as described in the conveyance documentation, for a specific amount of time.

- Navigational Servitude is described in ER 405-1-12 (1 May 1998). "The navigation servitude is the dominant right of the Government under the Commerce Clause of the U.S. Constitution (U.S. Const. Article I, Section 8, Clause 3) to use, control and regulate the navigable waters of the United States and the submerged lands thereunder for various commerce-related purposes including navigation and flood control. In tidal areas, the servitude extends to all lands below the mean high water mark. In non-tidal areas, the servitude extends to all lands within the bed and banks of a navigable stream that lie below the ordinary high water mark."

Property owners and easements for each PA are identified in Table 4.

Table 4 – Placement Area Real Estate Easements		
PA	**[1]Owner**	**Type of Easement**
28	Private Owners	Perpetual Right-of-Way (ROW) & Spoil
29	Private Owners	Perpetual Right-of-Way (ROW) & Spoil
30	Private Owner	Perpetual Right-of-Way (ROW) & Spoil
31		[2]
32	Private Owner	Perpetual Right-of-Way (ROW) & Spoil
33	Private Owners	Perpetual Right-of-Way (ROW) & Spoil
34	Private Owners & USA	Perpetual Right-of-Way (ROW) & Spoil
35	Private Owners	Perpetual Right-of-Way (ROW) & Spoil
36	Private Owners	Perpetual Right-of-Way (ROW) & Spoil
37	Private Owners	Perpetual Right-of-Way (ROW) & Spoil
38	Private Owners	Perpetual Right-of-Way (ROW) & Spoil
39	Private Owners, Galveston County, & Conservancy	Perpetual Right-of-Way (ROW) & Spoil
40	Private Owners & Conservancy	Perpetual Right-of-Way (ROW) & Spoil
41	Private Owners, USA & POHA	Perpetual Right-of-Way (ROW) & Spoil
42	State	Temporary Spoil Easement (30-years; RE Instrument dated 9 December 2004).
43	Private Owners, State & POHA	Navigational Servitude
44	USCG, USA, City of Galveston & POHA	Perpetual Right-of-Way (ROW) & Spoil Navigational Servitude
45	USA	Perpetual Right-of-Way (ROW) and Spoil & Navigational Servitude
46	USA	Navigational Servitude
47	USA	Navigational Servitude
48	USA	Navigational Servitude
49	USA	Navigational Servitude
50	USA	Navigational Servitude
51	USA	Navigational Servitude
52	USA	Navigational Servitude
53	USA	Navigational Servitude
54	USA	Navigational Servitude
55	USA	Navigational Servitude
56	USA	Navigational Servitude
57	USA	Navigational Servitude

[1]USA – United States of America
Conservancy - The Nature Conservancy of Texas
POHA – Port of Houston Authority
Texas – State of TX
USFWS – US Fish & Wildlife Service
USCG – US Coast Guard
[2]Issues with the easement; could impact ability to use in the future; this needs to be addressed in the DMMP Phase.
[3] PAs 73-82: This information is based on archived and audited RE documentation. Will need to determine whether or not the ownership and easement information provided for these PAs is current in DMMP.

Table 4 – Placement Area Real Estate Easements (conclusion of table)		
PA	**[1]Owner**	**Type of Easement**
58	USA	Navigational Servitude
58-A	State	Temporary Spoil Easement (30-years; RE Instrument dated 7 December 1995)
59	USA	Navigational Servitude
60	Private Owners	Navigational Servitude
61	Private Owners	Navigational Servitude
62	Private Owners	Perpetual Right-of-Way (ROW) and Spoil
62-A	State	[2]
63	Private Owners	Perpetual Right-of-Way (ROW) & Spoil
64	Private Owner	Perpetual Right-of-Way (ROW) & Spoil
65	Private Owner	Perpetual Right-of-Way (ROW) & Spoil
66	Private Owner	Perpetual Right-of-Way (ROW) & Spoil
67	USA	Navigational Servitude
68	USA	Navigational Servitude
69	Private Owner	Navigational Servitude
70	USFWS	Perpetual Right-of-Way (ROW) & Spoil
71	USFWS	Perpetual Right-of-Way (ROW) & Spoil
72	USFWS	Perpetual Right-of-Way (ROW) & Spoil
73	USFWS	[3]Perpetual Right-of-Way (ROW) & Spoil
74	USFWS	[3]Perpetual Right-of-Way (ROW) & Spoil
75	USA	[3]Perpetual Right-of-Way (ROW) & Spoil
76	USA	[3]Perpetual Right-of-Way (ROW) & Spoil
77	Private Owner & USA	[3]Perpetual Right-of-Way (ROW) & Spoil
78	Private Owner & USA	[3]Perpetual Right-of-Way (ROW) & Spoil
79	Private Owners	[3]Perpetual Right-of-Way (ROW) & Spoil
80	Private Owners	[3]Perpetual Right-of-Way (ROW) & Spoil
81		[3]Temporary; [3]Expired
82	Private Owner	Perpetual Right-of-Way (ROW) & Spoil
83	State	Temporary; Expired
84		Temporary; Expired
85		Temporary; Expired
86	Private Owner	Perpetual Right-of-Way (ROW) & Spoil
87	Private Owners	Perpetual Right-of-Way (ROW) & Spoil
88	Private Owners	Perpetual Right-of-Way (ROW) & Spoil

[1]USA – United States of America
Conservancy - The Nature Conservancy of Texas
POHA – Port of Houston Authority
Texas – State of TX
USFWS – US Fish & Wildlife Service
USCG – US Coast Guard

[2]Issues with the easement information; could impact ability to use in the future; this needs to be addressed in the DMMP Phase.

[3] PAs 73-82: This information is based on archived and audited RE documentation. Will need to determine whether or not the ownership and easement information provided for these PAs is current in DMMP.

