

VII. 50-YEAR DREDGED MATERIAL MANAGEMENT PLAN EVALUATION AND SELECTION

PLACEMENT PLANS CONSIDERED

Deepening and widening of the CCSC, as well as the extension of the La Quinta Channel, will generate approximately 41 million cubic yards (mcy) of new work material and 208 mcy of maintenance material over the 50-year period of economic evaluation. Approximately 3000 acres of upland confined placement areas as well several partially contained and open water, dispersive sites with unlimited capacity exist for development of a viable placement plan.

To evaluate alternatives for placement of this material, three feasible placement plans were developed. They are titled as follows: The Gulf Placement Plan, The Upland Confined Placement Plan, and the Beneficial Use Placement Plan. Each plan mixes possible placement methods to maximize beneficial uses while minimizing costs.

Each of these plans has similar concepts and differs only in the La Quinta and Upper and Lower Bay reaches. No alternative other than upland, confined placement was considered for the Inner Harbor, due to the availability of existing sites adjacent to this channel reach with sufficient capacity for the required maintenance as well as concerns about contaminants in this highly industrialized area. Due to the nature of material in the Upper Bay reach, creation of habitat as a beneficial use was not an option, and impacts associated with open bay placement have been evaluated and shown to have minimal impacts.

Gulf Placement Plan

An EPA approved ocean dredged material disposal area (PA 1) exists approximately one mile southeast of the jetties (Figure 1). The area is a dispersive site in the Gulf and has unlimited capacity. In addition, potential exists for beneficial use sites where material can be placed to create topographic relief for fishery enhancement.

In this alternative, all of the new work material from the Upper and Lower Bay portion of the channel was evaluated for placement offshore.

Upland Confined Placement Plan

There are several existing upland confined sites available for use throughout the bay system. The Inner Harbor has several sites including Suntide (IH-PA 8), Tule Lake (IH-PA 6), South

Shore (IH-PA 3), Rincon, (IH-PA 2), and IH-PA 1. These PAs are divided into cells that range in size from 183 acres to 360 acres. Mustang Island (PA 6), a 304-acre PA adjacent to the CCSC in Lower Bay is also available, as is PA 13, which is adjacent to the La Quinta Channel and is 750 acres in size. PA 10, a 196-acre site on the south side of the ship channel across from Port Ingleside is also available for use. PA 4 is another confined site located on Harbor Island along and north of the CCSC just west of the Inner Basin.

In this alternative all of the material from the La Quinta extension and from Station 540+00 to the Inner Basin would be placed in upland confined sites. PA 13 has sufficient capacity to hold all of the new work material from the La Quinta extension but capacity would be exceeded when taking into consideration maintenance material. For the Lower Bay portion of the channel, PA 6 was considered for the placement of all new work material. Because new work dredging in this area would generate 8.754 mcy of material, it would be infeasible for all of this material to be placed in PA 6. This would require that the PA size be increased. Redfish Bay has more sensitive, shallow water habitat than other portions of the bay system, and expanding PAs would permanently remove this habitat from the system. Because of the environmental sensitivity of this alternative it was removed from consideration.

Least Cost Beneficial Use Placement Plan

One of the main interests in the consideration of a 50-year dredged material management plan was to maximize the use of suitable quality dredged material for beneficial purposes. In coordination with the resource agencies and the public, several beneficial uses were investigated to determine the feasibility of implementation. Placement possibilities and their feasibility are discussed below.

Entrance Channel

PA 2, a partially unconfined site on San Jose Island, has been used in the past for the placement of sandy material to nourish the dune field and beach just north of the entrance jetty. No material is scheduled for placement at this site, however, it will be included as a part of the authorized project should opportunity to use material beneficially arise.

Material generated from deepening the entrance channel is made up of both sandy and clay material. Because of the nature of the material, beneficial use options were considered, including creation of feeder berms offshore and placement of material on the shoreline for beach nourishment. However, the material has an insufficient proportion of sand, and if placed on the beaches, would have negative aesthetic impacts. Because of this, only offshore beneficial use options were given further consideration.

Lower Bay Portion of the Channel

Another option available at this location, in addition to the existing contained sites, is Pelican Island (PAs 7 and 8). These sites have been used in the past for the placement of sandy maintenance material in an effort to maintain the island as an important bird nesting habitat.

The material composition in this reach is sandy, for both new work and maintenance, which lends itself to beneficial uses. Alternatives considered included placement in upland sites, placement of all material offshore, and placement in beneficial use sites. Because the amount of material to be dredged will exceed placement capacities of the confined sites in the area, use of these sites was not considered feasible. Costs were developed for alternatives, including offshore placement, but this alternative was more costly than beneficial alternatives.

Upper Bay Portion of the Channel

Previous practice in this reach has involved placement of material in eight open bay PAs (14A through 17B). These sites are currently being used for maintenance material dredged from the CCSC across the bay, and have essentially unlimited capacity.

Due to the silty nature of the existing material to be dredged from this reach, no beneficial use options were considered for a majority of the material. Some of the material on the eastern end is of sufficient quality to be used beneficially.

Inner Harbor

Sufficient capacity exists for both new work and maintenance material in existing upland sites immediately adjacent to the Inner Harbor. Because of this, no additional alternatives were considered that would require pumping long distances to other confined sites. Also, development of additional sites in other areas would require purchase of real estate. All existing sites adjacent to the Inner Harbor are currently owned and maintained by the PCCA. Because of these factors, it was determined that the use of existing upland, contained sites in the Inner Harbor is the least cost alternative.

The potential for contaminants in the material removed from the Inner Harbor precluded consideration of beneficial use options. The Contaminants Workgroup considered the presence of contaminants and evaluated existing data, and no concerns were identified. However, the workgroup recommended that, rather than potentially suspend buried contaminants into the aquatic environment, all new work and maintenance material should be placed in existing upland confined sites adjacent to the channel in this area. Due to the identification of this portion of the

placement plan as least cost, and the recommendation of the Contaminants Workgroup, no additional consideration was given to other alternatives.

La Quinta Extension

Extension of the La Quinta Channel will generate approximately 6.2 million cubic yards of material. A majority of the material to be removed during construction of the extension will consist of either stiff to hard clay or dense to medium dense sand. Because of the quality of the material several beneficial alternatives were considered, including habitat creation, use of material on adjacent uplands to create sound and aesthetic buffers between residential and expected industrial property, as well as use in increasing capacity of existing placement areas. Because the material was considered suitable and sufficient quantity exists, all three options were further evaluated as part of a BU Placement Plan.

After development of costs for both the Gulf Placement Plan and the Beneficial Use Placement Plan (Table 16), it became clear that the BU Placement Plan was the least cost alternative. Also, when considering potential impacts associated with the proposed Upland Placement Alternative, the BU Plan exhibits the greater potential for environmental enhancement. For this reason, the BU Plan has been identified as the NED plan.

Table 16
Cost Comparison for Placement Alternatives
(in \$000)

	CCSC Beneficial Use Alternative	CCSC Upland Placement Alternative	CCSC Gulf Placement Alternative	La Quinta Beneficial Use Alternative	La Quinta Upland Placement Alternative
First Cost	\$156,984	\$170,151	\$219,739	\$24,016	\$22,966
Maintenance Cost (50 yr)	\$372,851	\$435,006	\$831,169	\$30,048	\$42,437
Total Cost	\$529,835	\$605,157	\$1,050,908	\$54,064	\$65,403

DREDGED MATERIAL PLACEMENT PLAN

Deepening and widening of the CCSC, as well as the extension of the La Quinta Channel, will generate approximately 41 mcy of new work material and 208 mcy of maintenance over the 50-year period of economic evaluation. New work and maintenance dredged material from berthing

areas outside of the Federal Channel (or any other non-Federal interest maintenance responsibilities) anticipated for placement in the placement sites for this project is insignificant (200,000 cubic yards new work and 1.1 mcg maintenance over the 50-year period of economic evaluation) when compared to the quantities associated with the Federal project and will not reduce the availability of the disposal facility for Federal navigation purposes; and therefore, no additional non-Federal improvements to the placement sites are expected to be required to support containment of non-Federal interests dredged material. The detailed dredged material placement plan for new work and maintenance material is provided in Appendix F. Material will be placed in expanded existing upland sites and new upland sites, offshore sites, in-bay sites, and partly confined sites. Dredged material of sufficient quality will be used in a beneficial manner. Suitable material removed from the CCSC and the La Quinta Channel that will be used beneficially constitutes the least-cost plan (NED Plan). The RACT, Beneficial Use, and Contaminant Workgroups have reviewed the placement plan for water quality concerns and raised no issues. The plan has been broken down by channel segment and is generally described below followed by a table (Table 17) summarizing the dredged material sites and dredged material management plan. For the new upland confined site (PA 14-Site E), expanded existing sites (PA 10 and PA 13) and partly confined, beneficial use, disposal site (Site GH) supporting the La Quinta Extension, the O&M cost responsibilities for the disposal facility improvements will be 100 percent Federal. For the new upland confined sites (IH-PA6 and IH-PA 8), expanded existing sites (PA 6 and IH-PAs 1, 2, 3A, and 3B), the ESA Section 7 coordinated site (Site Pelican), and the new partly confined, beneficial use, disposal sites (Sites I, R, S, and CQ) supporting the CCSC, the O&M cost responsibilities for the disposal facility improvements will be 100 percent Federal except the non-Federal sponsor will share in 50 percent of any of the incremental O&M costs which would be incurred for a disposal facility for a project which had a depth of 45 feet. Costs to construct the disposal facilities and expansions to existing sites shall be considered as costs of constructing general navigation features and will be cost shared 50 percent non-Federal sponsor / 50 percent Federal for those supporting the CCSC and cost shared 25 percent non-Federal/ 75 percent Federal for those supporting the La Quinta Extension.

Entrance Channel

All material, both new work and maintenance will be placed in offshore sites. All of these sites are unconfined and no structural control will be utilized to contain material. New work material will be placed into two beneficial use sites based on composition of the material. Material from Station 301+00 to 150+00 has a higher percentage of silt and clay and will be placed in BU Site ZZ. Material from Station 150+00 to -37+82 has a larger percentage of sand and will be placed on BU Site MN. Maintenance material from the Entrance Channel will continue to be placed in PA 1, a site previously designated for the 45-foot project. Sufficient capacity exists for the proposed project. PA 2 is a partially confined placement area located on San Jose Island and is

also currently used for maintenance material when pipeline dredges are utilized to dredge the western portion of this reach and the eastern portions of the Lower Bay reach. This practice will continue for maintenance when and if suitable material is available.

Lower Bay portion of the CCSC

A majority of the new work material, as well as maintenance material, is high quality sand and will be used in several beneficial use sites. The easternmost portion of this reach, from Station 12+55 to 180+00, has a large soft silt and soft clay component and will be placed in PA 6. The remainder of new work material, from Station 180+00 to 549+00, will be utilized to create BU Sites I, R, and S, and a portion will be used to enhance Pelican Island (PAs 7 and 8). The maintenance material for the entire Lower Bay reach is made up of sand and silty sand, suitable for placement in a BU site. Because of this, all of the expected 11.7 mcy of maintenance material will be placed on Pelican Island, as is present practice.

BU Components - BU Sites I, R, and S will range in size from 121 to 201 acres. All three sites will utilize rock breakwaters to protect and contain dredged material as well as create hard substrate habitat. Material will be placed in the sites to raise the bottom elevation to approximately 1-2 feet below mean low tide (MLT), suitable for seagrass colonization. No seagrass planting will be performed. Instead, the areas will allow seagrass to vegetate through natural colonization. Rock breakwater will be used to protect two of the three sides of Site I (Figure 2). Site I will be placed north of the CCSC and southeast of the existing Dagger Island. Dredged material will be allowed to mound in several locations within this site to create a diversity of habitat types, ranging from submerged to fully emergent areas. Planting of *Spartina alterniflora* will be performed in these emergent areas to enhance the habitat created. BU Sites R and S will be located on the southern shore of PAs 10 and 9, respectively (Figure 3). Both sites will be semi-circular and protected from erosion by rock breakwaters. The breakwaters on all three sites will incorporate openings to insure tidal flow in and out of the area.

Rock breakwater, in conjunction with geo-tubes filled with dredged material, will also be used to protect high quality rookery and nesting habitat on Pelican Island. The breakwater would protect the northeastern corner of the island. The geo-tube would extend south from this breakwater and be utilized to help contain future maintenance material scheduled for placement on the island. Site Pelican Island, is an island encompassing two placement areas that is used by an endangered species, the Brown Pelican, as a nesting site. The armoring and geotube protection described for this site was coordinated with the U.S. Fish and Wildlife Service (USFWS) during Section 7 consultation under the Endangered Species Act (ESA). The features described in the EIS for this site are part of the reasonable and prudent measures and are required to qualify for an incidental take statement under the ESA. Therefore, to maintain project compliance with the requirements

of the ESA, restoration features for Pelican Island must be constructed and are non-negotiable. Any costs associated with these measures are, by definition, justified for this project.



Figure 2
Beneficial Use Site 1
Lower Bay

Two other environmental features have been developed as a part of this plan. These incorporate the use of rock breakwaters and geo-tubes for the control of erosion to protect existing habitat. Site L, measuring approximately 7,500 feet, would consist of construction of a rock revetment at the shoreline between the CCSC and an existing, high quality, marsh area west of Port Aransas. This shoreline revetment would protect a complex system of sand flats and wetlands measuring approximately 1200 acres in size. Two gaps would be left in the revetment to maintain water movement through two sloughs that currently connect the wetland complex and CCSC. Site P, measuring approximately 2,400 feet in length, consists of a rock breakwater constructed adjacent to Ingleside on the Bay (Figure 4). This structure will protect and enhance approximately 40 acres of existing seagrass beds that are currently exposed to high-energy wave action caused by winds and ship/boat wake. Neither BU Site L nor P would utilize dredged material but was developed in conjunction with the Dredged Material Placement/Beneficial Use Plan.

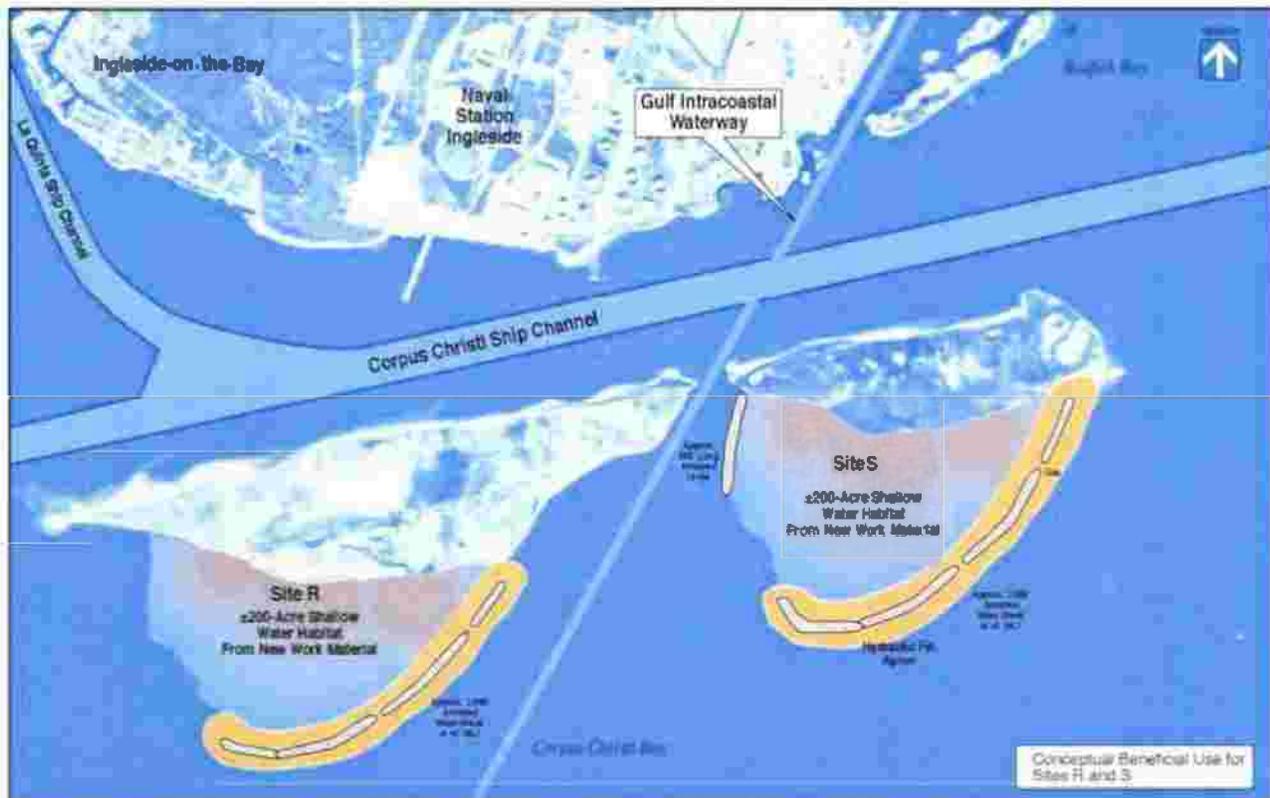


Figure 3
Beneficial Use Sites R and S
Corpus Christi Bay

Upper Bay portion of the CCSC

Widening and deepening of the channel, as well as construction of the barge shelves, in this portion of the CCSC will generate approximately 14.5 mcy of new work material and 82 mcy of maintenance material over the 50-year period of economic evaluation. New work material is largely made up of soft silt and soft sandy clay while the maintenance material is expected to be comprised of silt or sandy silt. Because of its consistency, all of the material, from Station 649+00 to 1080+00, will be placed in PAs 14-A through 17-B. Material from the eastern reach (Station 549+00 to 649+00) has a larger sand and clay component and will be used to construct BU site CQ.



