Attachment A – Project Description

PORT OF CORPUS CHRISTI AUTHORITY
CORPUS CHRISTI SHIP CHANNEL DEEPENING
NUECES AND ARANSAS COUNTIES, TEXAS

Project Description for Corpus Christi Ship Channel Deepening Project

Department of the Army Permit Application SWG-XXXX-XXXXX

Applicant: Port of Corpus Christi Authority

January 2019

Description for Corpus Christi Ship Channel Deepening Project

1.0 INTRODUCTION AND SUMMARY OF THE NATURE OF ACTIVITY

The Port of Corpus Christi Authority (PCCA) is requesting permit authorization from the U.S. Army Corps of Engineers (USACE) – Galveston District for the PCCA to conduct dredge and fill activities related to the deepening of a portion of the Corpus Christi Ship Channel (CCSC), hereinafter referred to as "the proposed project." The proposed project requires dredging in navigable waters of the United States to deepen the portion of the CCSC from Harbor Island into the Gulf of Mexico, an overall distance of approximately 12.8 miles (Station 54+00 to Station -620+00) as show on Sheet 2 of 17 of the permit drawings. The proposed project also involves the placement of fill (dredged material) in waters of the United States. Both of the proposed activities are regulated by the USACE.

The CCSC is currently authorized by the USACE to project depths of -54 feet and -56 feet mean lower low water (MLLW) from Station 54+00 to Station -330+00 as part of the Corpus Christi Ship Channel Improvement Project (CCSCIP). The current authorized width of the CCSC is 600 feet inside the jetties and 700 feet in the entrance channel. The proposed project would deepen the channel from Station 54+00 to Station -72+50 to a maximum depth of -78 feet MLLW (-75 feet MLLW plus two feet of advanced maintenance and one foot of allowable overdredge), and from Station -72+50 to Station -330+00, the channel would be deepened to a maximum depth of -80 MLLW (-77 feet MLLW plus two feet of advanced maintenance and one foot of allowable overdredge). The proposed project includes a 29,000-foot extension of the CCSC from Station -330+00 to Station -620+00 to a maximum depth of -80 MLLW (-77 feet MLLW plus two feet of advanced maintenance and one foot of allowable overdredge) to reach the -80-foot MLLW bathymetric contour in the Gulf of Mexico.

The proposed project is needed to accommodate transit of fully laden very large crude carriers (VLCCs) that draft approximately 70 feet. The deepening activities would be completed within the footprint of the authorized CCSC channel width. The proposed project does not include widening the channel; however, some minor incidental widening of the channel slopes is expected in order to meet side slope requirements and to maintain the stability of the channel. The proposed project including dredged material placement, is described below.

The following summarizes where information required by USACE Permit Engineering Form 4345 can be found in this attachment:

- Block 21, Type of Discharge – Section 1.1 discusses the amount and type of discharges anticipated to be generated by the channel improvements of the proposed action. Section 4 below provides details on the alternatives screening process, and Table 4.1 summarizes the new work dredge quantities and other attributes involved in the selection process, and of the proposed action.

- Block 22, Surface Area in Acres of Wetlands or Other Waters Filled – Section 3 describes the extent of the proposed affected waters, and summarizes potential impacts of the proposed action, and Table 3.1 summarizes the acreages of waters (associated with bay bottom impacted) proposed for excavation or fill.

- Block 23, Description of Avoidance, Minimization, and Compensation – Sections 4 and 5 describe the various channel and placement alternatives evaluated in the selection of the proposed action, as well as factors of avoidance and minimization of impacts to aquatic

resources where feasible involved in the selection process. Section 6 describes the mitigation or compensation proposed, as well as a summary of the aquatic impacts of the proposed action.

- Section 7 provides a short conclusion.

1.1 Proposed Project

To address changing market needs, the PCCA proposes to deepen the portion of the CCSC from Harbor Island (Station 54+00) into the Gulf of Mexico (Station -620+00) beyond the current authorized project depths of -54 feet and -56 feet MLLW to maximum depths of -78 feet and -80 feet MLLW to accommodate transit of fully laden VLCCs with drafts of approximately 70 feet. The overall project length is approximately 12.8 miles. The design depths are based on a detailed review of the dimensions of the VLCCs expected to call at the Port of Corpus Christi's (Port's) existing and proposed crude oil export terminals; the predominant density of crude oil to be exported and associated vessel drafts; environmental effects due to winds, waves and currents; and required under keel clearances, plus two feet of advanced maintenance and one foot of allowable overdredging depth. The proposed project does not include widening the channel, as the deepening activities would be completed within the footprint of the authorized CCSC channel width. However, some minor incidental widening would be expected to meet the side slope requirements of the deepened channel.