ECONOMIC ASSESSMENT

Prior Economic Conditions

The GIWW was originally constructed to provide a protected inland waterway connection between gulf ports; however, the GIWW ultimately enabled the gulf ports to be linked via the inland waterway system with the entire country. The channel was designed for shallow draft barges to transport commodities to and between the nation's major ports.

Current Economic Conditions

The economic analysis for determining the feasibility of continued maintenance of the waterway involved a comparison of transportation costs for commodities being shipped on the waterway now and those projected in the future, with the costs of shipping those same commodities by the least costly alternate transportation mode. Transportation costs were developed for each mode and the difference between each of the modes and the GIWW reflects the cost savings for each mode. The results showed the average annual transportation costs for the GIWW to be $228,494,000 and the next least costly alternative to be rail. Rail costs vary by distance traveled with higher costs per ton for shorter distances. By taking an average of the cost per ton-mile for trips less than 500 miles provided by the Department of Transportation, the break even miles equivalent to the cost transporting on the GIWW is 127 miles round trip. This distance is roughly equivalent to the distance from Houston ports to Freeport ports. A portion of the tonnage on this stretch of the GIWW travels distances farther than 127 miles round trip. Hence, transportation costs on the GIWW still remain the most economical mode.

From 2000 to 2008, an average of 27 million tons was transported on this section of the waterway, with the tonnage remaining steady. Since 1960, the tonnage transported on this section of the waterway increased an average of 2.2 percent. Transportation costs on the GIWW are consistently cheaper than other modes of transport, so this trend is expected to continue. See Table 5 for tonnage forecasts and projected transportation costs throughout the period of analysis for both the GIWW and rail.

Table 5
GIWW, Texas, High Island to Brazos River
Transportation Cost Forecast

YEAR	TONNAGE FORECAST	TRANSPORTATION COST (GIWW)	TRANSPORTATION COST (RAIL- 100 MILES ONE WAY)
2012	27,430,000	$181,662,000	$286,334,000
2017	27,430,000	$206,120,000	$324,884,000
2022	27,430,000	$233,871,000	$368,625,000
2027	27,430,000	$265,358,000	$418,254,000
2032	27,430,000	$301,084,000	$474,565,000
Average Annual Transportation Cost (2012 to 2032)*		**$228,494,000**	**$360,150,000**

*Discount Rate of 4%

Maintenance Costs

The cost effectiveness of continued maintenance was evaluated based on an assessment of benefit indicators and a comparison of the average annual maintenance costs. The benefit indicators evaluated were overall tonnage and vessel fleet trends.

The present channel dimensions of the GIWW were authorized in 1939. At the time, much of the remaining Texas portion of the GIWW had not been completed. No separate maintenance forecasts were made for the study reach in the authorizing documents, but maintenance of the GIWW from the Sabine River to Corpus Christi was estimated at $637,500 in 1939 dollars. The average annual maintenance cost for the past 25 years, based on this same area of the GIWW, was $208,119 adjusted to 1939 dollars. In 2010 dollars, this equates to an average annual cost of $3,276,457 from the Sabine River to Corpus Christi. The size of the barges has also increased in the GIWW since authorization.

In addition, the project was based on 45 feet wide barges with a maximum length of 750 feet, and present tow configurations often consist of two or three barges 54 feet by 298 feet. Thus the size of the tows has also increased since project authorization. The economic assessment worksheet is presented in Table 6.

Table 6
GIWW, Texas, High Island to Brazos River
Economic Assessment Worksheet for Continued Maintenance Dredging

	Economic Statistics	Authorizing Study	Current Conditions	Assessment	Summary
Benefit Indicators	Commodity Types	Crude petroleum, petroleum, sand and gravel	Petroleum and petroleum products, sand and gravel, agricultural products, sulfur, salt, shell	Steady/Up	Up
	Tonnage Estimates	None, study reach not yet constructed	25 million in 2008	Steady/Up	
	Growth Rates	1960-2015 petroleum tonnage was forecasted to increase at an annual rate of 1.0%	1960-2008 tonnage increased at an annual rate of 2.2%	Up	
	Vessel Types	Barges and fishing boats	Barges	Up	
	Vessel Sizes	Maximum width of 45 feet, Maximum length of 750 feet	108 Feet wide x 1,138 feet long	Up	
Cost Indicators*	Dredging Cycle	Not stated	2-5 years, longer in some reaches	N/A	Down
	Annualized Dredging Quantities	Not stated	1,303,607 cubic yards per year, 1994-2010	N/A	
	Average Annual Maintenance Cost	$637,500	$208,119	Down	
	Price Level	1939	1985-2010 adjusted to 1939 dollars	N/A	
Conclusion	**Justification of Continued Maintenance Dredging is Warranted**				

N/A = Not Applicable
*Cost Indicators reflect aggregate totals for the GIWW from Sabine River to Brazos River in order to compare to 1939 levels.

Conclusions

Analysis of the economic benefit and cost indicators shows that continued maintenance of the GIWW from High Island to Brazos River is warranted. This determination is based on overall increases in tonnage levels, tow sizes, and decreases in project maintenance costs. Additional economic analysis is not necessary.

ENVIRONMENTAL COMPLIANCE

National Environmental Policy Act (NEPA) Documents

The existing Environmental Compliance documents for the project are listed in Table 7.