Figure 4
Beneficial Use Site CQ
Upper Bay

BU Components - Site CQ, measuring approximately 250 acres in size, will be constructed northwest of the La Quinta Junction (Figure 4). Three sides of the site will utilize rock breakwater protection. The north edge will remain open. Material will be placed in the site to raise the bottom elevation to approximately 1-2 feet below MLT, suitable for seagrass colonization. No seagrass planting will be performed. The areas will allow seagrass to vegetate through natural colonization. A series of mounds will be created in this site similar to those in Site I in order to reduce the impact of fetch on the material during initial construction and to create a diversity of habitat after construction. The shoreline of these mounds will be planted with *Spartina alterniflora* to enhance the habitat created.

Inner Harbor

The placement areas available for use in this reach include IH-PA 1, IH-PA 2, IH-PA 3A, IH-PA 3B, IH-PA 3C, IH-PA 6, and IH-PA 8. All of these facilities are located in the immediate

vicinity of the channel and have sufficient capacity for maintenance material over the period of economic evaluation (50 years).

Because of the industry located in this reach, the Contaminants Workgroup and RACT raised concerns about the potential for resuspension of contaminants during any attempt at beneficial use. Detailed contaminant testing was not requested. Based on agency recommendations, all of the new work and maintenance material from Station 1080+00 to 1561+00 (Viola Turning Basin) will be placed in upland confined sites and not utilized beneficially.

La Quinta Channel

New work material generated from the extension of the La Quinta Channel will be placed in three locations. Approximately 2.7 mcy will be placed in PA 13, and, due to its large clay component, be used in the future to elevate the levees of the PA to contain future maintenance material. Another 2.5 mcy of sandy material will be placed in BU Site GH to create shallow water habitat. BU Site E will receive approximately 1 mcy of material. Maintenance material from the entire La Quinta channel will be placed in PAs 10 and 13.

BU Component - BU site GH will extend westward from the end of PA 13, and will be protected on its southern edge by a rock breakwater (Figure 5). Dredged material will be utilized to raise the bottom elevation to approximately 1 to 2 feet below MLT. Adjacent to the breakwater, material will be placed so as to create emergent habitat. These areas will be planted with *Spartina alterniflora* to enhance the habitat created. Because dredging the La Quinta Channel extension will impact five acres of seagrass a portion of BU Site GH will be used to perform mitigation. Fifteen acres of newly created shallow water area in BU Site GH will be transplanted with seagrass and monitored to insure success. The Mitigation Workgroup developed the 3:1 mitigation ratio. After incremental analysis the BU and Mitigation Workgroups proposed mitigation in this form after evaluation of several factors. All existing aquatic areas that have depths suitable for seagrass transplantation are already vegetated. Scraping down existing uplands to create areas of proper depth could create additional aquatic habitat, but at a high cost to the project. However, when considering that several hundred acres of habitat suitable for SAV growth will be created through the BU plan, it is clear that it is more cost effective to utilize the areas created when considering mitigation. The BU plan calls for the creation of several sites that would modify deeper areas by bringing them to a depth suitable for seagrass colonization. Based on these considerations, it is most advantageous to mitigate impacts to seagrasses through planting of 15 acres within the newly created BU Site GH. This site is close to the area of impact and will assist seagrass colonization in the remainder of the site.

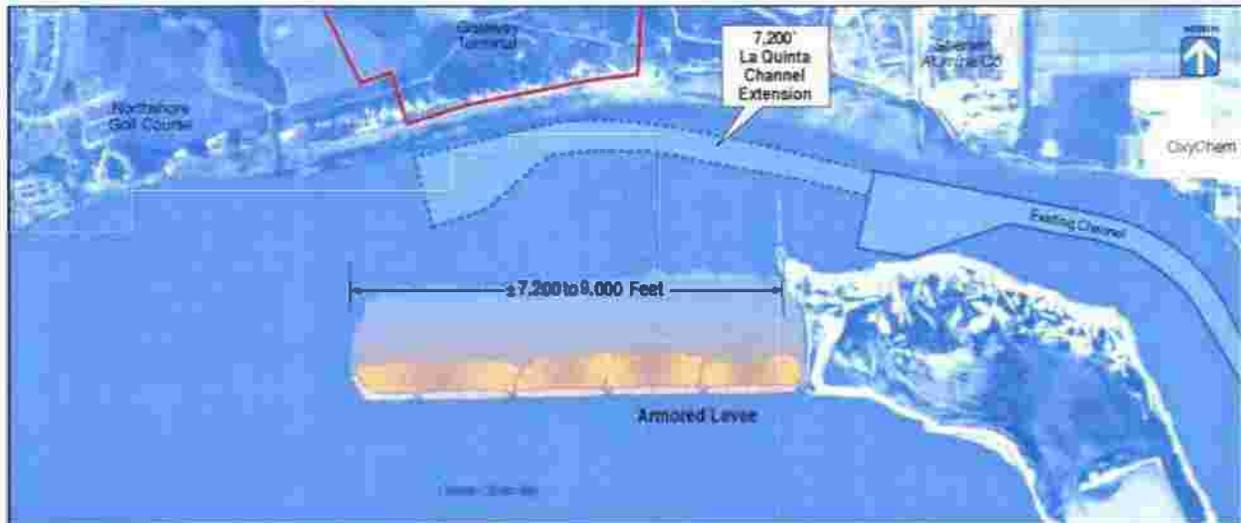


Figure 5
Beneficial Use Site GH
La Quinta Extension

BU Site E will measure approximately 100 acres in size and be placed on the western edge of the Port's proposed container terminal. The placement area will be enhanced during the development of the PCCA's proposed container terminal facility to create a buffer zone between the proposed facility and the adjacent residential and recreational properties.

Several PA's not detailed in this report are designated for placement of new work and maintenance material from the existing, authorized 45-foot deepening project. While not scheduled for use at this time, these areas are available for the 52-foot project, if needed. These PA's include:

IH-PA's 4 and 5, which are privately owned, but are potentially available for use through an agreement with the landowner or by navigation servitude. IH-PA 4 and IH-PA 5 were last used 23 years ago during the CCSC 45-foot deepening project.

PA 4 is a confined site located north of the CCSC on Harbor Island. It has not been used since the 45-foot deepening project for the placement of new work dredged material. It is owned by the PCCA and may be available for use by the proposed project.

PA 5 is an upland unconfined site located on the south side of the CCSC west of Port Aransas. It has not been used since before the CCSC was deepened to 45 feet and may be available for use by the proposed project through navigation servitude.

PA 9 is an unconfined emergent placement area located south of the CCSC and east of the GIWW crossing. It has not been used in the past 23 years. It was last used for placement of new work material during the 45-foot deepening project.

PA 18 is an unconfined open-water placement area that is configured as two narrow parallel placement corridors oriented perpendicular to the CCSC. PA 18 is available for use, but has not been used recently because of concerns that it could accelerate filling of the small boat channels near the Corpus Christi City Marina.

SUMMARY

Contaminant studies demonstrated that new work and maintenance dredged material from all sections of the channel, with the exception of the Inner Harbor, is acceptable for offshore disposal, beneficial uses in the bay or ocean, or upland disposal. Because of the availability of existing placement areas in the vicinity of the Inner Harbor and the potential for contaminant resuspension, this material will be placed in existing, nearby upland sites to remove it from the system. This was identified as the least cost alternative for the Inner Harbor reach.

The Beneficial Uses Workgroup of the Regulatory Agency Coordination Team developed a dredged material management/beneficial use plan that utilizes dredged material in an environmentally sound and economically acceptable manner and that incorporates other public benefits into its design. Beneficial uses of dredged material investigations identified a plan that will result in the following: creation of 935 acres of shallow water habitat, creation of 15 acres of submerged aquatic vegetation (as mitigation), creation of 26 acres of marsh, construction of 26,400 linear feet of rock breakwater, creation of 1,590 acres of offshore topographic relief, construction of 120 acres of upland buffer zone, construction of 7,500 linear feet of rock revetment, protection of 45 acres of submerged aquatic vegetation, protection of an existing bird island, and protection of 400+ acres of wetlands. Channel enlargement will result in direct permanent and temporary losses to 5 acres of patchy submerged aquatic vegetation, which will be mitigated through creation of 15 acres of submerged aquatic vegetation. The cumulative impact assessment showed that the proposed navigation improvements with the beneficial use plan will result in a net positive environmental effect to the Corpus Christi Bay ecosystem than for the without project condition.

Table 17
Placement Plan Summary for New Work and Maintenance Material

Channel Segment	Placement Site	Type (N) indicates New Site, (E) Expanded Site	Estimated Quantity (mcy)			Placement Site Improvements Required	O & M Required on Site
			New Work	Maintenance			
Entrance Channel							
	Site ZZ	BU - Offshore - EPA Designated - Offshore Placement Area	2.6		None		None
	Site MN	BU - Offshore (N)	1.7		None		None
	PA 1	EPA Designated - Off-shore Placement Area		62.0	None		None
Lower Bay							
	PA 6	Upland - Confined (E)	2.7		Levee Rehabilitation		Yes
	Site I	BU - Partly Confined (N)	2.1		Breakwater Containment		Yes
	Site Pelican	ESA Sec. 7 Coordinated	0.3	11.7	Breakwater Containment		Yes
	Site R	BU - Partly Confined (N)	2.4		Breakwater Containment		Yes
	Site S	BU - Partly Confined (N)	1.5		Breakwater Containment		Yes
Upper Bay							
	Site CQ	BU - Partly Confined (N)	2.9		Breakwater Containment		Yes
	PA 14-A	In Bay - Unconfined	0.9	11.0	None		None
	PA 14-B	In Bay - Unconfined	1.6	10.9	None		None
	PA 15-A	In Bay - Unconfined	1.6	10.9	None		None
	PA 15-B	In Bay - Unconfined	1.7	10.9	None		None
	PA 16-A	In Bay - Unconfined	1.5	11.0	None		None
	PA 16-B	In Bay - Unconfined	1.6	10.9	None		None
	PA 17-A	In Bay - Unconfined	1.6	10.9	None		None
	PA 17-B	In Bay - Unconfined	1.4	10.9	None		None
Inner Harbor							
	IH-PA 1	Upland - Confined (E)	0.8	10.6	Levee Raising		Yes
	IH-PA 2	Upland - Confined (E)	0.8	5.2	Levee Raising		Yes
	IH-PA 3A	Upland - Confined (E)	1.0		Levee Raising		Yes
	IH-PA 3B	Upland - Confined (E)	1.0	1.0	Levee Raising		Yes
	IH-PA 6/ Tule Lake	Upland - Confined (N)	1.6	1.1	Levee Raising		Yes
	IH-PA 8/ Suntime	Upland - Confined (N)	1.2	1.0	Levee Raising		Yes
La Quinta							
	PA 10	Upland - Confined (E)		2.8	Levee Raising		Yes
	PA 13	Upland - Confined (E)	2.7	25.2	Levee Raising		Yes
	PA 14 - Site E	Upland - Confined (N)	1.0		Levee Construction		Yes
	Site GH	BU - Partly Confined (N)	2.5		Breakwater containment		Yes
			40.7	208.0			

VIII. DESCRIPTION OF SELECTED PLAN

Based on the economic, engineering, and environmental factors considered, the selected plan includes deepening of the CCSC from Viola Basin to the end of the jetties in the Gulf of Mexico to -52 feet MLT, deepening of the remainder of the channel into the Gulf of Mexico to -54 feet MLT, widening of the Upper Bay and Lower Bay reaches to 530 feet, construction of 200-foot wide barge shelves to -12 feet MLT across the Upper Bay portion of the CCSC, and extending the La Quinta Channel 7,400 feet at a depth of -39 feet MLT. It is estimated that the approximately 41 million cubic yards of new work material would require seven separate dredging contracts to complete. The work is estimated to begin in April 2004 and be complete by January 2009. Dredged material management will be performed according to the Dredged Material Placement Plan described in Section VII.

GENERAL NAVIGATION FEATURES OF THE CCSC SELECTED PLAN

Entrance Channel

The Entrance Channel is defined as that portion of the CCSC extending from Station 310+00 in the Gulf of Mexico to Station -37+82 in the Inner Basin. It is 700 feet wide and protected on two sides by jetties. The land locked portion of the Entrance Channel would be deepened to 52 feet plus 2 feet of advanced maintenance. This would be modified in the portion of the channel that enters the open waters of the Gulf. This segment will be dredged to a 54-foot authorized depth with two feet of advanced maintenance to insure safe vessel passage in a high wave energy environment. The existing channel will be extended an additional 10,000 feet into the Gulf in order to reach the 56-foot contour. Minor widening of 100 feet is necessary on the northern side of the channel for approximately 4,000 feet adjacent to San Jose island based on the results of ERDC's Ship Simulation Report. This will improve the turning radius for vessels passing through the entrance channel and making the turn either out to the Gulf or into the Lower Bay portion of the channel.

Lower Bay portion of the CCSC

The Lower Bay portion of the CCSC extends from Stations 12+55 in the Inner Basin to Station 540+00 just west of the La Quinta Junction. This segment will be deepened from 45 feet to 52 feet plus 2 feet of advanced maintenance. Based on the ERDC's Ship Simulation Report, the selected width for this portion of the channel is 530 feet. The eastern portion of this channel segment is currently wider than the selected 530 feet and will remain as is; therefore, no

widening will be necessary in this reach. The western portion of this reach measures approximately 500 feet in width and will be widened to 530-feet.

Rock breakwater, in conjunction with geo-tubes filled with dredged material, will also be used to protect high quality rookery and nesting habitat on Pelican Island. The breakwater would protect the northeastern corner of the island. The geo-tube would extend south from this breakwater and be utilized to help contain future maintenance material scheduled for placement on the island. Site Pelican Island, is an island encompassing two placement areas that is used by an endangered species, the Brown Pelican, as a nesting site. The armoring and geotube protection described for this site was coordinated with the U.S. Fish and Wildlife Service (USFWS) during Section 7 consultation under the Endangered Species Act (ESA).

Upper Bay portion of the CCSC

The Upper Bay segment is defined as that portion of the CCSC extending from Station 540+00 near the La Quinta junction to Station 1050+00 near the Harbor Bridge. This reach is currently 400 feet wide and 45 feet in depth. This portion of the channel which crosses the open water segment of Corpus Christi Bay is the most physically restrictive in terms of width in addressing the need for ships to pass safely and in a timely manner. This entire stretch will be widened to 530 feet, based on the results of ERDC's Ship Simulation Report. This reach will also be deepened to 52 feet with 2 feet advanced maintenance.

Inner Harbor

Since the Harbor Bridge and Tule Lake Lift Bridge currently prevent two-way traffic in the Inner Harbor portion of the channel, no consideration was given to alternatives that would widen this reach. The Inner Harbor segment, measured from Station 1050+00 to 1561+00, will be deepened to 52 feet plus advanced maintenance. The channel width will range between 300 and 400 feet. Several minor modifications will be made to the turning basins to insure that they meet USACE navigation requirements. One basin, the Avery Point Basin, will not meet USACE width criteria due to the presence of industry on the shoreline of the channel. In the vicinity of the Tule Lake Lift Bridge, because the bridge may be removed and/or replaced, plan formulation was performed assuming that the channel width in this area will be 400 feet. This width is consistent with the remainder of the Inner Harbor channel segment. Making the channel width consistent in this area, should the bridge be removed, will allow the construction of a channel consistent with Corps criteria, as well as creating a safer passage through the channel for all ship traffic. Should the bridge remain at the time of project construction, channel width will be limited to 200 feet to insure no impacts to the bridge supports. This 200-foot width is sufficient to allow all expected traffic access beyond the bridge. The continued presence of the bridge will

not prevent the realization of benefits described in the economic analysis portion of this document.

GENERAL NAVIGATION FEATURES OF THE BARGE SHELF SELECTED PLAN

To evaluate the need for barge shelves across the bay, ERDC established video monitoring of barge traffic in the area. Because sufficient depths exist across a large portion of the bay adjacent to the channel, barge shelf markers were placed outside of the existing deep-draft channel to aid pilots. The video monitoring of these lanes suggests that widths currently marked with navigation aids are sufficient for the entire barge shelf. The existing aids to navigation are located approximately 200 feet from the bottom edge of the existing deep-draft channel. Based on information from ERDC's video monitoring, discussion with pilots in the area, need for minimal dredging, economic benefits, and enhanced safety, the barge shelves are to be dredged to 200 feet in width. The shelves will be constructed on both sides of the channel, will be located from Station 540+00 to Station 1070+00, and will be dredged to a depth of 12 feet with 2 feet of advanced maintenance.

GENERAL NAVIGATION FEATURES OF THE LA QUINTA CHANNEL EXTENSION SELECTED PLAN

The La Quinta Channel will be extended approximately 7,400 feet beyond its current limit at Station 309+30. The channel will measure 400 feet wide and a second turning basin with a 1,200-foot diameter will be constructed. The existing limits of the La Quinta Channel will remain at the 45-foot depth; however, the extension will be dredged to 39 feet with 2 feet of advanced maintenance.

Because dredging the La Quinta Channel extension will impact five acres of seagrass a portion of BU Site GH will be used to perform mitigation. Fifteen acres of newly created shallow water area in BU Site GH will be transplanted with seagrass and monitored to insure success.

The Port of Corpus Christi Authority performed an alternatives analysis on potential sites for their proposed container terminal. After a broader screening analysis three sites were evaluated, including the currently proposed La Quinta location. The other two sites were identified as the Welder site and National Steel site.

Based on factors including development costs, property configuration and operational efficiency, access to roadway and rail infrastructure, land use, and access to a navigable channel, the port determined that the La Quinta site was the best suited for placement of a proposed container

facility (Port of Corpus Christi Authority Container Terminal Alternative Site Analysis, Final Report, Goldston Engineering, 4/17/2001).

Because of the relationship between the extension of the existing Federal project and the proposed terminal, the PCCA must initiate construction of the terminal facilities prior to, or concurrent with, construction of the La Quinta Channel extension. The PCCA will be responsible for obtaining the necessary permits required for the container terminal under Section 404 of the Clean Water Act, Section 10 of the Rivers and Harbor Act, and/or any other applicable jurisdictions as appropriate utilizing the procedures described by NEPA.