The proposed project consists of the following:

- Deepening from the authorized -54 feet MLLW to approximately -77 feet MLLW, with two feet of advanced maintenance and one foot of allowable overdredge, from Harbor Island at Station 54+00 into the Gulf of Mexico to Station -72+50.

- Deepening from the authorized -56 feet MLLW to approximately -80 feet MLLW, with two feet of advanced maintenance and one foot of allowable overdredge, from Station -72+50 to Station -620+00 in the Gulf of Mexico.

- The existing Inner Basin at Harbor Island would be expanded as necessary to allow VLCC turning there. This modification would also include a flare transition from the CCSC within Aransas Pass to meet the turning basin expansion.

The total length of the CCSC proposed for deepening is approximately 12.8 miles. The proposed project would generate an estimated 38.9 million cubic yards (MCY) of new work material from initial construction, consisting of approximately 39 percent clays (15.1 MCY) and 61 percent sand (23.7 MCY). The clay portion of the new work dredged material located in the offshore reaches (Station -620+00 to -72+50), approximately 13.8 MCY, would be placed at Offshore Dredge Material Disposal Site (ODMDS) No. 1 approximately located approximately 2.9 miles southeast of the Aransas Pass South Jetty and adjacent to the CCSC. The clay portion of new dredged material from Stations -72+50 to Station -54+00 would be used beneficial where possible to create perimeter dikes. Proposed placement options for the new work material are described in more detail in Section 1.2.

The total maintenance quantity is estimated at 1.083 MCY per year, which includes an incremental increase of approximately 0.39 MCY due to the channel deepening beyond the CCSCIP. The 10-year proposed action maintenance increment would be approximately 3.9 MCY. Dredged material from maintenance work would be placed in the existing ODMDS No. 1 in the vicinity of the CCSC, proposed offshore feeder berms B-1 through B-6, or existing PA 2, as material suitability allows. A screening of placement areas (PA) and beneficial use (BU) areas is detailed in Section 5.0. Maintenance materials for the CCSC are currently placed or are planned to be placed in the aforementioned existing PAs and

are routinely rotated between sites. ODMDS No. 1 and the proposed feeder berms B1-B6 are dispersive sites, and would be able to accommodate the project's relatively small incremental amount.

1.2 Proposed Dredged Material Placement Plan

The dredged material placement plan selected for this project proposes to place new work material in a series of existing upland PA and BU sites and proposed new BU sites to beneficially use the new work dredged materials (approximately 38.9 MCY) as much as possible, to expand either existing upland PAs or BU sites, and address shoreline repair needs within Redfish Bay, Corpus Christi Bay, and the Gulf of Mexico in the vicinity of the Preferred Channel Alternative. The plan is shown in Sheet 5 of 17. Detailed views and conceptual cross sections are provided in Sheets 6 through 17 of 17. This plan was a result of the screening and formulation of placement alternatives discussed in Section 5.0. Table 1.1 below summarizes the elements of the placement plan, each representing a singular type of placement. In all but the case of offshore feeder berms B1 through B6, each represents a single site and placement or BU initiative.

The plan predominantly involves (1) use of the approved existing offshore New Work ODMDS, (2) other PA or BU expansion at existing sites used by the PCCA and the USACE to maintain the authorized Federal Project (Corpus Christi Ship Channel Improvement Project) to an authorized depth of -54 to -56 feet MLLW, or (3) new habitat restoration sites located in Redfish Bay, Corpus Christi Bay, or nature center that were identified/confirmed by resource agencies as desirable. These sites would be readily available given the use by the Federal project, for which PCCA is the Non-Federal Sponsor (NFS), and the desire to repair Hurricane Harvey damage and long term erosion.

One exception is dune and shore restoration at San Jose Island (SJI). The site is privately owned by the Bass Family and the planning team is coordinating with their representatives to ultimately gain approval to beneficially restore the extensive damage caused by Hurricane Harvey once additional restoration design detail is developed. Currently, the representatives indicate they view the concept positively and will engage in a series of meetings and coordination in early 2019 with the planning team to advance towards acceptance of this BU initiative. Because it provides substantial placement capacity, is nearby, and could make use of the large volumes of sand in the channel new work prism to restore very important barrier island resources, it is retained in the placement plan. Because of this, more capacity was identified than needed to provide flexibility. Therefore, the bottom of Table 1.1 includes various scenarios for excluding SJI and comparing it to needed new work placement capacity. With SJI removed, there is excess placement capacity available at other BU and PA features in the unlikely scenario that SJI is ultimately excluded from the project.