Table 7– NEPA Documents for Environmental Compliance

Document	[1]Issuing Agency	Date
Final Environmental Statement, Maintenance Dredging, Gulf Intracoastal Waterway, Texas Section, Main Channel and Tributary Channels, U.S. Army Corps of Engineers, Galveston District (1975 FES) *(completed and filed with the U.S. Environmental Protection Agency (EPA), January 1976).*	USACE, Galveston	Oct 1975
State Water Quality Certification	TCEQ	Oct 1978
Coastal Consistency Determination	CCC	Dec 1999
Environmental Assessment, Gulf Intracoastal Waterway, Texas Alternate Disposal Areas for Main Channel Galveston Bay to Matagorda Bay. Statement of Findings and Findings of No Significant Impact (FONSI) signed March 1983.	USACE, Galveston	Mar 1983
Environmental Assessment, Gulf Intracoastal Waterway, Texas Main Channel – Galveston Bay to Matagorda Bay, Alternative Disposal Area in the Vicinity of Jones Bay. Statement of Findings and FONSI signed February 1992.	USACE, Galveston	Feb 1992
Environmental Assessment, Gulf Intracoastal Waterway (Main Channel), High Island to Galveston Bay, Texas, Bend Easing and Passing Zone.	USACE, Galveston	Mar 1995
Environmental Assessment, Gulf Intracoastal Waterway, High Island to Galveston Bay, Texas – Alternative Placement Area for Rollover Pass, Texas.	USACE, Galveston	Jun 1996
Environmental Assessment, Gulf Intracoastal Waterway, High Island to Brazos River – Section 216 Feasibility Study, Chambers, Galveston, and Brazoria Counties, Texas.	USACE, Galveston	Sep 2003
Environmental Assessment, Beneficial Use of Dredged Material for Marsh Preservation in the Vicinity of Greens Lake, Galveston County, Texas.	USACE, Galveston	Feb 2007

[1]*USACE - U.S. Army Corps of Engineers*
TCEQ - Texas Commission on Environmental Quality
CCC – Coastal Coordination Council

Status of Compliance for the Next 20 Years

PAs 28, 32, 33, 34, 35, 36, 40, 42, 64, 65, 70, 71, 72, 86, 87 and 88 are active confined upland PAs; they were last used between 2000 and 2011. PAs 70, 71 and 72 are located within Brazoria National Wildlife Refuge (NWR) and use of these PA requires coordination with the refuge so they can manage the sites for wildlife between dredging cycles. All of these PAs have been fully coordinated (1975 FES) and there are no environmental or cultural resource limitations concerning their current footprint and use. If future usage of these PAs warrants physical modifications or expansion beyond the existing limits of the PAs (e.g. increasing the height or expanding the area) then these PAs will need to be reevaluated for environmental impacts and/or recoordinated. Options for future expansion may be constrained at PA 23 due to oil pipelines located on both sides of the PA (i.e. west (GIWW) side and parallel to the PA on the east side), and at PAs 33 and 34 due to tidal inlets and marsh immediately adjacent to the PAs.

PAs 29, 30, 31 and 37 were coordinated in 1975 as confined upland PAs for the GIWW, but they have not been used in more than 30 years (PAs 29, 30 and 31), or the date of last use is unknown (PA 37). This lack of use has resulted in naturalization of wetland vegetation and ponds within the PAs, especially within PAs 31 (located within the Anahuac NWR) and 37 where the levees have eroded so much that much of the PAs now have tidal circulation via small inlets and creeks. PA 30 has a narrow pinch point, a result of its small size and linear configuration. Because of this, future pumping of more than minor amounts of material into PA 30 would result in water quality issues. Expansion for additional capacity for these PAs is constrained by the adjacent tidal marsh. Additional environmental resources information must be gathered and reevaluated to determine environmental impacts, which could result from future use or modification of these PAs.

PA 38 is an active partially-emergent unconfined, open water PA that was last used in 2003. The use of PA 38 was fully coordinated in 1975 (1975 FES). However, due to requirements to address regional sediment management and concerns regarding environmental impacts associated with continued open bay placement, the continued use of this PA as an open water PA should be reevaluated and recoordinated. In addition, modification of this PA for continued use (e.g. confining/expanding as an upland PA) will need to be reevaluated for environmental impacts and recoordinated.

PA 39 is a confined upland PA coordinated for GIWW use in 1975. The last use of PA 39 for placement of material from the GIWW was about 10 years ago. Although some maintenance to repair the cellular concrete mattress shoreline protection was performed in 2010, due to the amount of time that has lapsed since this PA has been used, the PA will need to be reevaluated

for environmental impacts and/or recoordinated prior to continuing use or performing any modifications.

PAs 41 and 43 are partially-emergent unconfined/open water PAs coordinated for GIWW use in 1975. Material was last placed in PAs 41 and 43 in 2008 and 2010, respectively. Based on coordination in 1975, these PAs must be leveed and confined when they become emergent to a distance of 1,350 feet from the centerline of the GIWW. Additional limitations were placed on PA 41, including a no-discharge corridor that was established to avoid direct impacts to a demonstration marsh established in the mid-1970s. During at least one maintenance dredging cycle this corridor was not observed; during that dredging event, material was placed up-gradient of the marsh during the early 1990s (based on personal observation). That marsh may no longer exist. In addition, the HGNC Bolivar Marsh 288-acre BU cell that is currently under construction may limit placement capacity within PA 41 as a levee will be required to partially confine the western portion of PA 41 to prevent the placement of maintenance material into PA 41 from impacting the BU site. Due to requirements to address regional sediment management and environmental impacts associated with continued unconfined or open bay placement, the continued use of PAs 41 and 43 should be reevaluated and recoordinated. Future use or modification of these PAs for continued use (e.g. confining/expanding as an upland placement area) may need to be reevaluated for environmental impacts and/or recoordinated.

PA 44 is an active confined upland PA that was coordinated for the placement of maintenance material from the GIWW in 1975. The last use of PA 44 for the placement of GIWW maintenance material is unknown. Material currently being placed into this PA is generated from the Galveston Harbor Channel project.