SEPARABLE ECOSYSTEM RESTORATION FEATURES OF THE SELECTED PLAN

Two environmental features have been developed as a part of this plan. The PCCA will also be the cost share sponsor on these project components. Early in plan formulation, two specific areas exhibiting extremely sensitive habitat were identified and opportunities considered protecting and preserving them. These habitats include an area exhibiting healthy stands of submerged aquatic vegetation and an expansive inter-tidal marsh and sand flat habitat. The habitats are located adjacent to the Corpus Christi and La Quinta Ship Channels and all are in danger of degrading over time if not protected in the near future.

These plans all incorporate the use of rock breakwaters and geo-tubes for the control of erosion to protect and enhance these existing habitats. Site L, measuring approximately 7,500 feet, would consist of construction of a rock revetment at the shoreline between the CCSC and an existing, high quality, marsh area west of Port Aransas. This shoreline revetment would protect a complex system of sand flats and wetlands measuring approximately 1200 acres in size. Two gaps would be left in the revetment to maintain water movement through two sloughs that currently connect the wetland complex and CCSC. Site P, measuring approximately 2,400 feet in length, consists of a rock breakwater constructed adjacent to Ingleside on the Bay (Figure 4). This structure will protect and enhance approximately 45 acres of existing seagrass beds that are currently exposed to high-energy wave action caused by winds and ship/boat wake. Neither BU Site L nor P would utilize dredged material but was developed in conjunction with the Dredged Material Placement/Beneficial Use Plan. O&M responsibilities for the rock breakwater and geo-tubes for these ecosystem restoration features are the responsibility of the non-Federal sponsor.

The two sites will produce the expected benefits without the requirement of maintenance for the areas being protected. The benefits are not dependent on any management measures but are anticipated to occur naturally without any modifications. The breakwaters, which will be maintained by the sponsor, will allow these areas sufficient protection and produce benefits over

the economic period of evaluation. On Site L, the Non-Federal Sponsor, the City of Port Aransas and the Texas General Land Office hold title to this acreage variously. Approximately 200 acres of the tract belongs to the Non-Federal sponsor, including that portion on which the rock revetment will be constructed. The remainder of the tract consists of areas jurisdictional under Section 10 of the Rivers and Harbors Act of 1899 and Section 404 of the Clean Water Act. A Section 1135 project (i.e. project modifications for improvement of environment) is under study involving the City of Port Aransas and the Texas General Land Office to accomplish the perpetual preservation of the entire acreage. The entire acreage is subject to the Government's navigation servitude and its correlative permit authority. Additionally, the entire acreage is subject to the requirements set out in the Texas Coastal Management Plan, which is operated under the auspices of the Texas General Land Office. No additional real estate interest is required. For Site P, the Non-federal Sponsor owns patented title to the entire submerged acreage. On both sites, all operation, maintenance, repair, replacement and rehabilitation (OMRR&R) are the responsibility of the Non-Federal Sponsor, including monitoring.

TIDAL AND SALINITY CHANGES ASSOCIATED WITH THE SELECTED PLAN

Computer modeling of the selected plan was undertaken to evaluate potential changes to tide and salinity in the project area. A two-dimensional finite element hydrodynamic and salinity model was used to simulate the existing condition as well as the selected plan. Two years, 1993 and 1994, were chosen for the tidal simulation and two two-year periods were chosen for salinity simulation, 1988 and 1989 as a normal to dry period and 1991 and 1992 as a normal to wet period.

Construction of the selected plan will not change the average tide significantly in the Corpus Christi Bay and surrounding area. On average, it will fluctuate by 0.01 feet or less. The average tidal range will increase by 0.04 to 0.06 feet in Corpus Christi Bay and Nueces Bay, 0.02 feet in the JFK Causeway area, 0.01 feet in the upper Laguna Madre and Baffin Bay, while it will decrease by 0.02 feet in Aransas Bay and Copano Bay.

Analysis of current changes due to construction of the beneficial use sites was also performed, due to the potential to increase erosion. Only slight increases in current were simulated adjacent to new BU sites, and no increase in erosion is expected.

There has been a long-term increase in salinity in Corpus Christi Bay of about 0.1 part per thousand per year. This is likely from long-term decreases and changes in the timing of fresh water inflow into the bay system.

Salinity during normal to dry periods will not be significantly affected by the selected plan. In dry periods like that which occurred for several months in 1989, Nueces Bay will experience a higher monthly average salinity by 0.1 ppt and Corpus Christi Bay will also be higher by 0.1 parts per thousand (ppt) to 0.4 ppt. In the other months, the average monthly salinity in those areas would be lowered as much as 0.4 ppt by the selected plan. In the Upper Laguna Madre and Baffin Bay, and Aransas Bay and Copano Bay, the salinity will undergo similar small changes.

During wet periods like 1992, the bay system is likely to experience a lower monthly average salinity by 3 to 4 ppt in Nueces Bay and Corpus Christi Bay including the JFK Causeway area. This lower salinity in Corpus Christi Bay will affect Upper Laguna Madre and Aransas Bay as much as 2 to 3 ppt lower and 1 to 2 ppt lower in Baffin Bay and Copano Bay.

Based on these findings changes in channel depth will not cause salinity impacts like those that would be expected in a bay system with a strong salt wedge.

FACILITY REMOVALS/DEEP-DRAFT UTILITY RELOCATIONS ASSOCIATED WITH THE SELECTED PLAN

The Galveston District currently requires pipelines located below deep-draft navigation channels be buried 20 feet below the authorized project depth of the channel (SWGOM 1145-2-15). This requirement was developed taking into consideration several factors, including geotechnical, hydraulic, navigation, maintenance dredging, and pipeline placement method considerations. Exceptions to this requirement can be granted on a case-by-case basis.

During the feasibility phase, 79 pipelines were identified for further consideration. Three of the pipelines identified are located in the existing La Quinta Channel, where there are no proposed modifications. These were removed from further consideration. Exceptions to the 20-foot burial requirement were considered for the remainder of the lines. Several criteria were evaluated in making a determination of exception, including type of product moved through the pipeline, method of burial, type of protection over the existing line, and scour potential in the pipeline locale. After evaluation of these criteria, it was determined that 19 lines that would not meet cover requirements after project construction would be allowed to remain in their current location as an exception to the current policy. The goal of the burial requirements and the evaluation of exceptions were to ensure minimal potential for harm to the environment through impact of lines during routine maintenance and use of the channel system.

Based on the results of further analysis of the remaining 57 pipelines, it was determined that nine of the facilities will not be affected by the Project. These nine lines were either never constructed, already removed, or are currently in the process of being removed or relocated.

This leaves 48 pipelines and conduit facilities below the channel that will be affected by the Project. A preliminary evaluation was performed on the 48 lines and each was designated as a removal, relocation, or deep-draft utility relocation. This decision has direct bearing on which parties shall bear the cost of relocating/removing the facility. This designation is detailed in the attached Real Estate Plan.

Based on current law and Administration policy, cost-sharing for the selected plan will be based on Section 101(a)(4) of the Water Resources Development Act of 1986 and the U.S. Army Corps of Engineers policy contained in Policy Guidance Letter 44 (PGL 44) that sets forth the policy regarding the categorization and assignment of costs for actions involving facilities interfering with Federal navigation improvements. Cost sharing requires a determination as to whether the affected facilities will be categorized as "removals," "relocations" or "deep-draft utility relocations," as defined in PGL 44 for each of the pipelines and conduits affected by the Project.

Of the 48 lines identified that will be affected, 40 have been designated as deep-draft utility relocations while eight have been categorized as removals. All of the deep-draft utility relocations and three of the eight removals are located on the CCSC. The other five removals are required as a result of the La Quinta Channel extension.

Of the 43 lines that must be removed/relocated in the CCSC, a majority of the deep-draft utility relocations and all of the removals on the CCSC (34 total) are located in the Inner Harbor reach. Six required deep-draft utility relocations are located in the Lower Bay Reach while three are located in the Upper Bay Reach. No deep-draft utility relocations/relocations/removals are required due to construction of any other project component, including the Entrance Channel of the CCSC, barge lanes, or ecosystem restoration features. These results are preliminary with final conclusions to be developed following further analysis during the PED phase of the project.

The non-Federal Sponsor has informed the Corps that, based on current law, the non-Federal Sponsor lacks the authority to require the pipeline owners to remove lines in a "removal" context. The Sponsor has not requested the State to join in a request for the Government to direct removals. The Sponsor will perform or insure the performance of the removal. Such costs will not be creditable or included in the financial costs of the project cited in this feasibility report, the Chief's Report or the authorizing legislation.

For all deep-draft utility relocations, one-half of the costs shall be borne by the owner of the facility being relocated and one-half of the cost shall be borne by the non-Federal Sponsor. The non-Federal share of costs for deep-draft utility relocations will be creditable against the non-Federal sponsor's required additional 10 percent repayment requirement detailed in WRDA 86. A line-by-line categorization of these facilities is included in the attached Real Estate Plan. All

removals and deep draft utility relocations are located in the open water. There are no bank removal areas affecting removals or relocations.

Any conclusion or categorization contained in this report that an item is a deep draft utility relocation or a removal, to be performed by the Non-Federal Sponsor as part of its LERR responsibilities is preliminary only. The Government will make a final determination of the relocations necessary for the construction, operation, or maintenance of the Project after further analysis and completion and approval of final attorney's opinions of compensability for each of the impacted utilities and facilities. In the event the future status of a pipeline or facility is converted from a relocation to a removal, such as a pipeline that becomes abandoned, the Non-Federal Sponsor will work with the owner to assure the removal and none of the costs of removal will be creditable against the Sponsor's cost share.

The recommendations of the feasibility report are in accordance with current law and Administration policy.

HISTORIC RESOURCE IMPACTS ASSOCIATED WITH THE SELECTED PLAN

Cultural resource investigations conducted in conjunction with this study have determined that proposed improvements will impact one significant historic property, the wreck of the SS Mary, which is located immediately adjacent to the Entrance Channel between the Port Aransas jetties. Although the exposed wreckage of the SS Mary is in very poor condition, it is eligible for designation as a State Archaeological Landmark. Proposed channel deepening will adversely affect the wreck of the Mary. Based upon the position of the magnetic anomaly, combined with positions of wreckage, it appears that at least 16 feet of the Mary's stern should lie within the proposed dredging impact area of the channel.

Mitigation options for the Mary have been discussed in consultation with the Texas State Marine Archaeologist and the Texas State Historic Preservation Officer (SHPO). Data recovery is not feasible due to dangerous diving conditions, including currents in excess of 4 knots, proximity to ship traffic and near-zero visibility. Alternative mitigation measures will be pursued, such as the preparation of a Texas maritime history curriculum module for use in public schools and construction of a museum display. A Memorandum of Agreement will be negotiated with the Texas SHPO, which details these alternative mitigation requirements.

Table 18
Project Cost Summary for the Selected Plan

Project Cost	\$136,510,476
Interest During Construction	\$18,911,407
Deep-Draft Utility Relocations	\$26,031,294
Removals	\$5,022,160
Bulkhead, Berthing Modifications	\$49,672,500
NED Investment Cost	\$242,835,592
Average Annual Costs	
Amortization	\$15,138,373
O&M	\$2,247,188
Total Average Annual Costs	\$17,385,561

Table 19
Project and NED Investment Cost Summary

	CCSC	La Quinta Extension	Barge Shelves	Totals
Project Cost	\$110,213,110	\$25,386,380	\$910,986	\$136,510,476
Months to Construct	63	7	7	
Interest During Construction	\$18,521,997	\$375,920	\$13,490	\$18,911,406
Deep-Draft Utility Relocations	\$26,031,294	\$0	\$0	\$26,031,294
Removals	\$1,130,895	\$3,891,265	\$0	\$5,022,160
Bulkhead, Berthing Modifications	\$8,677,500	\$40,995,000	\$0	\$49,672,500
Interest During Construction for Other & Associated Costs	\$6,023,082	\$664,673		\$6,687,755
Total Other & Associated Costs	\$41,862,771	\$45,550,938		\$87,413,709
NED Investment Cost	\$170,597,878	\$71,313,238	\$924,476	\$242,835,592
Average Annual Cost Including Incremental O&M	\$12,304,973	\$4,995,974	\$84,614	\$17,385,561
Annual Benefits	\$32,606,650	\$9,264,460	\$134,157	\$42,005,267
Net Excess Benefits	\$20,301,677	\$4,268,486	\$49,543	\$24,619,706
B/C Ratio	2.6	1.8	1.6	

Project Cost, interest during construction, relocation/removal/deep-draft utility relocation costs, and bulkhead and berthing facility modification costs were combined to develop NED Investment Costs for each project component (Table 18). These costs were then used to update net excess benefit totals and B/C ratios. These costs differ from those in the earlier screening process due to the availability of more detailed information developed after the initial screening was performed.

Project Costs and price escalation, calculated by estimating mid-point of the proposed construction contracts, are combined to create the Fully Funded Cost. These costs are separated into expected Federal and non-Federal shares and detailed in Table 19 for the CCSC deepening, Table 20 for the extension of the La Quinta Channel, and Table 21 for the barge shelves.

**Table 20
CCSC 52-Foot Project Fully Funded Cost Allocation**

<u>General Navigation Features (GNF)</u>	<u>Non-Fed Costs</u>	<u>Federal Costs</u>	<u>Total Costs</u>
Channel Deepening and Widening	\$41,264,073	\$41,264,073	\$82,528,145
Placement Area Levee Construction/Drop Structures	\$1,058,286	\$1,058,286	\$2,116,571
Beneficial Use Sites (least cost disposal facility)	\$10,931,019	\$10,931,019	\$21,862,038
Historic Resources Mitigation	\$0	\$213,240	\$213,240
Engineering and Design	\$3,090,545	\$3,090,545	\$6,181,089
Construction Management	<u>\$3,366,530</u>	<u>\$3,366,530</u>	<u>\$6,733,059</u>
Fully Funded Total GNF	\$59,710,451	\$59,923,691	\$119,634,142

**Table 21
La Quinta Extension Fully Funded Cost Allocation**

<u>General Navigation Features (GNF):</u>	<u>Non Federal</u>	<u>Federal Cost</u>	<u>Total Cost</u>
Dredging for Extension	\$4,322,957	\$12,968,871	\$17,291,828
Placement Area Levee Construction/Drop Structures	\$244,594	\$733,782	\$978,376
Beneficial Use Sites (least cost disposal facility)	\$1,081,553	\$3,244,660	\$4,326,213
Environmental Mitigation	\$17,270	\$51,810	\$69,080
Engineering and Design	\$304,110	\$912,330	\$1,216,440
Construction Management	<u>\$284,263</u>	<u>\$852,788</u>	<u>\$1,137,050</u>
Fully Funded Total GNF	\$6,254,747	\$18,764,240	\$25,018,987

**Table 22
Barge Shelf Fully Funded Cost Allocation**

<u>General Navigation Features</u>	<u>Non- Federal</u>	<u>Federal Cost</u>	<u>Total Cost</u>
Dredging - Barge Shelves	\$84,843	\$763,588	\$848,431
Engineering and Design	\$6,402	\$57,621	\$64,023
Construction Management	<u>\$5,984</u>	<u>\$53,860</u>	<u>\$59,845</u>
Fully Funded Total GNF	\$97,230	\$875,069	\$972,299

Section 101 of Public Law 99-662 requires that the non-Federal sponsor pay an additional amount equal to 10 percent of the total construction cost for the general navigation features.

This may be paid over a period of 30 years and land, easement, right-of-way, and relocation (LERR) costs paid by the non-Federal sponsor may be credited against it. To determine the amount of credit, GNF costs were developed utilizing current dollar amounts (fully funded numbers minus escalation). These totals are detailed in Tables 22, 23 and 24. Totals for real estate, relocations, removals, and other associated costs are included.

**Table 23
CCSC 52-Foot Cost Allocation**

<u>General Navigation Features (GNF)</u>	<u>Non-Fed Costs</u>	<u>Federal Costs</u>	<u>Total Costs</u>
Channel Deepening and Widening	\$35,884,722	\$35,884,722	\$71,769,443
Placement Area Levee Construction/Drop Structures	\$897,000	\$897,000	\$1,794,000
Beneficial Use Sites (least cost disposal facility)	\$9,492,479	\$9,492,479	\$18,984,957
Historic Resources Mitigation	\$0	\$ 213,240	\$213,240
Engineering and Design	\$2,815,998	\$2,815,998	\$5,631,996
Construction Management	<u>\$2,971,862</u>	<u>\$2,971,862</u>	<u>\$5,943,724</u>
Sub-Total GNF	\$52,062,060	\$52,275,300	\$104,337,360
<u>Lands, Easements, Real Estate and Rights-of-Way(LERR)</u>			
Real Estate	<u>\$5,774,500</u>	<u>\$101,250</u>	<u>\$5,875,750</u>
Sub-Total LERR	\$5,774,500	\$101,250	\$5,875,750
<u>Deep-Draft Utility Relocations</u>			
Non-Federal Sponsor Costs	\$13,015,647	\$0	\$13,015,647
Utility Owner Costs	<u>\$13,015,647</u>	<u>\$0</u>	<u>\$13,015,647</u>
Sub-Total Relocations	\$26,031,294	\$0	\$26,031,294
<u>Pipeline Removals</u>			
	<u>\$1,130,895</u>	<u>\$0</u>	<u>\$1,130,895</u>
Sub-Total Removals	\$1,130,895	\$0	\$1,130,895
<u>Associated Non-Federal Costs:</u>			
Berthing Areas Dredging, Docks, Bulkheads, etc	<u>\$8,677,500</u>	=	<u>\$8,677,500</u>
Sub-Total Associated	\$8,677,500	\$0	\$8,677,500
Current Cost	<u>\$93,676,249</u>	<u>\$52,376,550</u>	<u>\$146,052,799</u>

Actual cost of deep-draft utility relocations borne by the non-Federal sponsor, up to 50 percent of the total cost of the deep-draft utility relocations, is also creditable against the additional 10 percent share of GNF. However, for actions categorized as removals, non-Federal sponsor costs are not creditable against the additional 10 percent share of GNF.