Table 1.1: Selected New Work Placement Plan (See Sheet 5 of 17)

Placement Option	Description	Placement Capacity (CY)	Proximity to New Work Dredging Operations	Provides Environmental Benefit
M3	Estuarine/aquatic creation creation extension Pelican Island	4,328,400	Located approximately 6 miles from Harbor Island	This option will convert featureless bay bottom to approximately 330 acres of estuarine/aquatic habitat.
M4	Restoring historic land and marsh loss at Dagger Island	867,000	Located approximately 7 miles from Harbor Island	This option will restore eroding marsh habitat for native shorebirds and coastal wildlife. Design of project elements will be coordinated to support TPWD's existing permitted project.
M9	Estuarine/aquatic creation creation adjacent to PA9	3,500,000	Located approximately 8 miles from Harbor Island	This option will convert featureless bay bottom to approximately 329 acres of estuarine/aquatic habitat.
M10	Estuarine/aquatic creation adjacent to PA10	10,933,600	Located approximately 10 miles from Harbor Island	This option will convert featureless bay bottom to approximately 770 acres of estuarine/aquatic habitat.
PA6	2 foot dike raise and fill	3,704,900	Located approximately 4 miles from Harbor Island	This option does not create any environmental benefit.
SS1	Restoring eroded shoreline and armoring to protect Harbor Island seagrass area	1,682,000	Located approximately 3 miles from Harbor Island	This option restores an eroding shoreline to its historic profile.
SS2	Restore shoreline washout along Port Aransas Nature Preserve as a result of Hurricane Harvey	695,600	Located approximately 2 miles from Harbor Island	This option restores two washouts of shoreline along the Port Aransas Nature Preserve as a result of Hurricane Harvey.
PA4	Reestablish eroded shoreline and land loss behind PA4	3,020,000	Located approximately 2 miles from Harbor Island	This option does not create any environmental benefit.
SJI	Dune & shore restoration San Jose Island	7,000,000	Located directly next to Channel Dredging Operations	This option restores several miles of beach profile that was washed away as a result of Hurricane Harvey.
NW ODMDS	Place on part of New Work ODMDS	13,800,000	Located directly next to Channel Dredging Operations	This option does not create any environmental benefit.
B1-B6	Feeder berms offshore of SJI and Mustang Island	7,200,000	Located less than 10 miles from Channel Islands Dredging Operation	This option will nourish beach shoreline by natural sediment transport processes.
Scenarios for new work placement capacity provided and needed.		56,731,500	Total Capacity Provided	
		49,731,500	Total Capacity less SJI (should that option become unavailable)	
		38,926,000	Total NW placement capacity required for Channel Preferred Alternative – Base Option	
		10,805,500	Additional Capacity less SJI (should that option become unavailable)	

2.0 PURPOSE AND NEED FOR PROJECT

The purpose of the proposed project is to:

- Allow for more efficient movement of U.S. produced crude oil to meet current and forecasted demand in support of national energy security and national trade objectives,
- Enhance the PCCA's ability to accommodate future growth in crude oil movement, and
- Construct a channel project that the PCCA can implement to accommodate industry needs.

Currently, crude oil is exported using Aframax and Suezmax vessels. The Suezmax vessels are sometimes light loaded (lightered) due to depth restrictions in the existing CCSC, and would continue to be light loaded when the current federally-authorized CCSC deepening project is completed. Reverse lightering translates into additional vessel trips, cost, man hours, operational risk, and air emissions. To efficiently and cost effectively move crude oil cargo, oil exporters are increasingly using fully loaded vessels, including VLCCs. Non-liquid commodity movements are also trending toward larger, more efficient vessels. In order to fulfill its mission of leveraging commerce to drive prosperity in support of national priorities, the PCCA must keep pace with the global marketplace.

The need for the proposed project is driven by the considerations below, which are explained in the following paragraphs:

- Bolstering national energy security through the growth of U.S. crude exports.
- Protecting national economic interests by decreasing the national trade deficit.
- Supporting national commerce by keeping pace with existing and expanded infrastructure being modified or already under development to export crude oil resulting from the large growth in the Permian and Eagle Ford oil field development, which has helped the U.S. recently become the top oil-producing nation in the world.
- Improve safety and efficiency of water-borne freight movements.

The infrastructure and proximity to the major Texas shale plays makes the Port an attractive location for efficiently exporting crude oil by VLCC vessels. The PCCA has received interest from new and existing customers for developing crude oil export terminals and facilities. Production and export of crude oil and natural gas have greatly increased over the years and are providing an economic boom to the Port and the region.