PA 45 is a partially confined PA also known as Little Pelican Island/Pelican Spit that was coordinated for use for the GIWW in 1975 and 2003. The site was last used in early 2012. This area is utilized by colonial waterbirds as a nesting, feeding and loafing area, thus use of the PA is restricted to times of the year when birds are not actively nesting. Beginning in 1987, sandy dredged material has been used to construct marsh habitat along the spit extending from this island. An additional 70 acres of marsh was proposed for construction from the BU of dredged material from the proposed modification of the Pelican Moorings and Texas City Wye modifications in 2003 (USACE, 2003); however this project was never constructed. Due to requirements to address regional sediment management and general environmental concerns associated with continued unconfined placement, the use of these PAs for unconfined placement should be reevaluated and recoordinated.

PAs 46 through 59 are open water placement areas coordinated for use for the GIWW in 1975. PAs 45, 47, 48 and 49 are active open water PAs; PAs 45, 47, 48, and 51 are scheduled to be

used in 2012. PAs 46 and 49 were used as recently as 2009. PAs 50 and 51 are located along the GIWW Alternate Route. PAs 50 through 59 have not been used in over 10 years due to their location in an area with a low shoaling rate, and because of the presence of oyster reef in the footprint and vicinity of these PAs. Due to requirements to address regional sediment management general environmental impacts associated with continued open bay placement, and impacts to oyster reef in the vicinity, the use of these PAs for unconfined open water placement should be reevaluated and recoordinated. Future use or modification of these PAs for continued use (e.g. confining/expanding as an upland placement area) will need to be reevaluated for environmental impacts and/or recoordinated.

58A is a recently constructed active confined upland PA located along Highland Bayou. This PA was coordinated for the placement of GIWW maintenance material in 1992. It was last used in 2000.

PAs 60 and 61 were coordinated as placement areas for the GIWW in 1975, as partially-emergent unconfined/open water placement areas. According to the Galveston District Operations Division, these PAs have not been used recently (within the last 10 years) due to the prevalence of oysters and seagrasses within and surrounding these sites; if they are to be used, contracts are restricted to placement during the winter months (December through March) when seagrasses are dormant. In addition, the material must be placed in a thin-layer. Per the 1975 FES, PA 60 was prohibited from use by the Environmental Protection Agency (EPA) (per letter dated 9 October 1975). Due to the presence of oysters and seagrasses at these PAs, requirements to address regional sediment management, as well as overall environmental impacts associated with continued open bay placement, the continued use of these PAs for open water or partially confined placement should be reevalated and recoordinated. Future use or modification of these PAs for continued use (e.g. confining/expanding as an upland placement area) will need to be reevaluated for environmental impacts and/or recoordinated.

PA 62 is an unconfined barrier island on the south side of the GIWW at Greens Lake; it was coordinated as a PA for the GIWW in 1975. This PA was last used in 2000. PA 62 is operated such that material is discharged over the crest of existing ground so that material does not return to the channel. Also, an energy dissipater or spreader is used to minimize scour and maximize retention of material on the land and facilitate nourishment of the barrier. The 2003 High Island to Brazos River 216 Study Environmental Assessment (EA) coordinated use of this PA as a BU site that would use GIWW material to nourish the area to protect Greens Lake from wave action. The preferred alternative proposed that the PA be partially leveed on the east and south sides to create conditions for migration of sediments and natural establishment of fringe marsh on unprotected south side of the barrier island. Due to the presence of seagrasses at this PA, requirements to address regional sediment management, as well as overall environmental

impacts associated with continued unconfined open bay placement, the continued use of this PA should be reevaluted and recoordinated.

PA 62A is a BU site located north of the GIWW between Greens Lake and Carancahua Bayou. This PA was coordinated through a 2007 EA. The back limit of the PA is 1,350 feet from the GIWW centerline, but there are needs for dredged material BU beyond this limit. If the use of other nearby PAs is curtailed because of the presence of seagrasses or oysters, it may become economically feasible to consider longer pumping distances.

PA 63 is a partially-emergent unconfined open water site coordinated as a PA for the GIWW in 1975. Use of this PA is constrained between Station 77+000 and Station 84+300. This PA is under contract with constraints as there are seagrasses on the backside. The only time pumping into this PA is feasible is during the dormant period (December-March) for seagrasses. In the contract we have to address that the PA is only used during the seagrass dormant period and the material has to be placed in a thin layer. That means PA 63 can only be used for three months of the year. There is also breaching in this PA. Marsh nourishment and the construction of geotubes would help protect this area. Due to the presence of seagrasses at this PA, requirements to address regional sediment management, as well as overall environmental impacts associated with continued unconfined open bay placement, the continued use of this PA should be reevaluated and recoordinated.

PA 66 was coordinated for use by the GIWW as a partially-emergent unconfined, open water PA coordinated as a placement area for the GIWW in 1975. This PA was last used for the placement of GIWW material in the 1980's. Because of its small size and expanse of intertidal marsh, this area has not been used since that time. Due to the presence of marsh at this PA, requirements to address regional sediment management, as well as overall environmental impacts, the continued use of this PA should be reevaluated and recoordinated.

PA 67 is a partially-emergent unconfined, open water placement area originally coordinated as a PA for the GIWW in 1975. The island within this PA supports colonial waterbird nesting. This PA is proposed for BU, as described in the 2003 Chocolate Bayou EA. The BU would entail nourishment of the island together with marsh creation. The most recent attempt to nourish the island was made in the early 2000s, but this effort was not completed as a result of environmental concerns raised during construction and resulting contract difficulties.

PAs 68 and 69 are open water placement areas coordinated as placement areas for the GIWW in 1975. They have not been used in over 10 years and are not viable placement areas due to their location in a high energy area. Any dredged material placed into these open water PAs almost immediately returns to the GIWW channel. Due to requirements to address regional sediment

management and overall environmental impacts associated with continued open bay placement, the continued use of these PAs for future open water or partially confined placement should be reevaluated and recoordinated

PAs 73 and 74 are upland confined sites within Brazoria NWR. They were coordinated as a placement area for the GIWW in 1975, and their use requires coordination with the Brazoria NWR to manage the site for wildlife between cycles. However, these areas have not been used in over 40 years since the channel in the vicinity of these PAs does not experience shoaling and does not require routine maintenance. Additional environmental resources information must be gathered and reevaluated to determine environmental impacts, which could result from future use or modification of these PAs. Expansion for additional capacity for these PAs may be constrained by the adjacent tidal marsh.