Total GNF for all project components, as well as non-Federal sponsor credit, which includes real estate costs associated with dredged material placement areas and 50 percent of the cost of the

**Table 25
Barge Shelf Cost Allocation**

<u>General Navigation Features</u>	<u>Non-Federal</u>	<u>Federal Cost</u>	<u>Total Cost</u>
Dredging - Barge Shelves	\$79,087	\$711,784	\$790,871
Engineering and Design	\$6,281	\$56,531	\$62,812
Construction Management	<u>\$5,730</u>	<u>\$51,573</u>	<u>\$57,303</u>
Sub-Total GNF	\$91,099	\$819,887	\$910,986
Current Cost	\$91,099	\$819,887	\$910,986

Table 26 Total GNF Costs and Credits	
Total Cost GNF	\$128,658,307
10% of GNF ^a	\$12,865,831
Creditable Deep-Draft Utility Relocation Costs	\$13,015,647
Creditable Real Estate Costs	<u>\$7,733,419</u>
Total Non-Federal Sponsor Creditable Costs	\$20,749,066
Creditable Difference	\$(7,883,235)

a – Maximum amount creditable to non-Federal sponsor

Two sites detailed in this report are considered separable ecosystem restoration features. For these sites, Site L and Site P, costs and Habitat Suitability Index (HSI) estimates were developed to compare with and without project conditions. Current dollar costs were developed for Site L and Site P and are detailed in Table 27. Average annual costs (AAC) for these project components were developed and are based on the current dollar costs. These AAC's will then be compared to the increase in average annual habitat units (AAHU) expected as a result of construction of Sites L and P.

The traditional method of measuring habitat value of a restoration project is the Habitat Evaluation Procedure (HEP). However, HEP depends on a series of models that measure the suitability of a given habitat for one or more indicator species to measure the value of a habitat. For coastal wetlands and submerged aquatic vegetation, such as seagrass, traditional HEP procedures are not directly applicable. HEP procedures do not account for the direct and indirect value that these habitats provide to numerous aquatic (nursery, shelter, food) and avian species (nesting, roosting, food) or for their significant contribution to primary productivity.

Table 27
Ecosystem Restoration Features
Cost Allocation

	Non-Fed Costs	Federal Cost	Total
Site L			
Geotextile Fabric	\$51,686	\$95,989	\$147,675
Rip Rap and Blanket Stone	\$849,995	\$1,578,562	\$2,428,557
Total (Site L)	\$901,681	\$1,674,551	\$2,576,232
Site P			
Geotextile Fabric	\$0	\$0	\$0
Rip Rap and Blanket Stone	\$597,229	\$1,109,139	\$1,706,368
Total (Site P)	\$597,229	\$1,109,139	\$1,706,368

Because there are no HSI models available that are directly applicable to the habitats being restored or preserved by this project, a surrogate measure of the habitats has been used. These habitat values were estimated using a few indicator species that have HSI models available and are known to use these habitats. However, these estimates must be considered conservative since the method is not capable of measuring all of a habitat's values for reasons described above.

Site L is located on Mustang Island just west of the City of Port Aransas. The restoration feature consists of approximately 7,500 feet of rock breakwater extending east from Piper's Cut almost to the County Pier along the shoreline of the CCSC. The purpose of the breakwater is to protect an existing complex wetland ecosystem just south of the CCSC from wakes generated by navigation traffic. At present, there is a 250 to 700-foot wide upland strip of land separating the shallow subtidal to supratidal wetland complex from the Channel. The field sparrow, great blue heron, and brown shrimp were selected as indicator species to calculate AAHU's for the site.

Without the breakwater to protect this system of wetlands and nearby upland habitat, erosion, which is advancing at the rate of about 17 feet per year in some locations, will soon reach the diverse mosaic of wetland/upland habitats and begin removing the fringing marsh. The system's character will also alter from a shallow, quiet nursery/feeding area to a deeper monohabitat in an intertidal/subtidal system. While this new habitat will have value to the ecosystem, the rich mosaic complex of habitats that now interact with each other will be lost.

To facilitate the task of measuring habitat value in an area of juxtaposed habitats of varying size, all habitats were grouped into six broad habitat categories. These habitats are Uplands, Sand Flats, Blue-Green Algae Flats, Spartina-Mangrove Saltmarsh, Freshwater Pond-Cattail, and Subtidal Vegetated-Nonvegetated Bottom. An aerial photograph was used to delineate the habitats and the area of each habitat was estimated as a percent of the total area. The percent

coverage was then converted to acres based on an estimate of 1,200 acres for the total area under review.

The next step in the process of assigning a value to each habitat consisted of a review of HSI models provided by the U.S. Fish and Wildlife Service to determine which species is most applicable for the area. The field sparrow was selected to characterize the upland habitat; the great blue heron was selected for the spartina-mangrove saltmarsh (marsh) habitat, the freshwater pond-cattail (pond) habitat, and the shallow subtidal vegetated-nonvegetated (subtidal) habitat; and the brown shrimp was selected for the subtidal habitat. There were no suitable representative species for the sand flats or blue-green algae flats habitats available in the HSI models. Therefore, these habitats will not be used in the value calculations. However, these habitats have value as explained below.

The HSI values assigned to each habitat for the indicator species are multiplied by the habitat area to produce Habitat Units (HU) that indicate the relative size (value) of the area for the indicator species. Then the HU gains or losses for the with and without project scenarios are annualized by summing HUs across all years in the period of economic analysis and dividing the total cumulative HUs by the period of analysis (50 years). This provides the average annual HUs (AAHU) needed for cost comparisons. A generalized formula is used to calculate the total cumulative HUs (CHU) and can be used to account for a linear or curvilinear rate of change in HUs over the time interval being analyzed. The formula can be used for as few as two target years: a target year of 1 (for one year after the baseline evaluation) and a final target year (50 for this analysis). The AAHUs are calculated by dividing the CHUs by the time interval being analyzed (50 years). The net impact of a project on an area is calculated by subtracting the AAHUs for the without project condition from the AAHU value for with project conditions.

Field Sparrow: The existing upland habitat is about 120 acres in size and has a moderate HSI value of 0.77, which translates into $120 \text{ acres} \times 0.77 \text{ HSI} = 93 \text{ HUs}$. Under future (50 years) conditions without the proposed erosion protection (future w/o), this habitat which is nearest the Channel will be the first to disappear. Therefore, a value of 0 HU is assigned to this condition in Table 28. It is postulated that with erosion protection, the upland habitat will remain in its present condition as sparrow habitat since it has changed little over the last 15 years, other than losing land area to erosion. Therefore, the future with erosion protection (future with) condition is assigned the same HSI value of 0.77 with 93 HU (Table 28).

Table 28
HSI, HU, and AAHU Estimates for Site L

Habitat/ (Indicator Sp.)	Acres	Existing		Future W/O			Future With		
		HSI	HU	Acres	HSI	HU	Acres	HSI	HU
Upland/ (Field Sparrow)	120	0.77	93	0	0	0	120	0.77	93
Marsh/ (G.B.Heron)	240	0.1	24	120	0.1	12	240	0.1	24
Pond/ (G.B.Heron)	60	0.1	6	60	0.1	6	60	0.1	6
Subtidal/ (B.Shrimp)	420	0.58	244	480	0.13	63	420	0.73	307
Total HU			367			81			430
Cumulative HU						10,001			17,204
AAHU (CHU+50)						200			344
Net Impact (AAHU _{with} - AAHU _{without})									144 AAHU

Great Blue Heron: This species was used to characterize two habitats totaling 300 acres. Although each of these habitats would be affected at differing rates with differing outcomes by erosion over the 50-year period of economic analysis without protection, it was assumed that wave action and erosion would convert all of the upland habitat and half of the marsh habitat to subtidal habitat. It was also assumed that the pond habitat would not be affected significantly because of its distance from the channel and the continued inflow of freshwater from the sewage treatment plant. This would result in a net loss of heron feeding habitat. On the other hand, with erosion protection, it was assumed there would be little noticeable change in size of the three habitats. A note of caution for estimating the HSI for these habitats is that the controlling factor in determining the value of a habitat for the great blue heron is distance from the heronries. Since this factor is given a value of 0.1 in this area, the feeding habitat values of 1.0 (the maximum) are secondary because the factors are multiplicative. As a result, the HSI for the great blue heron is 0.1.

Based on the above assumptions and caveats, the existing condition provides a habitat value of 300 acres X 0.1 HSI = 30 HU. For the future w/o condition, the size of the habitat decreases to 180 acres X 0.1 HSI = 18 HU. For the future with condition, the value of the feeding habitat will remain equivalent to the existing condition (Table 28).

Brown Shrimp: This HSI model was used to provide a value for the subtidal habitat. Under existing conditions, the 420 acres of subtidal bottom has an HSI value for brown shrimp of 0.58. This translates into a value of 244 HU for the area. Under future w/o conditions, it is assumed the quality of the habitat decreases with the loss of vegetation and silts/organic sediments. It is also assumed that only half of the upland area is converted to subtidal habitat, but it does not benefit the shrimp significantly since there would be no vegetation or organic material to provide feeding habitat. Therefore, the HSI for this condition is about 0.13 for a total habitat value of 63 HU. For the future with project condition, it is assumed that the vegetative cover will increase from about 50 percent to about 70 percent based on anecdotal evidence over the last 15 years. This increase translates into an HSI of 0.73 and a total habitat value of 307 HU (Table 28).

As shown in Table 28, the AAHU for Site L after 50 years without erosion protection is estimated to be 200 and with erosion protection it is 344. The net impact of providing erosion protection for Site L is a net gain of about 144 AAHUs over the 50-year period of economic analysis.

It is assumed that there is not enough change (loss) in the upland habitat (Site L) or seagrass habitat (Site P) in the first year of analysis to affect the habitat value of the area. Therefore, the HSI and HU values for the analyses at Year 0 and Year 1 are assumed to be the same.

It is important to note that the estimates provided in Table 28 are conservative since a better estimate of the suitability of the area for wildlife would have been obtained by using more indicator species. However, there is a lack of good indicator species for the area in the HSI model list. Also, two of the habitats, the sand flats and blue-green algae flats, were not accounted for in this assessment for reasons noted above. Together these habitats total about 360 acres or 30 percent of the area. However, the sand flats and blue-green algae flats have an intrinsic value that cannot be measured by HEP analysis. These habitats contain the primary constituent elements necessary for piping plover use and are part of the designated Critical Habitat in the region as listed by the USFWS. Thus, these habitats are protected under the ESA and cannot have a monetary value assigned to them.

Site P is located near Ingleside-on-the-Bay at the junction of the Channel to La Quinta and the CCSC. As a result, the site is exposed to the erosive effects of navigation traffic induced waves and wind waves generated across a large expanse of open water to the south. The restoration feature consists of approximately 2,400 feet of rock breakwater located offshore and paralleling the shoreline in less than 4 feet of water. It is designed to protect and enhance about 45 acres of existing seagrass habitat used as a feeding/nursery area by many estuarine species. Seagrass is important to the area since there is little nursery habitat in the form of emergent marsh or submerged vegetation in Corpus Christi Bay.

Two species, the brown shrimp and spotted seatrout, were selected as the best representatives to characterize and measure the suitability of the habitat for the estuarine species. Both species have HSI models available and show a dependence on seagrass or other vegetated cover for survival.

Brown Shrimp: Because the seagrass at this site is exposed to high-energy waves, it is limited to about 40 percent coverage of the 45-acre site. As a result, the HSI value for the existing condition is estimated at 0.5. This produces a habitat value of 23 HU. It is estimated that erosion over the next 50 years without the breakwater will result in a loss of most of the seagrass and soft organic material on the bottom that the shrimp depend upon. Thus, the HSI for future without project with only 10 percent seagrass coverage is estimated to be 0.13, which produces a habitat value of 6 HU. On the other hand, with erosion protection, the seagrasses are expected to increase in coverage to about 80 percent of the area, which results in an HSI value of 0.8 and a habitat value of 36 HU (Table 29).

Spotted Sea Trout: The HSI model for the spotted seatrout has a water quality component that depends on salinity and temperature and a food/cover component that depends on the amount of submerged or emergent vegetation, shell reefs, and oyster beds. Since the water quality at Site P is optimal (a value of 1.0), the determining factor for the suitability measure of the area is the amount of cover. With an existing cover of 40 percent seagrass, the HSI is estimated at 0.8 and the habitat value is 36 HU. The future without project condition of 10 percent seagrass coverage results in an HSI value of 0.22 and a habitat value of 10 HU. The future with condition provided an optimum habitat and gives an HSI value of 1.0 with a habitat value of 45 HU (Table 29).

Table 29
HSI, HU, and AAHU for Site P

Habitat/ (Indicator Sp.)	Acres	Existing		Future W/O			Future With		
		HSI	HU	Acres	HSI	HU	Acres	HSI	HU
Seagrass/ (B. Shrimp)	45	0.5	23	45	0.13	6	45	0.8	36
Scagrass/ (Seatrout)	45	0.8	36	45	0.22	10	45	1.0	45
Total HU			59			16			81
Cumulative HU						1,002			1,796
AAHU (CHU+50)						20			36
Net Impact (AAHU _{with} - AAHU _{without})									16 AAHU

Because two indicator species are used to characterize the habitat value for one habitat, an average HSI value was used to calculate the CHUs and AAHUs for both the with and without project conditions. Based on the AAHU values in Table 29 averaged over both indicator species, the AAHU for the future without project is 20 and for the future with, it is 36. The net impact for Site P by providing erosion protection is a net gain of about 16 AAHUs over the 50-year period of economic analysis. This would indicate that the erosion protection proposed for Site P is needed to preserve the habitat value for the area.

The AAHUs developed for these two sites are compared to the average annual costs for each project component to calculate a cost per unit comparison (Table 30). Based on these calculations Site L will result in a cost of \$1,115 per habitat unit while Site P will realize a cost of \$6,648 per habitat unit. Based on the sensitive nature of the habitat types at both sites, the AAC/AAHU's identified for Sites L and P are considered minimal. The two sites exhibit habitat identified as important on both a Federal and State level, including habitat utilized by endangered species including piping plover and green sea turtle.

Table 30
Ecosystem Restoration Features
AAC/AAHU Comparison

	AAC	AAHU	AAC/AAHU
Site L	\$160,602	144	\$1,115
Site P	\$106,375	16	\$6,648

NON-FEDERAL SPONSOR VIEWS

The non-Federal sponsor for the existing project, the Port of Corpus Christi Authority, has actively participated throughout the planning process. Their primary concern has been inclusion of the project authorization in the Water Resources Development Act of 2003. The Port of Corpus Christi Authority is supportive of the selected plan and has indicated an interest in beginning construction as soon as possible.

It is the position of the non-Federal sponsor that the Federal government should strictly enforce navigational servitude for this project and the cost to perform the required alterations to remove all pipeline and conduit facilities within the navigation servitude and affected by the Project by lowering, raising, removing or replacing the facilities will be borne 100 percent by the owner of the facility. These views are not in accord with Corps' policy. The non-Federal Sponsor has informed the Corps that, based on current law, the non-Federal Sponsor lacks the authority to require the pipeline owners to remove lines in a "removal" context. The Sponsor has not

requested the State to join in a request for the Government to direct removals. The Sponsor will perform or insure the performance of the removal. Such costs will not be creditable or included in the financial costs of the project cited in this feasibility report, the Chief's Report or the authorizing legislation.

X. SUMMARY OF COORDINATION, PUBLIC VIEWS, AND COMMENTS

Public input has been important in the overall planning process to assure that plans considered and developed were compatible with community and regional objectives. The primary purposes of public involvement are: (1) to allow the public the opportunity to provide timely information to the USACE so that developed plans will reflect their preferences to the greatest extent possible, and (2) to provide a method by which the USACE can inform the public so that those who choose to participate in the project formulation and the planning process can do so with a relatively complete understanding about the issues, opportunities, and consequences associated with a study.

The various measures used during this study to assure open, two-way public communication included public notices, newsletters, media interviews, and meetings with various interested parties.

The Feasibility phase was initiated with issuance of a Public Notice in July 1999, which presented a summary of the past and planned study activities for this study. This notice also discussed the study process, the specific problems in the two channels, and various alternatives to be investigated. It invited all interested parties to provide input to the study beginning with a Public Meeting held in August 1999. Nine public meetings followed to update the public about the progression of the project and to solicit input. A series of newsletters was also sent to over 1,400 interested parties as well as individuals who attended meetings on the project. Other various forms of outreach utilized during this project included early regulatory agency coordination, RACT/Workgroup meetings, individual contacts, a toll-free 800 number, Spanish voice mailbox, web site postings, press releases, and comment forms.

A Feasibility Scoping Meeting was held in Corpus Christi, Texas on May 11, 2000. USACE Headquarters and Southwest Division personnel, as well as Port of Corpus Christi Authority representatives, were in attendance to also discuss the study process, the specific problems in the Corpus Christi and La Quinta Channels, and various alternatives to be investigated. To update Headquarters and Division personnel, a In-Progress Review meeting was held in Corpus Christi on August 28 and 29, 2001. As a follow-up to this meeting, an Alternatives Formulation Briefing was held by teleconference on February 6, 2002, to discuss final plan selection.

Studies were coordinated with U.S. Fish and Wildlife Service (USFWS), Texas Parks and Wildlife Department, Texas Commission on Environmental Quality, National Marine Fisheries Service, Texas State Historic Preservation Officer, and other Federal and State resource agencies. USFWS coordination began in July 2001, and the draft Coordination Act Report was

completed in March 2002. Regular RACT and workgroup meetings were held with all agency members. Workgroups met to evaluate hydrodynamic and salinity modeling, beneficial use opportunities, shoreline erosion, contaminants, mitigation, and cumulative impacts. The meetings provided guidance to insure that minimal impacts would occur with all project components and that dredged material was utilized in a beneficial manner.