PA 75 is a partially confined placement area within the Brazoria NWR, originally coordinated as a placement area for the GIWW in 1975. In 1983, an EA was finalized replacing PA 75 with PAs 75A, 75B, and 75C to avoid unconfined placement in Christmas Bay. However, none of these PAs have been used since they were coordinated as the channel in the vicinity of these PAs does not experience shoaling and does not require routine maintenance. Additional environmental resources information must be gathered and reevaluated to determine environmental impacts, which could result from future use or modification of these PAs. Expansion for additional capacity for these PAs may be constrained by the adjacent tidal marsh and restrictions placed on them by the refuge.

PAs 76, 77, 78, 80, 81, and 82 are partially confined and confined upland placement areas coordinated as placement areas for the GIWW in 1975. These areas have not been used in over 40 years since the channel in the vicinity of these PAs does not experience shoaling and does not require routine maintenance. Additional environmental resources information must be gathered and reevaluated to determine environmental impacts, which could result from future use or modification of these PAs.

PA 79 was coordinated as a placement area for the GIWW in 1975; however, by letter dated 9 October 1975, the EPA prohibited its use as a PA.

PAs 83, 84 and 85 were coordinated as partially confined or confined upland PAs for placement of GIWW maintenance material in 1975. However, there is no dredging history of these PAs being used for the GIWW; they are currently owned by the Port of Freeport. Additional environmental resources information must be gathered and reevaluated to determine environmental impacts, which could result from future use or modification of these PAs for use for GIWW maintenance material.

Requirements for Future Compliance

Limited capacities of some of the existing confined placement areas, together with expected impediments to future use of open water placement areas, will require development of new placement areas or alternatives in the near future. The scarcity of available upland sites and typically long pumping distances to such areas illustrate the urgent need to explore beneficial uses of dredged material. Expanding existing emergent confined placement areas adjacent to the waterway and/or increasing the number and size of open water placement areas to resolve the projected capacity limitations will likely be met with significant resistance from resource agencies and the public. Any new dredged material management alternatives for maintenance of the GIWW would require environmental coordination prior to potential future use. This coordination would involve public interest review and NEPA documentation in coordination with State and Federal regulatory and resource agencies. At a minimum, each new alternative would require environmental documentation under an EA/Finding of No Significant Impact (EA/FONSI). NEPA compliance will require coordination under the Fish and Wildlife Coordination Act; Clean Water Act; Endangered Species Act; Clean Air Act; Magnuson-Stevens Fishery Conservation and Management Act; National Historic Preservation Act; Executive Order (EO) 11990, Protection of Wetlands; Council on Environmental Quality (CEQ) Memorandum dated August 11, 1980, Prime or Unique Farmlands; EO 12898, Environmental Justice; Memorandum of Agreement (MOA) with the Federal Aviation Administration (FAA) to Address Aircraft-Wildlife Strikes; and Coastal Zone Management Act (CZMA), as well as other laws, executive orders, and regulations.

Table 8 –Determination of Whether Environmental Issues Exist for PA(s)

PA(s)	Environmental Issues (Yes/No)
29, 32, 33, 34, 35, 36, 40, 42, 44, 58A, 62, 62A, 63, 64, 65, 68, 70, 71, 72, 86, 87, 88	No
29, 30, 31, 37, 38, 39, 41, 43, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 66, 67, 68, 73, 74, 75, 75A, 75B, 75C, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85	YES

CONCLUSIONS

Continued operation of the GIWW – High Island to Brazos River over the next 20 years is limited by both capacity and potential future impediments to the use of open water placement areas for environmental reasons as indicated in Table 8.

Analysis of the economic benefit and cost indicators show that continued maintenance of the GIWW from High Island to Brazos River is warranted.

Concerning the capacity of the PAs, if capacity alone is considered for all PAs, including open water PAs (without considering environmental concerns), the only upland sites with potential capacity issues are PA 30 and PAs 86/87. The unavailability of PA 30 creates a capacity shortfall of about 284,000 cubic yards; however, this could be accommodated by other PAs in its proximity. PA 86/87 has an estimated 511,000 cubic yards shortfall based on the estimated maximum levee height. If the material from the reach served by PA 86/87 can be pumped to PA 88, and the PA 30 material can be placed in another existing PA, then there is capacity available for the 20-year period of analysis.

Concerning environmental considerations, the majority of the PAs coordinated for placement of material dredged from the GIWW, High Island to Brazos River Reach require reevaluation and recoordination.

Table 9 - Future Maintenance Limitations	
The Ability to Maintain this Project for the Next 20 Years is Limited by:	
Economic Viability	N
Placement Area Capacity	N[1]
Environmental Compliance	Y

[1]If the material from the reach served by PA86/87 can be pumped to PA 88 and the PA 30 material can be placed in another existing PA then there is capacity available for the 20-year period of analysis.

RECOMMENDATIONS

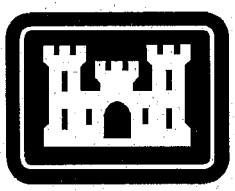
Due to current capacity, engineering, and environmental issues with the existing PAs, a new DMMP should be developed to identify new placement alternatives and develop a minimum of 20 years of capacity for future maintenance of the High Island to Brazos River Reach of the GIWW, Texas Project

Based on these findings, I recommend that this analysis be certified as being in accordance with the current policy and that a DMMP Study be conducted.