XI. RECOMMENDATIONS

It is recommended that the existing projects for the Corpus Christi Ship Channel, Texas, authorized by the Rivers and Harbors Act of 1968, be modified generally as described in this report as the Selected Plan, with such modifications as in the discretion of the Chief of Engineers may be advisable, and subject to cost-sharing and financing arrangements satisfactory to the President and the Congress, to provide deep-draft channel improvements to the Port of Corpus Christi from the enlargement and continued maintenance of a portion of the Corpus Christi Ship Channel.

The Project Cost of all project components, minus inflation and interest during construction, totals \$136,510,500. The NED Investment Cost of all components, totals \$242,836,000, and includes \$18,911,000 in interest during construction for project components, \$26,031,000 in deep-draft utility relocation costs, \$5,022,000 in removal costs, \$49,672,500 in bulkhead and berthing modification costs, and \$6,688,000 in interest during construction for associated activities. Total average annual costs for the project are \$18,083,000. Fully Funded Cost of the projects, which includes Project Costs and expected escalation totals, is \$145,625,000.

These recommendations are made with the provision that, prior to implementation of the recommended improvements, the non-Federal Sponsor shall enter into binding agreements with the Federal government to comply with the following requirements:

The Port of Corpus Christi Authority shall:

a. Enter into an agreement which provides, prior to execution of the project cooperation agreement, 25 percent of design costs;

b. Provide, during construction, any additional funds needed to cover the non-federal share of design costs;

c. Provide, during the period of construction, a cash contribution equal to the following percentages of the total cost of construction of the general navigation features (which include the construction of land-based and aquatic dredged material disposal facilities that are necessary for the disposal of dredged material required for project construction, operation, or maintenance of the navigation improvements and for which a contract for the federal facility's construction or improvement was not awarded on or before October 12, 1996;):

(1) 10 percent of the costs attributable to dredging to a depth not in excess of 20 feet;
plus

(2) 25 percent of the costs attributable to dredging to a depth in excess of 20 feet, but not in excess of 45 feet; plus

(3) 50 percent of the costs attributable to dredging to a depth in excess of 45 feet;

d. Pay with interest, over a period not to exceed 30 years following completion of the period of construction of the project, up to an additional 10 percent of the total cost of construction of general navigation features. The value of lands, easements, rights-of-way, relocations, and deep-draft utility relocations provided by the non-Federal sponsor for the general navigation features, described below, may be credited toward this required payment. The value of deep-draft utility relocations for which credit may be afforded shall be that portion borne by the non-Federal sponsor, but not to exceed 50 percent, of deep-draft utility relocation costs. If the amount of credit equals or exceeds 10 percent of the total cost of construction of the general navigation features, the non-Federal sponsor shall not be required to make any contribution under this paragraph, nor shall it be entitled to any refund for the value of lands, easements, rights-of-way, relocations, and deep-draft utility relocations in excess of 10 percent of the total cost of construction of the general navigation features;

e. Provide all lands, easements, and rights-of-way, and perform or ensure the performance of all relocations and deep-draft utility relocations determined by the Federal Government to be necessary for the construction, operation, maintenance, repair, replacement, and rehabilitation of the general navigation features (including all lands, easements, and rights-of-way, relocations, and deep-draft utility relocations necessary for dredged material disposal facilities).

f. Provide, operate, maintain, repair, replace, and rehabilitate, at its own expense, the local service facilities (Oil Docks 1, 4, 7, 8, 11, Bulk Dock 2, and Corpus Christi Public Elevator); in a manner compatible with the project's authorized purposes and in accordance with applicable Federal and State laws and regulations and any specific directions prescribed by the Federal Government;

g. Accomplish all removals determined necessary by the Federal Government other than those removals specifically assigned to the Federal Government;

h. Provide 35 percent of the separable project costs allocated to ecosystem restoration as further specified below:

(1) Provide all lands, easements, and rights-of-way, including suitable borrow and dredged or excavated material disposal areas, and perform or assure the performance of all relocations determined by the Government to be necessary for the construction, operation, and maintenance of the project;

(2) Provide or pay to the Government the cost of providing all retaining dikes, wasteweirs, bulkheads, and embankments, including all monitoring features and stilling basins, that may be required at any dredged or excavated material disposal areas required for the construction, operation, and maintenance of the project; and

(3) Provide, during construction, any additional costs as necessary to make its total contribution equal to 35 percent of the separable project costs allocated to ecosystem restoration.

i. For so long as the ecosystem restoration portions of the project remain authorized, operate, maintain, repair, replace, and rehabilitate such ecosystem restoration portions, at no cost to the Government, in a manner compatible with the project's authorized purposes and in accordance with applicable Federal and State laws and any specific directions prescribed by the Government.

j. Give the Federal Government a right to enter, at reasonable times and in a reasonable manner, upon property that the non-Federal sponsor owns or controls for access to the project for the purpose of inspection, and, if necessary, for the purpose of operating, maintaining, repairing, replacing, and rehabilitating the general navigation features;

k. Hold and save the United States free from all damages arising from the construction, operation, maintenance, repair, replacement, and rehabilitation of the project, any betterments, and the local service facilities, except for damages due to the fault or negligence of the United States or its contractors;

l. Keep, and maintain books, records, documents, and other evidence pertaining to costs and expenses incurred pursuant to the project, for a minimum of 3 years after completion of the accounting for which such books, records, documents, and other evidence is required, to the extent and in such detail as will properly reflect total cost of construction of the general navigation features, and in accordance with the standards for financial management systems set forth in the Uniform Administrative Requirements for Grants and Cooperative Agreements to State and local governments at 32 CFR, Section 33.20;

m. Perform, or cause to be performed, any investigations for hazardous substances as are determined necessary to identify the existence and extent of any hazardous substances regulated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 U.S.C. 9601-9675, that may exist in, on, or under lands, easements, or rights-of-way that the Federal Government determines to be necessary for the construction, operation, maintenance, repair, replacement, or rehabilitation of the general navigation features. However, for lands that the Government determines to be subject to the navigation servitude, only the Government shall perform such investigation unless the Federal Government provides the non-Federal sponsor with prior specific written direction, in which case the non-Federal sponsor shall perform such investigations in accordance with such written direction;

n. Assume complete financial responsibility, as between the Federal Government and the non-Federal sponsor, for all necessary cleanup and response costs of any CERCLA regulated materials located in, on, or under lands, easements, or rights-of-way that the Federal Government determines to be necessary for the construction, operation, maintenance, repair, replacement, and rehabilitation of the project;

o. To the maximum extent practicable, perform its obligations in a manner that will not cause liability to arise under CERCLA;

p. Comply with Section 221 of Public Law 91-611, Flood Control Act of 1970, as amended, and Section 103 of the Water Resources Development Act of 1986, Public Law 99-662, as amended, which provides that the Secretary of the Army shall not commence the construction of any water resources project or separable element thereof, until the non-Federal sponsor has entered into a written agreement to furnish its required cooperation for the project or separable element.

q. Comply with the applicable provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, Public Law 91-646, as amended by Title IV of the Surface Transportation and Uniform Relocation Assistance Act of 1987, and the Uniform Regulations contained in 49 CFR Part 24, in acquiring lands, easements, and rights-of-way, required for construction, operation, maintenance, repair, replacement, and rehabilitation of the general navigation features, and inform all affected persons of applicable benefits, policies, and procedures in connection with said act;

r. Comply with all applicable Federal and State laws and regulations, including, but not limited to, Section 601 of the Civil Rights Act of 1964, Public Law 88-352 (42 U.S.C. 2000d), and Department of Defense Directive 5500.11 issued pursuant thereto, as well as Army Regulation 600-7, entitled "Nondiscrimination on the Basis of Handicap in Programs and

Activities Assisted or Conducted by the Department of the Army." The State is also required to comply with all applicable Federal labor standards requirements including, but not limited to, the Davis-Bacon Act (40 USC 3144 *et seq*), the Contract Work Hours and Safety Standards Act (40 USC 3701 *et seq*), and the Copeland Anti-Kickback Act (40 USC 3145 *et seq*).

s. Provide the non-Federal share of that portion of the costs of mitigation and data recovery activities associated with historic preservation, that are in excess of 1 percent of the total amount authorized to be appropriated for the project, in accordance with the cost sharing provisions of the agreement;

t. In the case of a deep-draft harbor, provide 50 percent of the excess cost of operation and maintenance of the project over that cost which the Secretary determines would be incurred for operation and maintenance if the project had a depth of 45 feet;

u. Prevent obstructions of or encroachments on the project (including prescribing and enforcing regulations to prevent such obstructions or encroachments) which might reduce the ecosystem restoration, hinder its operation and maintenance, or interfere with its proper function, such as any new development on project lands or the addition of facilities which would degrade the benefits of the project;

v. Do not use Federal funds to meet the non-Federal sponsor's share of total project costs unless the Federal granting agency verifies in writing that the expenditure of such funds is authorized; and

w. The container facilities on the La Quinta Channel will be substantially completed prior to the initiation of construction of the 39-foot La Quinta Channel Extension portion of the project.

Construction of the recommended channel improvements is estimated to take 5 years to complete. During this period, the Government and the Sponsors shall diligently maintain the projects at their previously authorized dimensions according to the previous cooperation agreement. Maintenance materials that have accumulated in the channels at the time that "before dredging" profiles are taken for construction payment shall be considered as new work material and cost-shared according to the new cooperation agreement. Any dredging in a construction contract reach after the improvements have been completed and the construction contract closed will be considered to be maintenance material and cost-shared according to the new agreement.

Those portions of the projects for the Corpus Christi Ship and La Quinta Channels that are deepened or newly created shall be operated and maintained according to the terms and provision

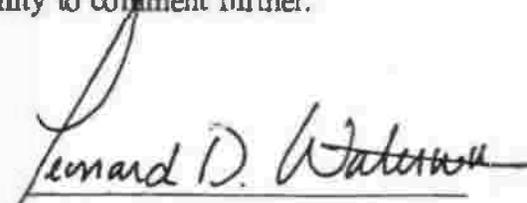
of the new agreements. All other portions of the existing projects for the La Quinta Channel shall continue to be operated and maintained according to the existing agreement applicable to that portion of the channel.

The recommendations contained herein reflect removal of pipelines, in most cases, with less than 20 feet of cover after project construction over the width of the channel plus an additional 25 feet of width on each channel edge. It has been proposed that some of the lines remain at their current depth based on several criteria, including type of product transported in the line, whether the line has a casing, type of material the line is buried in, and scour in the portion of the channel the line is located in. Based on these considerations, 19 pipelines that will not have 20 feet of cover after project construction will remain at their current depth. Additional consideration will be given to cover requirements during design of the project. Should less cover be considered adequate, the District Engineer will notify the affected pipeline owners that they will not need to remove their pipelines. Should the decision be made that more cover is needed on lines not previously scheduled for removal, the District Engineer will update the project economic evaluation to reflect the additional associated costs and submit the economic update to the Chief of Engineers for approval prior to advertising the first construction contract and notify the affected pipeline owners that they will have to remove these pipelines. Since pipeline removals are not a project cost, no changes to the Baseline Cost Estimate or Sponsor and Federal Cost-sharing will be required for either situation, however, modifications would be made to the cost allocation tables found in Section IX of this report.

The recommendations contained herein reflect the information available at this time and current Departmental policies governing formulation of individual projects. They do not reflect program and budgeting priorities inherent in the formulation of a national Civil Works construction program nor the perspective of higher review levels with the Executive Branch. Consequently, the recommendations may be modified before they are transmitted to the Congress as proposals for authorizations and implementation funding. However, prior to transmittal to the Congress, the non-Federal sponsor, the State, interested Federal agencies, and other parties will be advised of any modifications and will be afforded an opportunity to comment further.

3 April 2003

Date



Leonard D. Waterworth
Colonel, Corps of Engineers
District Engineer

 U.S. Army Corps of Engineers Lower River District	<table border="1"> <tr> <th>DATE</th> <th>BY</th> <th>DESCRIPTION</th> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> </table>	DATE	BY	DESCRIPTION												
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U.S. Army Engineers District, Galveston Corps of Engineers Galveston, Texas Project No. 1561-57-5732 Stationing: STA. 1350+00 TO STA. 1561+57.5732	A/E: FRY/GRANT/AGOR E.I.: GARY J. P.E. D.R.: DAVID R. CAMPBELL, P.E. Checked by: J.S. THOMAS Date: 11/15/00 Scale: 1" = 100'
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U.S. Army Engineers District, Galveston Corps of Engineers Galveston, Texas Project No. 1561-57-5732 Stationing: STA. 1350+00 TO STA. 1561+57.5732	DREDGING PLAN TO VIOLA TURNING BASIN ENTRANCE CHANNEL (52-FOOT PROJECT) CORPUS CHRISTI SHIP CHANNEL, TEXAS
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Drawing No. **C-1**
 Sheet 1 of 1
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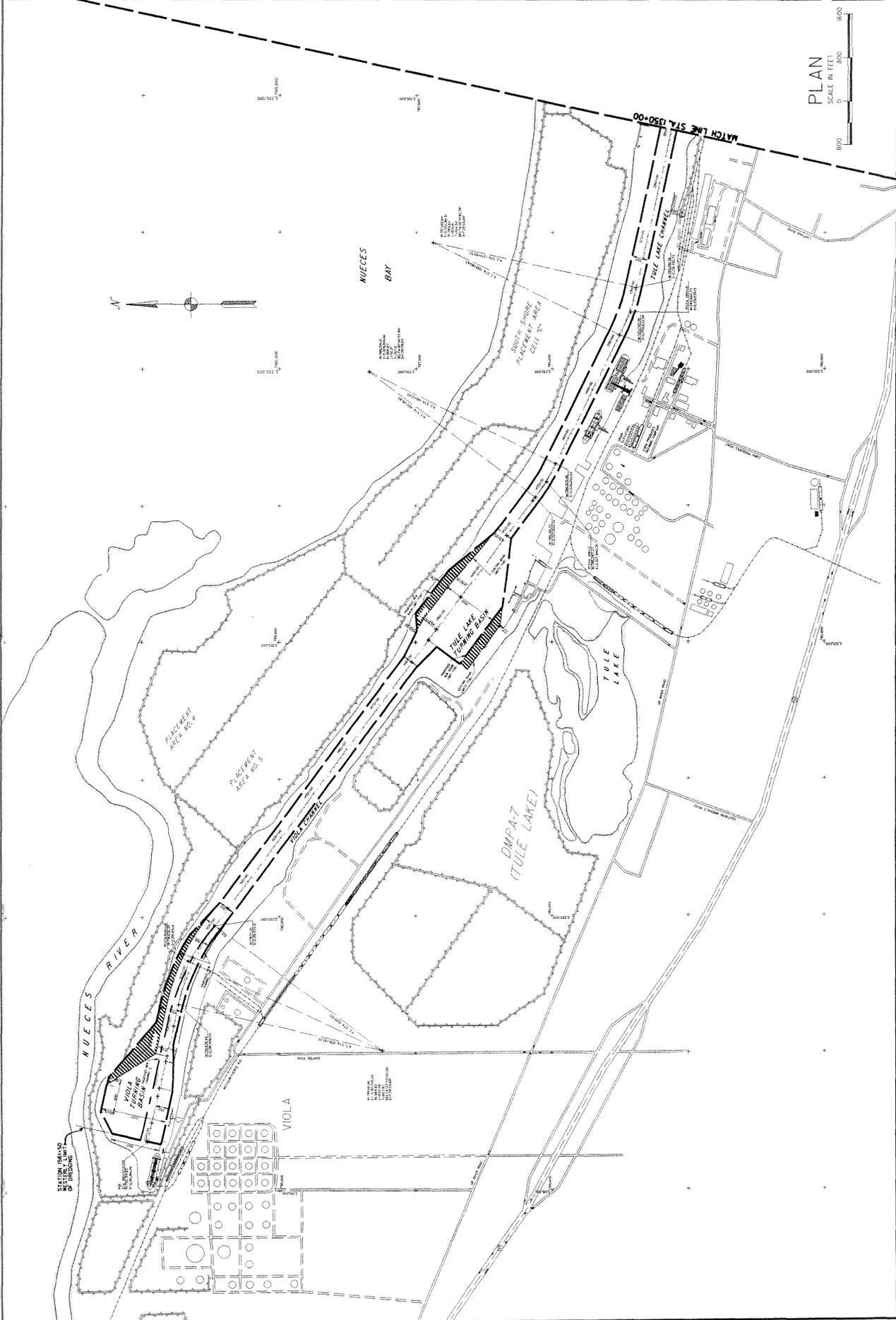
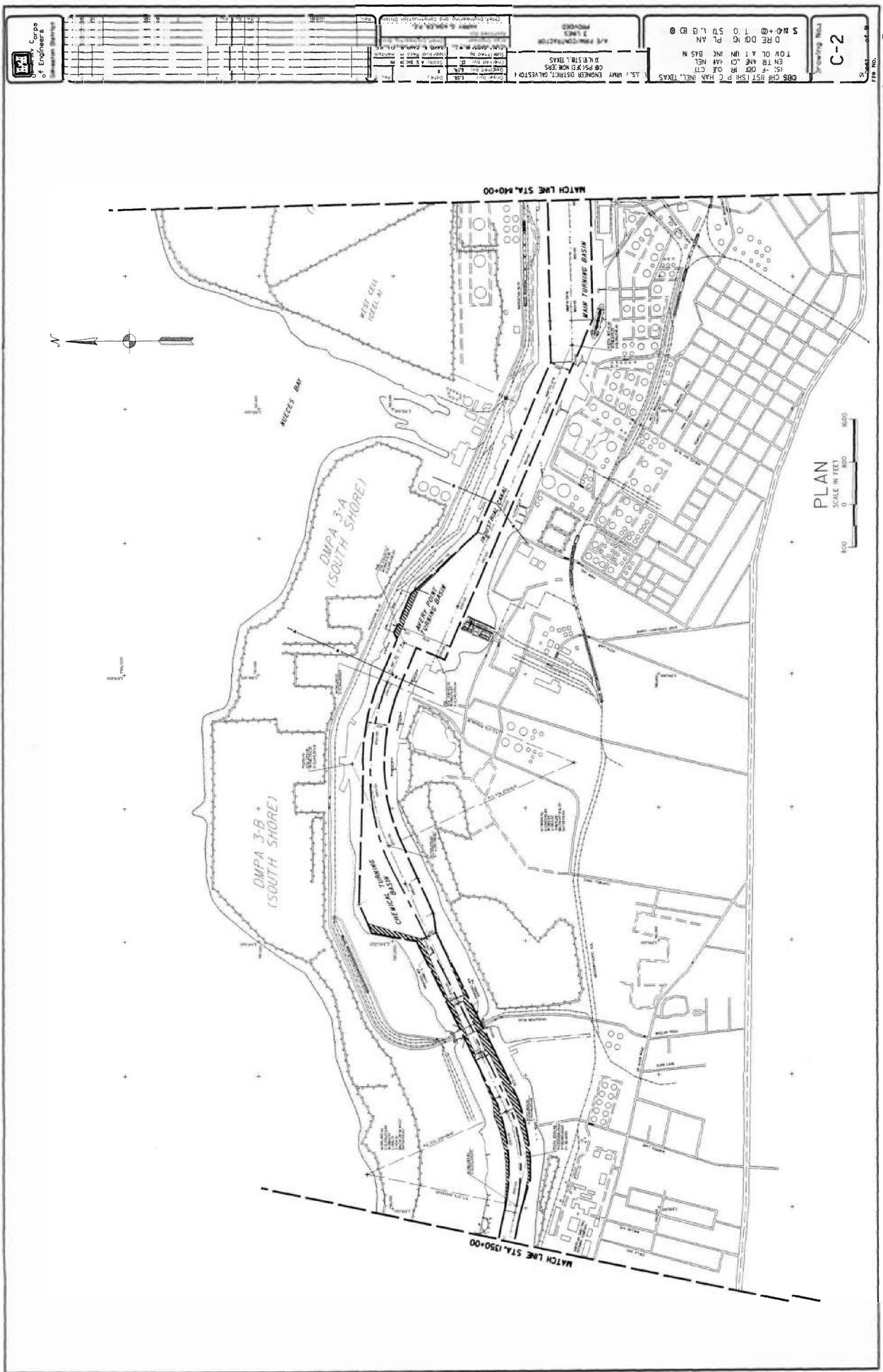
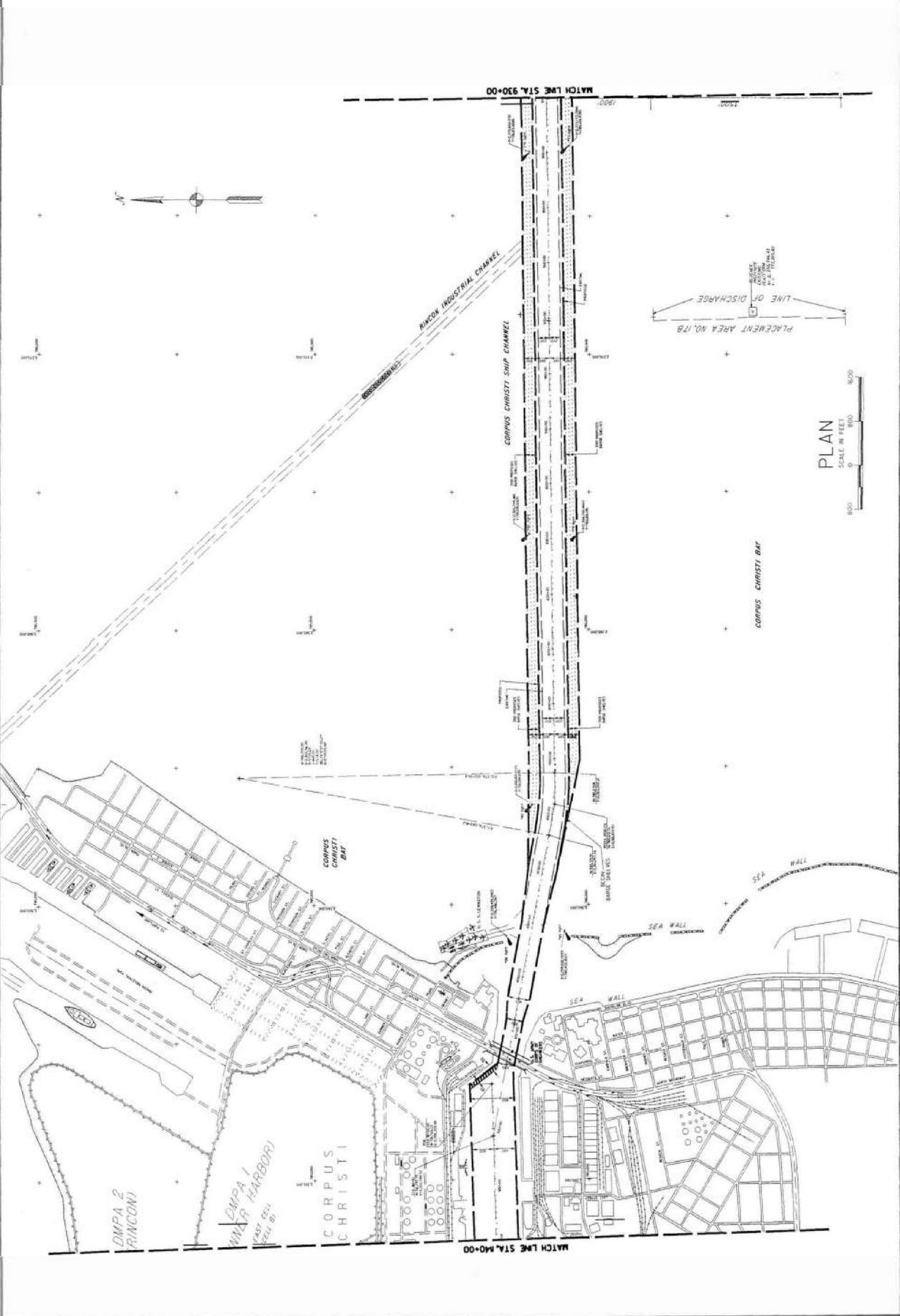


Plate 2

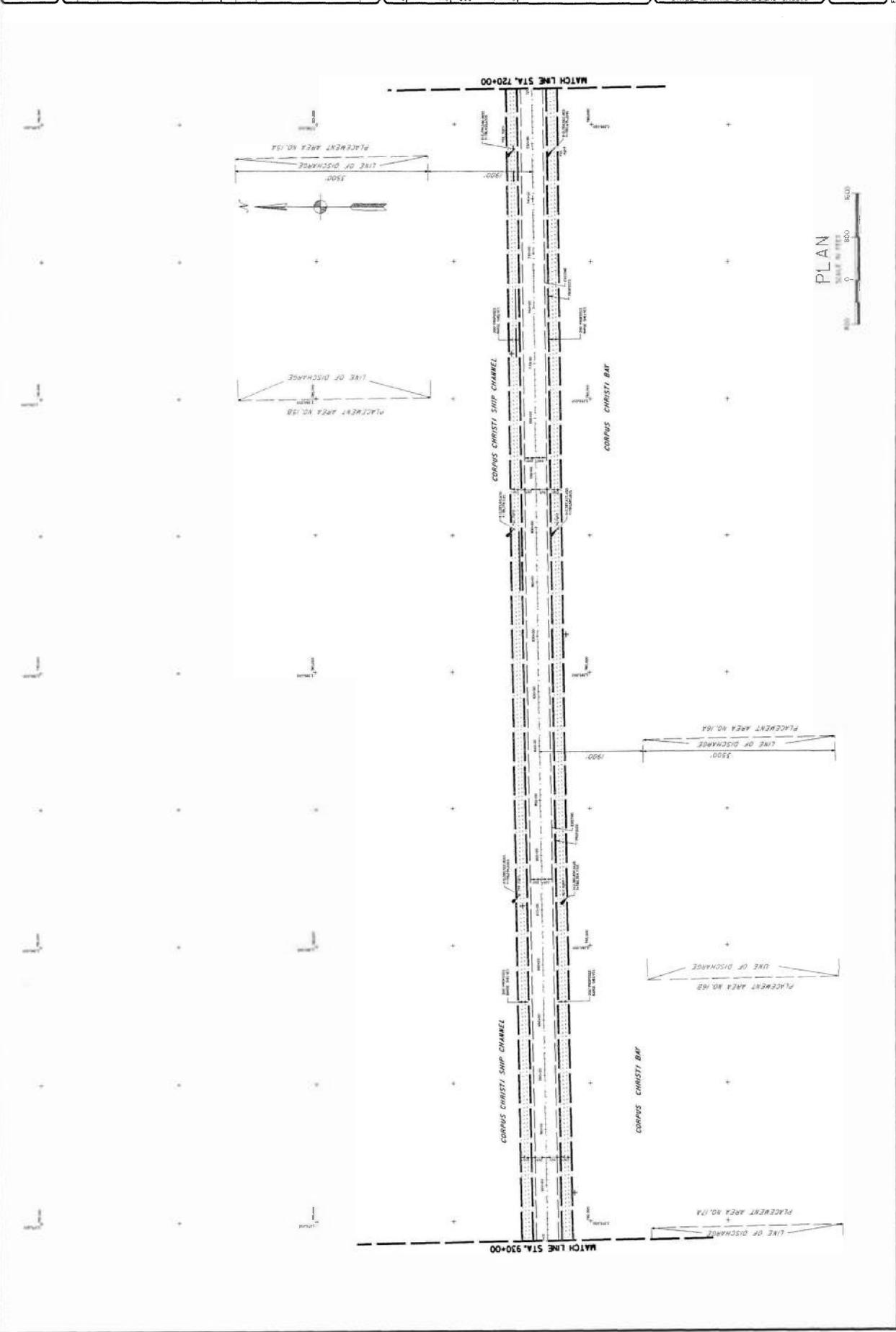


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	PROJECT NO. 14-0000000 DRAWING NO. C-2 SHEET NO. 1 OF 1	CONTRACT NO. W-60-1-1-10000 DRAWING NO. C-2 SHEET NO. 1 OF 1	TITLE: WEST CELL (CELL #1) PROJECT: WEST CELL (CELL #1) DRAWING NO. C-2 SHEET NO. 1 OF 1	DATE: 10/1/68 DRAWN BY: J. L. B. B. CHECKED BY: J. L. B. B. APPROVED BY: J. L. B. B.

	CORPUS CHRISTI SHIP CHANNEL, TEXAS (52-FOOT PROJECT) ENTRANCE CHANNEL TO NOLA TURNING BASIN DREDGING PLAN STA. 930+00 TO STA. 1140+00	U.S. ARMY ENGINEER DISTRICT, GALVESTON CORPUS OF ENGINEERS GALVESTON, TEXAS	A/E FIRM/CONTRACTOR 3 LINES PROVIDED HARRY G. KOHLER, P.E. CHIEF ENGINEER DAVID B. CAMPBELL, P.E. PROJECT MANAGER JOHN W. BROWN CHECKED BY: C.S.B.	Drawing No.: C-3 Sheet of 9
	CORPUS CHRISTI SHIP CHANNEL, TEXAS (52-FOOT PROJECT) ENTRANCE CHANNEL TO NOLA TURNING BASIN DREDGING PLAN STA. 930+00 TO STA. 1140+00	U.S. ARMY ENGINEER DISTRICT, GALVESTON CORPUS OF ENGINEERS GALVESTON, TEXAS	A/E FIRM/CONTRACTOR 3 LINES PROVIDED HARRY G. KOHLER, P.E. CHIEF ENGINEER DAVID B. CAMPBELL, P.E. PROJECT MANAGER JOHN W. BROWN CHECKED BY: C.S.B.	Drawing No.: C-3 Sheet of 9



 U.S. Army Corps of Engineers Convection District	Date: _____ Scale: _____ Sheet No. _____ of _____	U.S. ARMY ENGINEER DISTRICT, GALVESTON CORPUS OF ENGINEERS A/E FIRM/CONTRACTOR LINES PROVIDED MARY Q. KOHLER, P.E. Approved by: _____ Checked by: _____ Drawn by: _____ Title: _____ Date: _____	CORPUS CHRISTI SHIP CHANNEL, TEXAS DREDGING PLAN STA. 720+00 TO STA. 930+00 TO VIOLA TURNING BASIN ENTRANCE CHANNEL (52-6001 PROJECT)
	Title: _____ Date: _____ Checked by: _____ Drawn by: _____ Title: _____ Date: _____	U.S. ARMY ENGINEER DISTRICT, GALVESTON CORPUS OF ENGINEERS A/E FIRM/CONTRACTOR LINES PROVIDED MARY Q. KOHLER, P.E. Approved by: _____ Checked by: _____ Drawn by: _____ Title: _____ Date: _____	CORPUS CHRISTI SHIP CHANNEL, TEXAS DREDGING PLAN STA. 720+00 TO STA. 930+00 TO VIOLA TURNING BASIN ENTRANCE CHANNEL (52-6001 PROJECT)



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	PROJECT NO. _____ DRAWING NO. _____ SHEET NO. _____ OF _____	U.S. ARMY CORPS OF ENGINEERS VICKSBURG DISTRICT GULFPORT DISTRICT OFFICE	DATE: _____ DRAWN BY: _____ CHECKED BY: _____ TITLE: _____	STA. 500+00 TO STA. 720+00 DRE DRAINAGE PLAN TO VICA FLUMING DAM DRAINAGE CHANNEL (SEE PLAN SHEET)	SHEET NO. C-5 OF 9

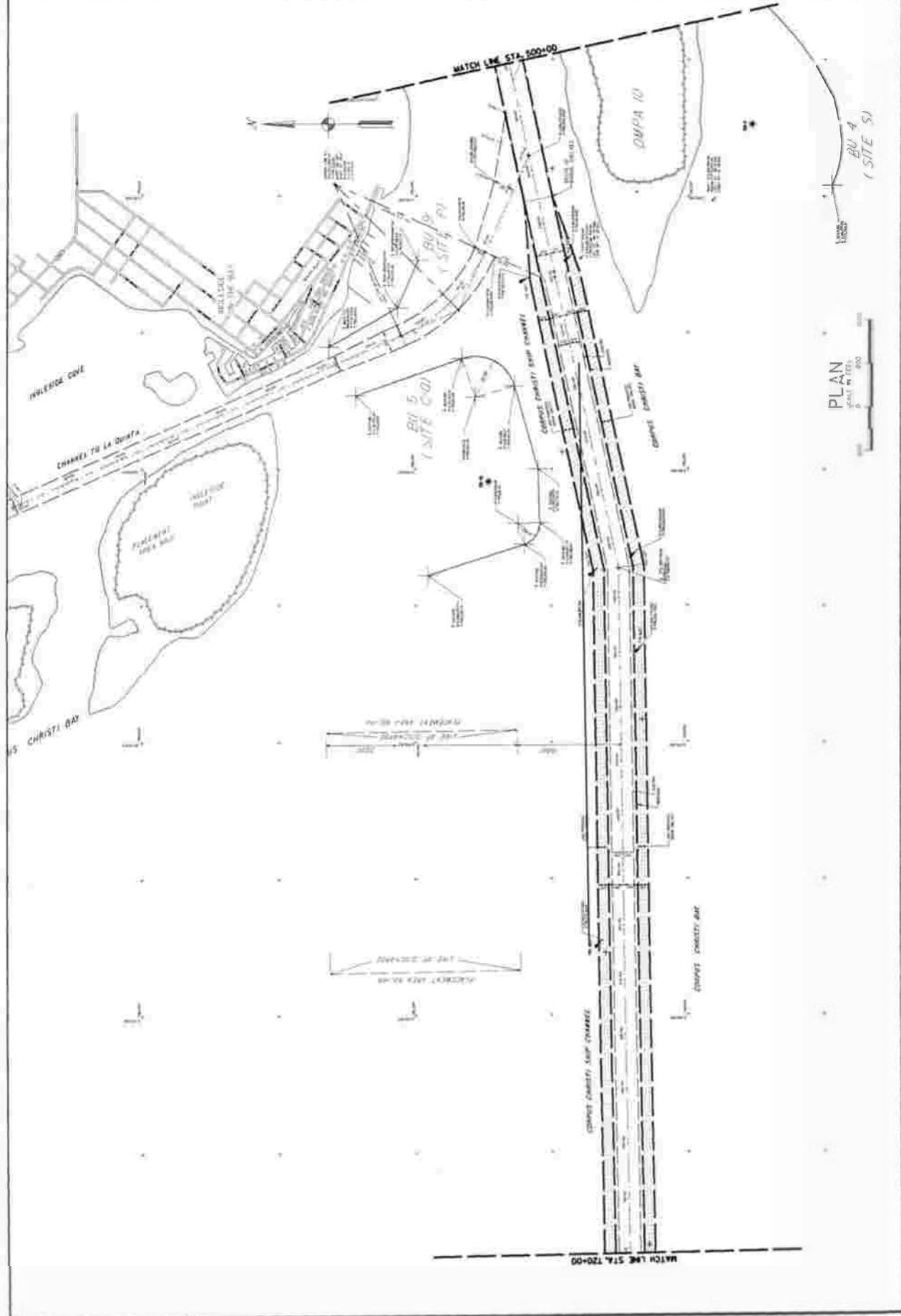
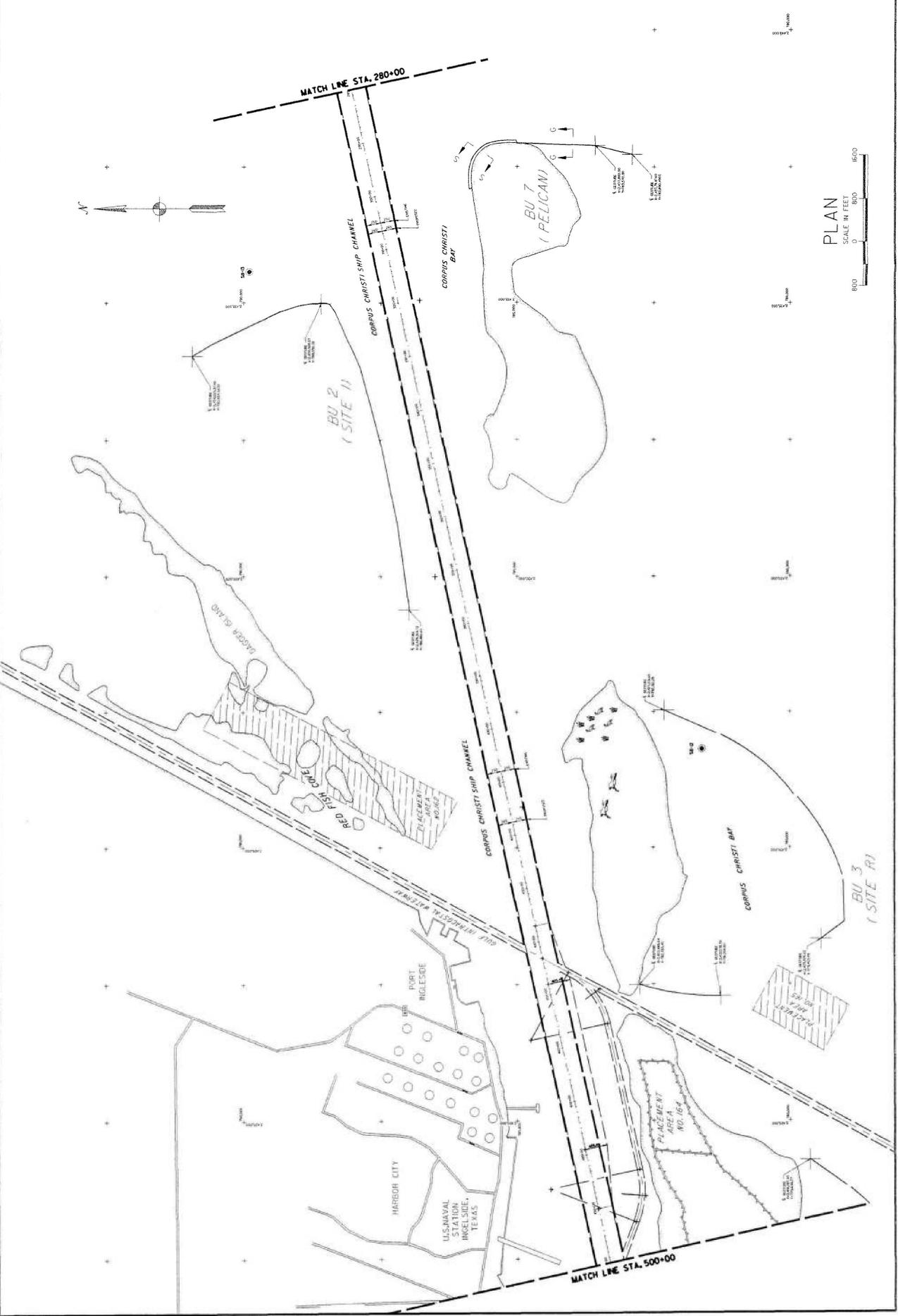