22 June 2012
Date

Christopher W. Sallese
Colonel, Corps of Engineers
District Commander

GIWW BRAZOS RIVER TO PORT O'CONNOR PRELIMINARY PROJECT ASSESSMENT



US Army Corps
of Engineers
Galveston District

GULF INTRACOASTAL WATERWAY, TEXAS BRAZOS RIVER TO PORT O'CONNOR

PRELIMINARY PROJECT ASSESSMENT

U.S. Army Engineer District, Galveston
Southwestern Division
March 2000

BRAZOS RIVER TO PORT O'CONNOR

STUDY AUTHORITY AND PURPOSE

This Preliminary Project Assessment (PPA) complies with EC 1165-2-200, "National Harbors Program: Dredged Material Management Plans (DMMP)," dated 21 July 1994. The purpose of this assessment is to establish whether a more detailed DMMP study is required and if so, to provide the information necessary to permit its prioritization in the District's budget and workplan.

PROJECT INFORMATION

General Description

The Gulf Intracoastal Waterway (GIWW) is an inland waterway system, which stretches from Brownsville, Texas, along the entire Gulf of Mexico to St. Marks, Florida. The GIWW provides over 1,300 miles of protected waterway for all types of shallow-draft vessels. The Texas section of the GIWW is a 12-foot (ft) deep by 125-ft wide channel which spans 423 miles along the Texas coast from Brownsville to the Texas-Louisiana border and ties Texas ports to the national waterway system. The study area (Figure 1) consists of approximately 72 miles of the GIWW in Brazoria, Matagorda, and Calhoun counties extending from the Brazos River crossing to Port O'Connor, Texas. The channel dimensions are listed below in Table 1.

Table 1.
GIWW, Texas, Brazos River to Port O'Connor
Channel Dimensions

Reach or Segment	Depth (ft)	Width (ft)
Main Channel	12	125
Across Matagorda Bay	12	175
FM 2031 Bridge	12	100
Colorado River Crossing	12	75-300

Figure 1. Project Map

MAP TO BE ADDED BY GALVESTON DISTIRCT

Non-Federal Sponsor

The non-Federal Sponsor for the project is the State of Texas, represented by the Texas Department of Transportation (TxDOT), Multimodal Operations, Waterway Branch, 125 East 11th Street, Austin, Texas 78701-2483. Their telephone number is (512) 416-2349.

PROJECT AUTHORIZATION

Table 2 provides dates and descriptions of authorized project features for the GIWW, Port O'Connor to Corpus Christi Bay study area.

Table 2.
GIWW, Texas, Brazos River to Port O'Connor
Authorized Project Activity

Date	Project and Work Authorized	Documents
21 Jan. 1927	Channel 9 by 100 ft, Galveston Bay to Corpus Christi	H. Doc. 238, 68th Cong., 1st Sess.
23 Mar 1939	Enlarge waterway to depth of 12 ft and a width of 125 ft from Sabine River to Corpus Christi.	H. Doc. 230, 76th Cong., 1st Sess
23 Oct 1962	Improve main channel 16 ft deep and 150 ft wide from Sabine River to Houston Ship Channel; with two relocations; relocate main channel in Matagorda Bay and Corpus Christi Bay and maintain existing Lydia Ann Channel.	H. Doc. 556, 87th Cong., 2nd Sess.

PLACEMENT AREAS AND DREDGING

Placement Areas

There are 37 placement areas (PAs) available for this section of the GIWW. Twenty-one of the PAs are upland confined, 2 upland unconfined, 7 upland partially confined, 1 beach nourishment site and 7 open water sites. PA 91 is not currently used for the GIWW, but is co-coordinated with the San Bernard River Channel and available for use. PAs 90 and 92 are also co-coordinated with the San Bernard River. For this evaluation, the yearly average maintenance for the San Bernard River mouth, 14,372 cubic yards, was included in the yearly average of PA 92. The total amount dredged represents that section of the GIWW, but the yearly average includes the San Bernard River. Capacity available for upland confined, upland unconfined and upland partially confined were calculated as if they were all confined uplands. PA 117 was not used because of the availability of PA 117A, which utilizes beach nourishment. PA 117 is available for use, and is fully coordinated with the appropriate regulatory agencies.

Dredging frequencies and good dredging records vary along this section of the GIWW. Table 3 below shows the record period for each reach that was used to calculate the average annual shoaling rate.

Table 3.
GIWW, Texas, Brazos River to Port O'Connor
Maintenance Dredging Records

Reach	First Record	Last Record	Total Years
245+000 thru 340+000	1968	1997	29 years
340+000 thru 455+000	1970	1997	27 years
455+000 thru 540+000	1968	1995	27 years
540+000 thru 625+000	1969	1996	27 years
625+000 thru 630+000	1960	1992	32 years

Table 4 provides more detail on PAs available on the Brazos River to Port O'Connor section of the GIWW. PA 90 will be filled in 26 years, 2023, and will be the first PA to run out of capacity along this reach. Based on Table 4 there is sufficient capacity along the Brazos River to Port O'Connor section of the GIWW.

Summary of Analysis

There is sufficient capacity along the Brazos River to Port O'Connor section of the GIWW and no DMMP is required at the time. Based on the analyses there is capacity at least until 2023 providing the minimum 20 years capacity.

ECONOMIC ASSESSMENT

Prior Economic Conditions

The purpose of the project authorization was to provide a protected inland waterway from the Great Lakes to the Mexican Border. The authorization in 1925 provided for a channel 9 ft deep and 125 ft wide. The channel was designed for shallow draft barges to transport commodities to and between the nation's major ports.

Table 4.