Plate 6

 Corps of Engineers District of Engineers Galveston District	Description Date No.	Checked by Date No.	Approved by Date No.	Checked by Date No.	Approved by Date No.
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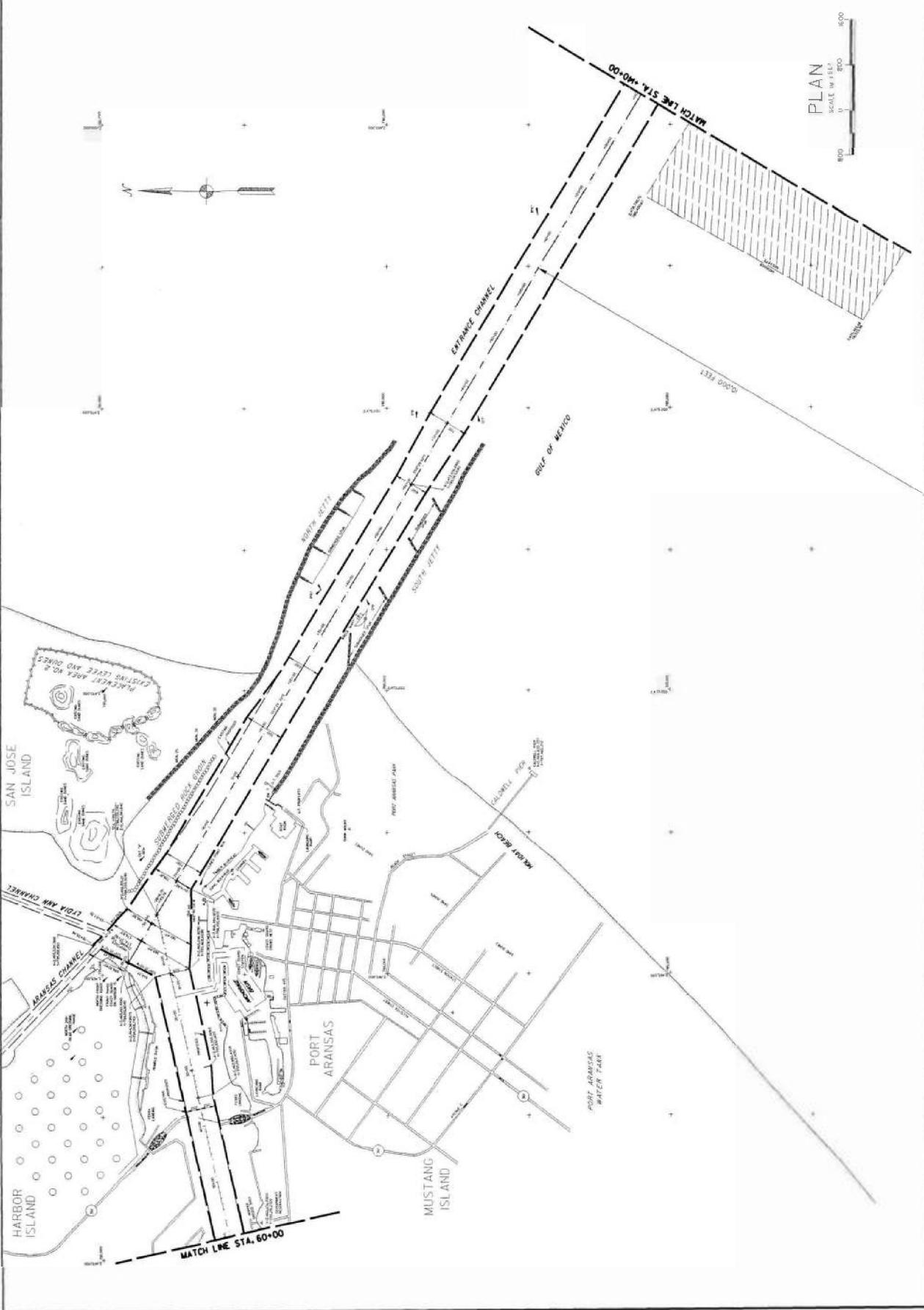
U.S. ARMY ENGINEER DISTRICT, GALVESTON
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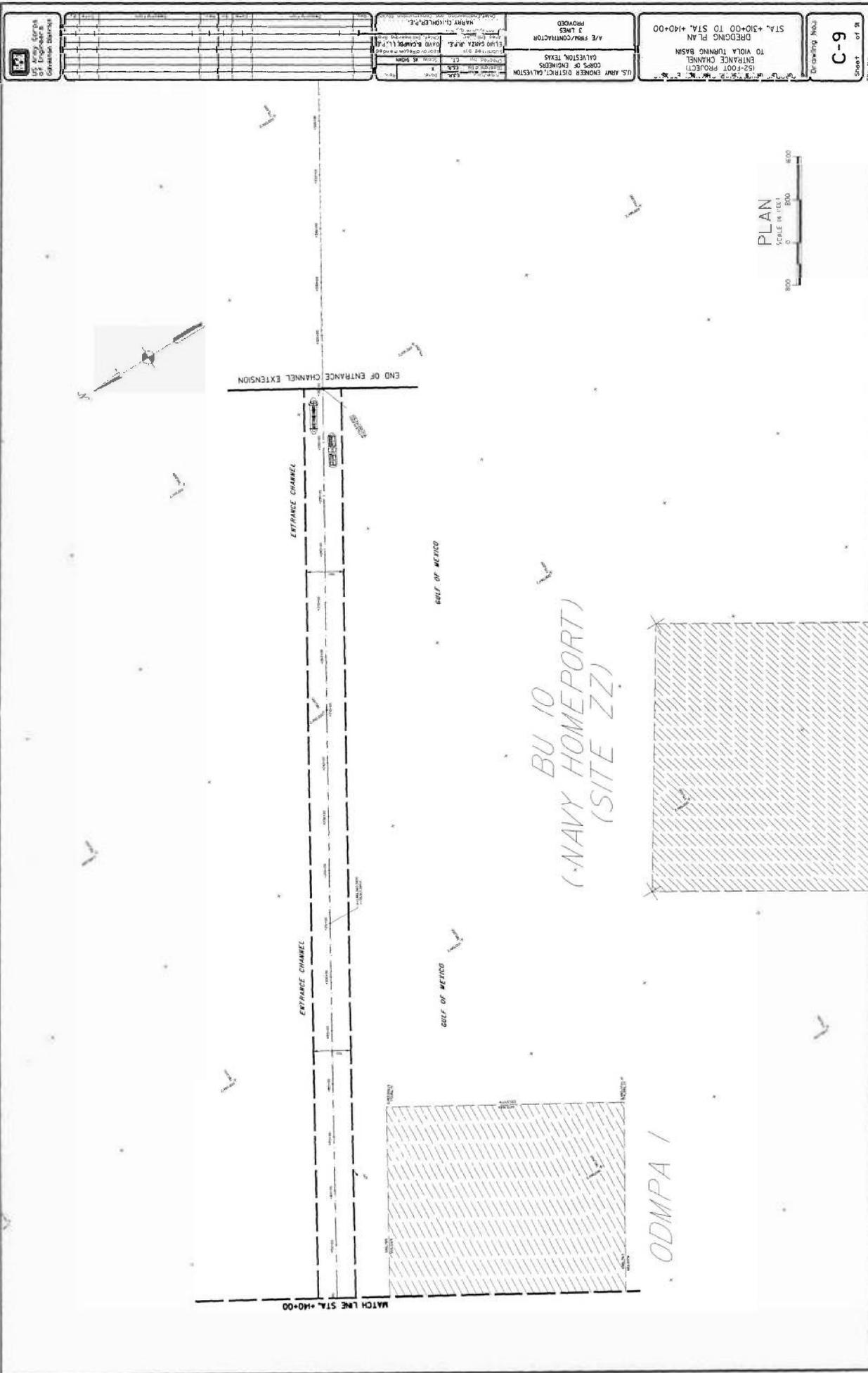
CORPUS CHRISTI SHIP CHANNEL, TEXAS
 DREDGING PLAN
 TO VIOLA TURNING BASIN
 ENTRANCE CHANNEL
 (S-101 PROJECT)
 STA. 280+00 TO STA. 500+00

Drawing No.:
C-6
 Sheet of 9

Plate 7

 U.S. Army Corps of Engineers Galveston District	Date: _____ Description: _____ Scale: _____ Sheet: _____ of _____	Checked by: _____ Drawn by: _____ Prepared by: _____ Title: _____	Approved by: _____ Date: _____ Title: _____	A/E Firm/Contractor: _____ _____ _____	U.S. Army Engineer District, Galveston Corps of Engineers Galveston, Texas	STA. +40+00 TO STA. 600+00 DREDGING PLAN TO VIOLA TURNING BASIN ENTRANCE CHANNEL (52-FOOT PROJECT) COMPUS CHRISTI SHIP CHANNEL, TEXAS	Drawing No.: _____ Sheet: C-8 of 9
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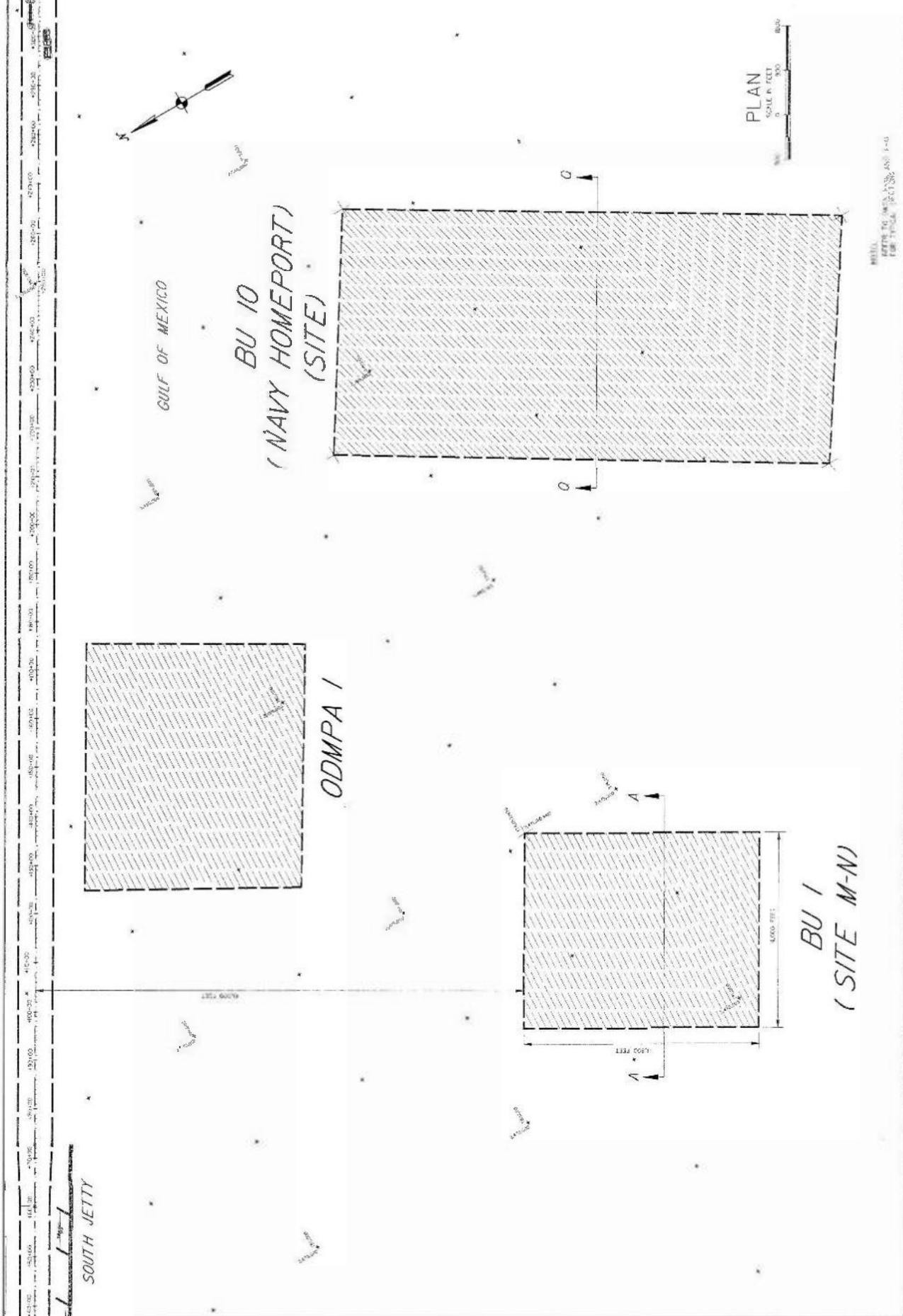




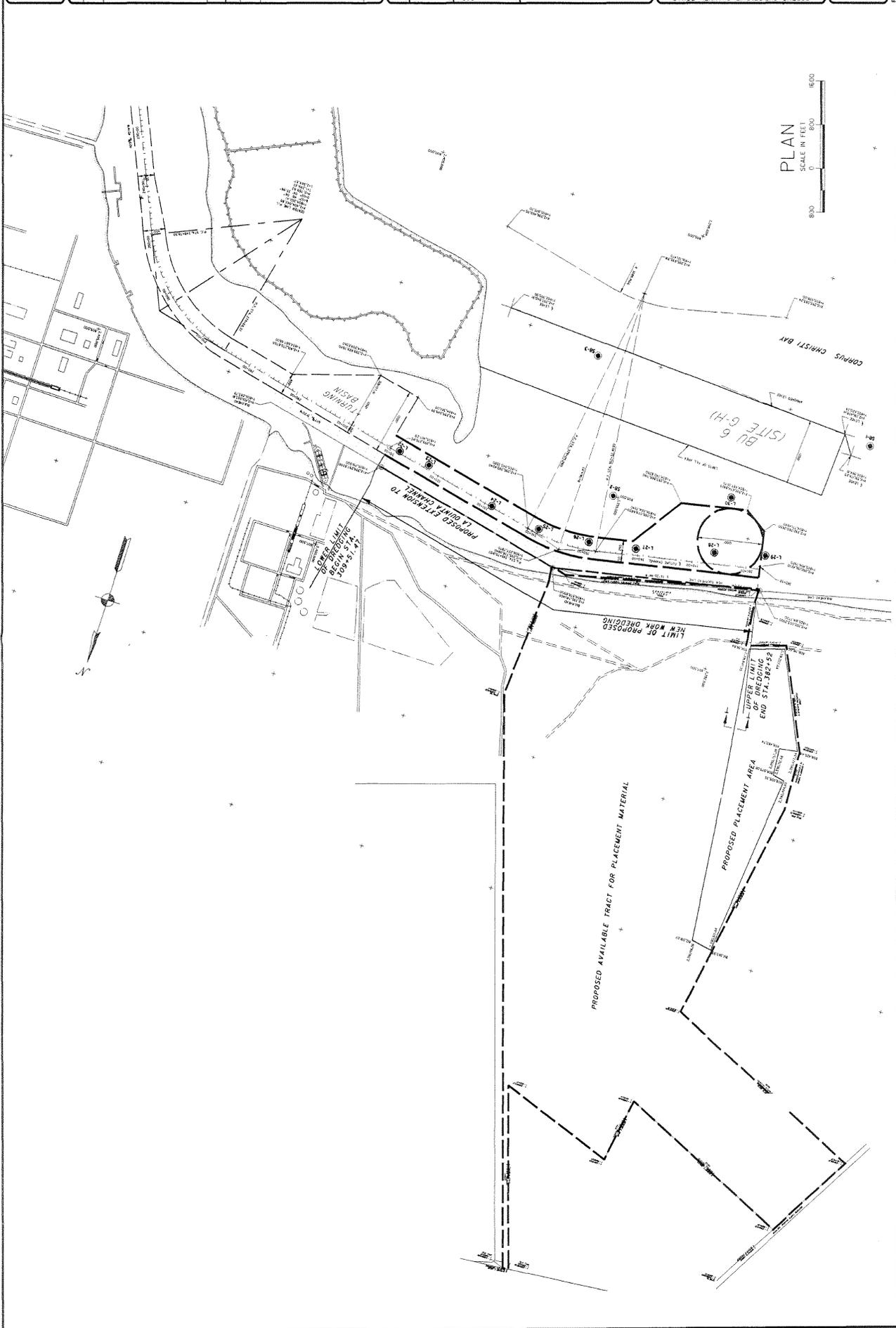
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	PROJECT: 102-FOOT PROJECT TO VIOLA TURNING BASIN ENTRANCE CHANNEL STA. +310+00 TO STA. +140+00
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Plate 10