GIWW, Texas, Brazos River to Port O'Connor Placement Area Usage and Limitations

Reach	PA	Type	Size (Ac)	Levee Height (ft)	Max Levee Height Est. (ft)	Capacity (cu yds)	Total Dredged (cu yds)	Yearly Average (cu yds)	Remaining Capacity/ Notes
245+000 thru 260+000	89	CU	829	17	25	10,699,627	4,382,877	151,134	88 years
260+00 thru 268+000	90	CU	119	19	25	1,151,920	1,630,832	56,235	26 years
268+000 thru 276+000	92	CU	190	11	25	4,291,467	689,498	38,148	140 years
276+000 thru 278+000	93	CU	70	13	25	1,355,200	293,907	10,135	167 years
278+000 thru 285+000	94-A	CU	103	12	25	2,160,253	484,473	16,706	162 years
285+000 thru 290+000	95-A	CU	50	14	22	645,333	511,560	17,640	46 years
290+000 thru 298+000	95-B	CU	76	15	25	1,226,133	619,821	21,373	72 years
298+000 thru 313+000	96-A	CU	90	14	25	1,597,200	873,662	30,126	66 years
313+000 thru 331+000	97	UU	174	8	15	1,965,040	655,755	22,612	109 years
331+000 thru 336+000	98	UU	31	14	22	400,107	472,475	16,292	31 years
336+000 thru 340+000	99	CU	40	11	22	709,867	303,765	10,475	85 years
340+000 thru 343+000	100	CU	74	8	25	2,029,573	373,305	13,826	183 years
343+000 thru 353+000	101-A	UPC	181	9	22	3,796,173	1,106,074	40,966	116 years
353+000 thru 363+000	102-D	UPC	245	10	30	7,905,333	1,098,758	40,695	242 years
363+000 thru 370+000	102-E	UPC	224	10	30	7,227,733	474,394	17,570	514 years
370+000 thru 377+000	102-C	CU	132	15	25	2,129,600	686,739	25,435	105 years
377+000 thru 384+000	103	UPC	91	8	30	3,229,893	821,326	30,419	133 years
384+000 thru 390+000	104-A	CU	65	15	25	1,048,667	654,142	24,227	54 years
390+000 thru 400+000	104-B	CU	80	14	25	1,419,733	1,064,648	39,431	45 years
400+000 thru 423+000	105	UPC	444	12	25	9,312,160	2,251,827	83,401	140 years
423+000 thru 455+000	106	CU	627	14	25	11,127,160	3,231,285	119,677	116 years
455+000 thru 463+000	108	CU	224	17	25	2,891,093	1,007,246	37,305	97 years
463+000 thru 467+000	108-A	CU	73	16	25	1,059,960	675,333	25,012	53 years
467+000 thru 482+000	109	CU	233	16	25	3,383,160	750,655	27,802	152 years
482+000 thru 490+000	110	CU	180	16	25	2,613,600	731,930	27,108	120 years
490+000 thru 506+000	111	UPC	352	13	25	6,814,720	1,982,942	73,442	116 years
506+000 thru 526+000	112-A	UPC	500	15	25	8,066,667	3,373,951	124,961	81 years
526+000 thru 533+000	112-B	CU	138	20	30	2,226,400	2,470,526	91,501	31 years
533+000 thru 540+000	112-C	OW	117	NA	NA	Unlimited	3,698,607	136,985	Unlimited
540+000 thru 543+000	113	OW	53	NA	NA	Unlimited	1,768,436	65,498	Unlimited
543+000 thru 548+00	114	OW	83	NA	NA	Unlimited	1,712,499	63,426	Unlimited
548+000 thru 551+000	115	OW	52	NA	NA	Unlimited	732,634	27,134	Unlimited
551+000 thru 555+000	116	OW	52	NA	NA	Unlimited	686,472	25,425	Unlimited
555+000 thru 590+000	116-A	OW	80	NA	NA	Unlimited	510,587	18,911	Unlimited
590+000 thru 617+000	116-B	OW	12	NA	NA	Unlimited	2,361,900	87,478	Unlimited
Not Used	117	CU	118	13	25	2,284,480			Not Used
617+000 thru 634+000	117-A	BN	78	NA	NA	Unlimited	635,647	19,864	Unlimited

Maintenance records vary for different reaches. Remaining site life calculated from last dredging event

CU = Confined Upland
UPC = Upland Partially Confined
UU = Upland Unconfined
OW = Open Water
BN = Beach Nourishment

Current Economic Conditions

The economic analysis for determining the feasibility of continued maintenance of the waterway involved a comparison of transportation costs for commodities being shipped on the waterway now and those projected in the future, with the costs of shipping those same commodities by the least costly alternate transportation mode. The alternate modes evaluated were inland barge, rail, and seagoing barges. Transportation costs were developed for each mode and the difference between each of the modes and the GIWW reflects the cost savings for each mode. The results showed the average annual transportation costs for the GIWW to be $141,393,000 and the next least costly alternative to be rail, with average annual cost of $265,438,000. Table 5 shows the tonnage forecasts and projected transportation costs throughout the period of analysis for both the GIWW and rail. The average annual difference between the two modes if $124,045,000.

During 1997 approximately 19 million tons of primarily petroleum and petroleum products were transported on this section of the waterway. Due to the fact that transportation costs on the GIWW have been shown to be approximately half of the next least costly mode of transportation it is expected that the volume of commerce transported on the waterway will continue to increase.

Table 5.
GIWW, Texas, Sabine River to Port O'Connor
Transportation Cost Forecasts

Year	Tonnage Forecast*	Transportation Cost (GIWW)	Transportation Cost (Rail)
1996	54,000,000**	$264,063,000	$495,726,000
2004	57,396,000	$280,671,000	$526,906,000
2006	8,132,400	$284,270,000	$533,661,000
2014	61,078,000	$298,674,000	$560,702,000
2016	61,380,800	$300,155,000	$563,482,000
Average Annual Transportation Cost (7.625)		**$141,393,000**	**$265,438,000**

*Based on forecast prepared by the Institute for Water Resources for the 1992 Inland Waterway Review (IWR) 92-R-7), October 1992.
**Forecast is an estimated amount, current data is not available.

Maintenance Cost

The cost effectiveness of continued maintenance was evaluated based on an assessment of benefit indicators and a comparison of the average annual maintenance costs. The benefit indicators evaluated were overall tonnage and vessel fleet trends. A previous analysis conducted for the High Island to Brazos River portion of the GIWW, showed that waterway transportation was almost half the cost of rail, the next least costly means of transportation.

The present channel dimensions of the GIWW were authorized in 1939. At the time, much of the remaining Texas portion of the GIWW had not been completed. No separate maintenance forecasts were made for the study reach in the authorizing documents, but maintenance of the GIWW from Corpus Christi to the Sabine River was estimated at $637, 500. Economic data for the past 17 years for this portion of the GIWW, adjusted to 1939 dollars, show an average annual maintenance cost of $429,291. The size of the barges has also increased since authorization.

In addition, the project was based on 45-ft wide barges with a maximum length of 750 ft. Present tow configurations often consist of two or three barges, 298 ft by 54 ft. Thus the size of the tows has also increased since project authorization. The economic assessment worksheet is presented in Table 6.

Conclusion

Analysis of the economic benefit and cost indicators show that continued maintenance of the GIWW from the Brazos River to Port O'Connor is warranted. This determination is based on overall increases in tonnage levels, tow sizes, and decreases in project maintenance costs. Additional economic analysis is not necessary.

ENVIRONMENTAL COMPLIANCE

Status of Compliance for the Next 20 Years

Environmental documents which cover the existing project dredging and placement activities are listed in Table 7. All dredging and placement activities are fully coordinated in accordance with existing environmental laws.

New placement area alternatives, such as beneficial use of dredged material, will require the preparation of an Environmental Assessment (EA). This will also require endangered species and historic properties coordination with state and federal agencies. In addition, coordination under the

Clean Water Act, such as Section 404(b)(1) evaluation and State Water Quality Certification, will also be required for any new placement areas.

Table 6.
GIWW, Texas, Brazos River to Port O'Connor
Economic Assessment Worksheet for Continued Maintenance Dredging

	Economic Statistics	Authorizing Study	Current Conditions	Assessment	Summary
Benefit Indicators	Commodity Types	Crude petroleum, petroleum and chemical products, sand and gravel.	Petroleum and petroleum products, sand and gravel, agricultural products, sulfur, salt, shell.	Steady/Up	Up
	Tonnage Estimates	None, study reach not yet constructed	19 million tons in 1997	Up	
	Growth Rates	1960-2015 petroleum tonnage was forecasted to increase at an annual rate of 1% per year	1960-1994 petroleum tonnage increased at an annual rate of 1.24%.	Steady	
	Vessel Types	Barges and fishing boats.	Barges	Steady	
	Vessel Sizes	Maximum width of 45 ft Maximum length of 750 ft	108 ft wide x 1,138 ft long	Up	
Cost Indicators	Dredging Cycle	Not stated	2-5 years, longer in some reaches	N/A	Down
	Annualized Dredging Quantities	Not stated	9,308,285 cubic yards per year, 1980-1996	N/A	
	Avg. Annual Maintenance Cost	$637,500	$429,291	Down	
	Price Level	1939	1980-1996 adjusted to 1939 prices.	N/A	
Conclusion	Justification of continued maintenance dredging is warranted.				

N/A = Not Applicable

Table 7.
GIWW, Texas, Brazos River to Port O'Connor
Environmental Compliance

Reach or Segment	Document	Preparation Date
Main Channel	Environmental Assessment, Maintenance Dredging, Gulf Intracoastal Waterway - Main Channel - Matagorda Bay to San Antonio Bay, Placement of Dredged Material adjacent to front beach County Park, Port O'Connor, Texas, U.S. Army Engineer District, Galveston, Texas.	October 1992
	State Water Quality Certification	September 1992
	Environmental Assessment, Gulf Intracoastal Waterway, Texas, Main Channel - Galveston Bay to Matagorda Bay, Alternate Disposal Areas in the vicinity of East Matagorda Bay, U.S. Army Engineer District, Galveston, Texas	February 1988
	State Water Quality Certification	February 1988
	Environmental Assessment, Gulf Intracoastal Waterway, Texas, Main Channel - Galveston Bay to Matagorda Bay, alternate disposal areas in the vicinity of East Matagorda Bay. U.S. Army Engineer District, Galveston, Texas.	June 1986
	Environmental Assessment, Gulf Intracoastal Waterway, Texas, alternate disposal areas for main channel – Galveston Bay to Matagorda Bay, vicinity of Bryan Beach and Big Boggy National Wildlife Refuge, U.S. Army Engineer District, Galveston, Texas.	January 1986
	Environmental Assessment, Gulf Intracoastal Waterway, Texas, alternate disposal areas for main channel – Galveston Bay to Matagorda Bay, U.S. Army Engineer District, Galveston, Texas.	March 1983
	State Water Quality Certification	December 1982
	Environmental Assessment, Maintenance Dredging, Gulf Intracoastal Waterway and tributaries, Texas Section, Matagorda Bay to San Antonio Bay, Supplement No. 12, U.S. Army Engineer District, Galveston, Texas.	October 1975
	State Water Quality Certification	October 1978
	Final Environmental Statement, Maintenance Dredging, Gulf Intracoastal Waterway, Texas Section, Main Channel and tributary channels. U.S. Army Corps of Engineers Galveston District.	October 1975
	State Water Quality Certification	October 1978
	Consistency Determination Received – Coastal Coordination Council	December 1999

CONCLUSIONS

Continued operation of the GIWW from the Brazos River to Port O'Connor over the next 20 years is not limited by placement area capacity, economic viability, or environmental compliance.

RECOMMENDATIONS

Continued maintenance of this project is warranted on the basis of project usage and indicators of economic productivity, sufficient placement area capacity, and maintenance activities in compliance with applicable environmental laws and regulations for the next 20 years. Therefore, a DMMP is not required beyond this assessment.