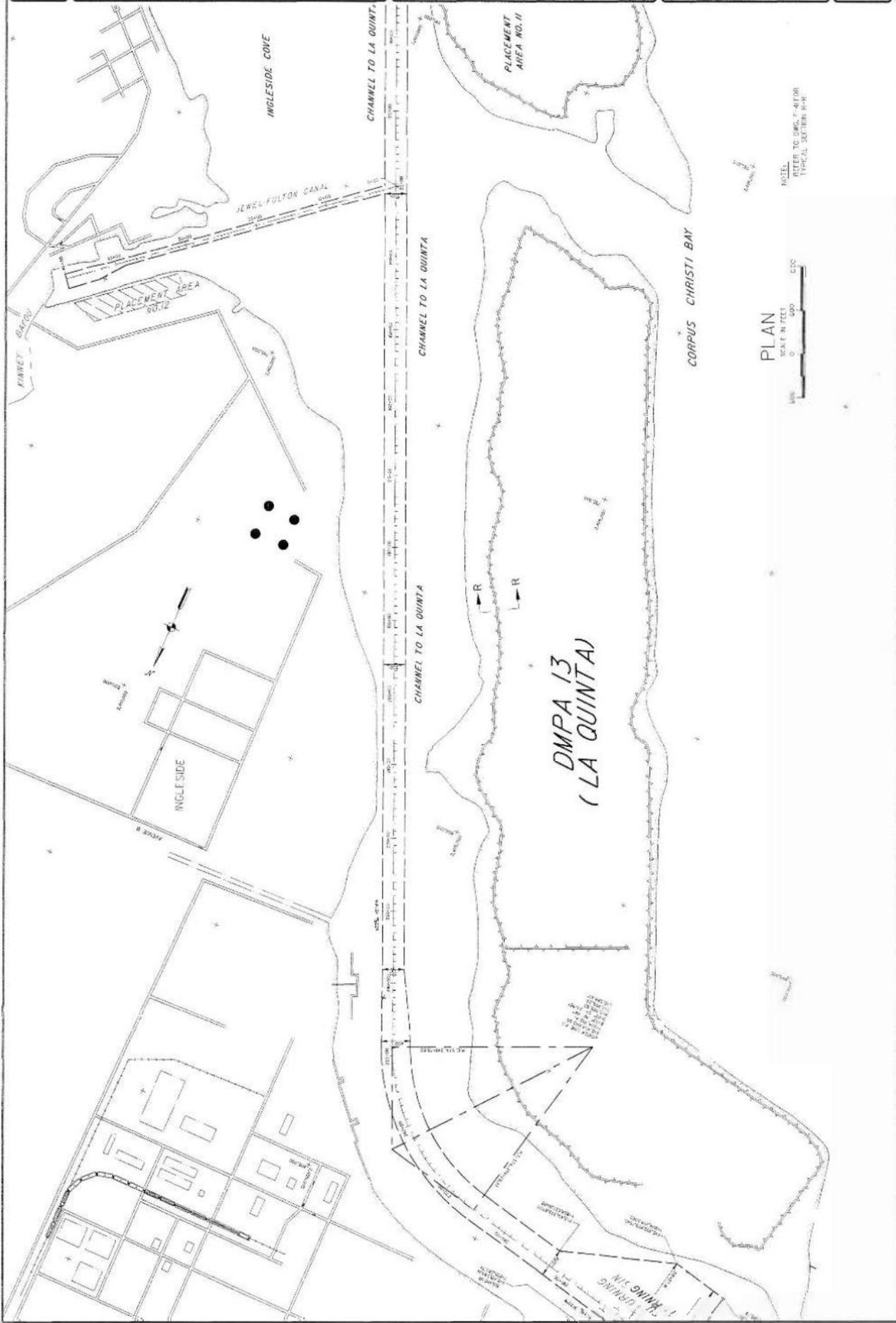
 State of Texas License No. 12345 Date of Issue: 12/31/2023 Expiration Date: 12/31/2024	U.S. Army Engineer District, Galveston Corps of Engineers Station, Texas Date: 12/31/2023 Scale: AS SHOWN	A/E FIRM/CONTRACTOR JAMES G. KENNEL, P.E. 12345 GOLF COURSE DRIVE HOUSTON, TEXAS 77055	U.S. ARMY ENGINEER DISTRICT, GALVESTON CORPS OF ENGINEERS STATION, TEXAS DATE: 12/31/2023 SCALE: AS SHOWN
	PROJECT NO.: 12345 DRAWING NO.: F-29 SHEET NO. OF 3	PLACEMENT AREA AND BU 1 SITE M-N CORPUS CHRISTI SHIP CHANNEL, TEXAS	DRAWING NO. F-29 SHEET 15 OF 15



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	U.S. ARMY ENGINEER DISTRICT, CORPUS CHRISTI, TEXAS CORPUS CHRISTI SHIP CHANNEL, TEXAS DMPA 13 (LA QUINTA)	A/E FIRM/CONTRACTOR 3 LINES PRODUCED BY CLAYTON & KIRKMAN, P.A. CLAYTON & KIRKMAN, P.A. 1500 WEST 15TH STREET CORPUS CHRISTI, TEXAS 78401 PHONE (361) 841-1111 FAX (361) 841-1112 WWW.CLAYTONANDKIRKMAN.COM	U.S. ARMY ENGINEER DISTRICT, CORPUS CHRISTI, TEXAS CORPUS CHRISTI SHIP CHANNEL, TEXAS DMPA 13 (LA QUINTA)



CORPUS CHRISTI SHIP CHANNEL
CHANNEL IMPROVEMENTS PROJECT
CORPUS CHRISTI AND NUECES BAYS
NUECES AND SAN PATRICIO COUNTIES, TEXAS

FINAL
ENVIRONMENTAL IMPACT STATEMENT

U.S. Army Corps of Engineers
Galveston District

April 2003

ABSTRACT

FINAL
ENVIRONMENTAL IMPACT STATEMENT

Corpus Christi Ship Channel Channel Improvements Project
Corpus Christi and Nueces Bays
Nueces and San Patricio Counties, Texas

The responsible lead agency is the U.S. Army Engineer District, Galveston. The responsible cooperating agency is the U.S. Environmental Protection Agency.

Abstract: The Galveston District has reviewed the Port Aransas-Corpus Christi Ship Channel (45-Foot Project) and other reports to determine the feasibility of modifying the Corpus Christi Ship Channel (CCSC) to improve commercial navigation. The plan of improvements is described in the accompanying Feasibility Report and Final Environmental Impact Statement (FEIS). The CCSC and La Quinta Channel are navigation channels that connect the harbor facilities in Corpus Christi and Ingleside-On-The-Bay, San Patricio and Nueces Counties, Texas with the Gulf of Mexico. Ship sizes have increased resulting in the need for light loaded vessels to traverse the present waterway. The current channel depth requires that large crude carriers remain offshore and transfer cargo into smaller crude tankers for the remainder of the voyage. Ship delays are experienced as well due to the 400-foot channel width versus the needed 530-foot channel width and from the lack of barge lanes. Crude petroleum imports and petroleum product imports are expected to increase 50% and 500% by 2056, respectively. Twenty-three alternatives were evaluated. Based on the environmental impacts, engineering feasibility, and economic considerations, the recommended plan consists of deepening the CCSC to 52 feet and widening to 530 feet with modifications to turning basins; addition of 12-foot-deep, 200-foot-wide barge lanes on either side of the 530-foot channel for 9.6 miles in the upper Corpus Christi Bay; extension of La Quinta Channel for 1.4 miles at a depth of 39 feet and width of 300 feet; and a dredged material management/beneficial use plan.

THE OFFICIAL CLOSING DATE FOR THE RECEIPT OF COMMENTS IS 30 DAYS FROM THE DATE ON WHICH THE NOTICE OF AVAILABILITY OF THIS FINAL EIS APPEARS IN THE *FEDERAL REGISTER*.

If you would like further information on this statement, please contact:

Ms. Carolyn Murphy
U.S. Army Engineer District, Galveston
2000 Fort Point Road
Galveston, Texas 77550
Commercial telephone: 409/766-3044

NOTE: Information, displays, maps, etc., discussed in the Feasibility Report and Appendices are incorporated by reference in the FEIS.

April 2003

SUMMARY

Major Conclusions and Findings

Major factors affecting formulation of the Corpus Christi Ship Channel – Channel Improvements Project, Texas, were effects on water quality, sediment quality, bay system hydrology, estuarine resources, socioeconomic, and cumulative impacts. Contaminant studies demonstrated that new work and maintenance dredged material from all sections of the channel, with the exception of the Inner Harbor, is acceptable for offshore disposal, beneficial uses in the bay or ocean, or upland disposal. Because there have been contaminant problems with sediments in the Inner Harbor in the past, this material will be placed in existing, nearby upland sites to remove it from the system. The Hydrodynamic and Salinity Model demonstrated that minimal impacts on water exchange, inflow, and salinity would occur. Tidal amplitude may increase up to 0.06 feet and changes in salinity may seasonally and locally decrease by up to 4 parts per thousand (ppt). Shoreline erosion was studied without the beneficial use sites and it was concluded that neither the existing or proposed conditions had consistently positive or negative impacts on shoreline erosion. Several of the beneficial use sites are located to provide erosion protection to areas of concern for erosion.

The Beneficial Uses Workgroup of the Regulatory Agency Coordination Team developed a dredged material management/beneficial use plan that utilizes dredged material in an environmentally sound and economically acceptable manner and that incorporates other public benefits into its design. Beneficial uses of dredged material investigations identified a plan that will result in the following: creation of 935 acres of shallow water habitat, creation of 15 acres of submerged aquatic vegetation (as mitigation), creation of 26 acres of marsh, construction of 26,400 linear feet of rock breakwater, creation of 1,590 acres of offshore topographic relief, construction of 120 acres of upland buffer zone, construction of 7,500 linear feet of rock revetment, protection of 45 acres of submerged aquatic vegetation, protection of an existing bird island, and protection of 400+ acres of wetlands. Channel enlargement will result in direct permanent and temporary losses to 5 acres of patchy submerged aquatic vegetation, which will be mitigated through creation of 15 acres of submerged aquatic vegetation. The cumulative impact assessment showed that the proposed navigation improvements with the beneficial use plan will result in a net positive environmental effect to the Corpus Christi Bay ecosystem relative to the without project condition.

Recommended Plan

The Corpus Christi Ship Channel – Channel Improvements Project provides navigation safety and efficiency enhancements and environmental restoration via beneficial uses of dredged material. The recommended plan consists of deepening and selective widening of the existing –45 foot MLT deep, 400-ft-wide authorized channel from the Entrance Channel to a point about ½ mile east of the Harbor Bridge. Deepening of the channel will occur along its entire 34 mile length to –52 feet MLT. The existing Entrance Channel will be lengthened 10,000 feet and deepened from its present authorized depth of –47 feet MLT to an authorized depth of –54 feet MLT. The channel will be widened from its present

400-foot width to 530 feet through Upper Corpus Christi Bay. The Lower Corpus Christi Bay reach will be widened from its present 500-foot width to 530 feet. Barge shelves, which will each be 200 feet wide as measured from the toe of the widened channel, will occur along both sides of the channel through Upper Bay. The recommended plan includes the extension of La Quinta Channel approximately 7,400 feet at a width of 300 feet and to a depth of -39 feet MLT.

The Dredged Material Management/Beneficial Uses Plan outlines the placement of dredged material from construction of the project improvements. Eight existing confined upland sites, an existing offshore placement site, and eight existing, unconfined bay sites will be utilized to confine both new work and maintenance dredging material. An additional upland placement site for the La Quinta Channel Extension and seven new open-water beneficial use sites will be established; two offshore, and the remainder in Lower Corpus Christi Bay. Additional beneficial use project features for erosion protection that will benefit the coastal environment will be constructed without the use of dredged material.

Other Major Conclusions and Findings

This Environmental Impact Statement has been prepared to satisfy the requirements of all applicable laws and regulations using the Council of Environmental Quality's National Environmental Policy Act regulations (40 CFR Part 1500) and the Corps of Engineers regulation ER 200-2-2 (33 CFR 230). The following is a brief summary of the effects of the recommended plan on the significant environmental resources of Corpus Christi Bay.

Water Quality

A Hydrodynamic and Salinity Model for Corpus Christi Bay, developed by the Texas Water Development Board, evaluated water exchange and salinity impacts. The model results concluded that changes in tidal amplitude of 0.06 feet or less are expected in the project area, and that changes in salinity may seasonally and locally decrease by up to 4 ppt or increase up to 0.38 ppt. Testing of maintenance material elutriates with chemical analyses and water column bioassays has indicated no cause for concern. No significant increase or decrease in ballast water introductions is expected. As a result, no net adverse direct or indirect impacts from water quality are expected as a result of the recommended plan.

Sediment Quality

The results of sediment analyses demonstrated that new work and maintenance dredged material are acceptable for beneficial uses with two exceptions. Sediments from the Inner Harbor will be placed in several upland confined placement areas, and the fine material from the Upper Bay will continue to go into open-bay, unconfined placement areas.

Community Types

Five acres of submerged aquatic vegetation will be directly impacted by the recommended plan. This loss will be mitigated by planting 15 acres of seagrass within a 200-acre shallow water beneficial use site. The

beneficial use plan will protect and create submerged aquatic vegetation habitat areas, wetlands, and coastal shore areas.

Fish and Wildlife Resources

No significant adverse impacts to finfish, shellfish, recreational and commercial species, aquatic communities, essential fish habitat, and wildlife resources are expected to occur from the recommended plan. Temporary impacts to fish and wildlife resources may be experienced from dredging and resulting suspended solids (turbidity). However, the beneficial use plan will create new habitat to be used by these species.

Threatened and Endangered Species

Identification of all Federally listed threatened or endangered species in the project area and any impacts the project may have on these species has been completed. A Biological Assessment of impacts on threatened, endangered, and candidate species in the area has been prepared and coordinated with the U.S. Fish and Wildlife Service and National Marine Fisheries Service. The Galveston District has determined that the recommended plan will not have any significant adverse effect on the listed species and the FWS has concurred (Appendix C). The NMFS's Biological Opinion is also included in Appendix C.

Hazardous, Toxic, and Radioactive Waste

A review of a regulatory agency database information search, an aerial photographic review, interviews with regulatory officials, and a site reconnaissance were conducted to determine the impacts of the recommended plan on or from existing hazardous, toxic, and radioactive waste. Areas identified in the Inner Harbor will not cause an impact because dredged materials will go to upland confined placement areas. Petroleum pipelines occur within the channel and will be relocated. No impacts to oil and gas wells are expected.

Historic Resources

All project impact areas have been evaluated for potential effects to historic properties including multiple marine remote-sensing surveys and diver assessments. The recommended plan will impact one significant historic property, the wreck of the SS *Mary* (41NU252) and mitigation will be done in coordination with the State Historic Preservation Officer. No terrestrial cultural resources will be impacted.

Air Quality

Minor, temporary impacts on air quality from the recommended plan would result during construction dredging activities while air quality from maintenance dredging and ship operations should be similar to those now occurring. Changes in air quality may occur due to the increase in traffic in the La Quinta Channel extension because of the proposed La Quinta Gateway Container Facility. This impact is not a

result of the recommended plan and is expected to occur regardless of the deepening and widening of the main channel.

Noise

Minor, temporary impacts to the noise environment from the recommended plan would result during construction while maintenance dredging activities should be similar to those now occurring. Noise is not expected to increase significantly.

Socioeconomic Resources

Implan Professional, a computer-based modeling program, was used to predict indirect and induced effects from the recommended plan. Industry and employment data from the Nueces and San Patricio counties was used in the analyses. No adverse effects to socioeconomic resources are expected to occur from the recommended plan but beneficial economic impacts are expected.

Cumulative Impacts

Nine past, present, and reasonably foreseeable future projects and their impacts upon the project area were evaluated. The cumulative impact assessment concluded that the recommended plan has a net positive environmental effect on the project area relative to the without project (existing CCSC).

Areas of Controversy and Unresolved Issues

A draft Fish and Wildlife Coordination Act Report (CAR) is under revision by the FWS and will not be ready for inclusion in this document. The Final CAR for this project is included with the FEIS. Other resource agencies submitted comments on the recommended plan and the beneficial uses sites discussed in the 50-year disposal plan.

Relationship to Environmental Requirements

The recommended plan is in full compliance with the environmental requirements applicable to this stage of the planning process. A discussion of the applicable laws can be found in Section 7.0 of the FEIS.

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