Investments at the PCCA that are directly aimed at product from the Eagle Ford Shale are over $100 million. In the latter part of July 2018, the PCCA sold more than $216 million in bonds to fund energy export products. A portion of this money will be used for the authorized deepening of the CCSC, but also will help fund other improvements, including a crude oil export terminal under design at Harbor Island. The new oil export terminals being planned at the Port will have loading arms, handling equipment, storage tanks, and other related facilities for larger ships including VLCCs.

More efficient transport of crude in greater volumes is the impetus for the PCCA to deepen the channel to accommodate fully loaded VLCCs. Presently, the existing channel depth requires that current crude carriers, whether VLCCs or other vessels, not depart fully loaded from the Port, or that VLCCs remain offshore while smaller tankers transfer their cargo to the larger VLCCs, a process known as reverse lightering. The inefficiency of this process is compounded by some of these smaller vessels not being able to be fully loaded while moving through the Port.

Production from the Permian and Eagle Ford basins continues to increase, and several of the major midstream companies are currently undergoing major expansions to facilitate the export of greater

volumes of crude. As these exports increase, the number of lightering vessels and product carriers will also increase, adding to shipping delays and congestion inside and outside of the Port. These delays and congestion will increase the cost of transportation, which in turn will increase the cost of crude oil with the ultimate consequence of making U.S. crude less competitive in the global market.

3.0 SITE ANALYSIS

The proposed project is located in the Gulf of Mexico, the southern portion of Corpus Christi Bay, and Redfish Bay near Port Aransas as shown in Sheet 1 of 17. The Port is located in Corpus Christi Bay on the south-central portion of the Texas coast, approximately 200 miles southwest of Galveston and approximately 150 miles north of the mouth of the Rio Grande. The CCSC provides deep water access from the Gulf of Mexico to the Port via Port Aransas, through Corpus Christi Bay. The CCSC extends from deep water in the Gulf of Mexico approximately 4.3 miles offshore through the Port Aransas jettied entrance, then continues for 21 miles westward to the Inner Harbor. The proposed project would be constructed within the limits of the CCSC from the Gulf of Mexico to Harbor Island, which comprises the Entrance Channel segment and approximately 2,000 linear feet of the Lower Bay segment of the CCSC. The Entrance Channel segment of the CCSC is currently maintained to a depth of -49 feet MLLW, and the Lower Bay segment to a depth of -47 feet MLLW. The CCSC has been federally authorized to a depth of -56 feet MLLW from the Gulf of Mexico to the end of the jetties in the Entrance Channel segment, and to -54.0 feet MLLW in the Lower Bay segment. Dredging work to reach the authorized depths is scheduled to begin in early 2019.

3.1 Affected Waters

The proposed improvements to the CCSC would take place in the open water marine environment of the Gulf of Mexico and Corpus Christi Bay. Waters in the project area are navigable waters of the United States (WOUS) regulated by the USACE under Section 10 of the Rivers and Harbors Act of 1899. The areas of proposed channel deepening are unvegetated. Deepening of the CCSC would take place in WOUS, and the proposed improvements were detailed in Section 1.1 above, and were shown in Sheets 2 through 4 of 17. The estimated amounts of new work dredging and maintenance dredging were also listed in Sections 1.1 and 1.2. Similarly, waters occurring in the areas of proposed dredged material placement, whether for upland placement or for beneficial use, are also navigable waters of the United States (i.e. subject to the ebb and flow of the tide) regulated by the USACE. The channel amounts were determined using Computer Aided Design (CAD) and Geographical Information System (GIS) analysis with proposed channel widths and projected daylight lines (where channel template meets existing bathymetry) using the most current bathymetric data available from the USACE and surveyed for this project. The estimated amount of WOUS was 1,728 acres between the projected side slopes of the deepened channel. A summary of potential impacts of the channel WOUS including wetlands is summarized in Table 3.1.

For placement impacts, GIS features based on the proposed template extent using existing National Oceanic and Atmospheric Administration (NOAA) bathymetry and CAD analysis were used in conjunction with existing seagrass and oyster habitat mapping downloaded from NOAA, Texas General Land Office (TGLO) and Texas Parks & Wildlife Department (TPWD). The National Wetland Inventory (NWI) data was used to identify potential mapped wetland habitat. Open water acreage was derived using a land, shoreline and water data set sourced from ESRI and Texas Department of Transportation (TXDOT), which was found to match aerial imagery well. Habitat features were clipped using the placement footprints and review of the mapped habitat was conducted using a current ESRI aerial (2017) to verify the nature of mapped features. A summary of potential impacts of the placement plan to WOUS including wetlands, and other special aquatic sites is provided in Table 3.2. The comments in the table show individually the results of aerial review in examining the nature of the mapped habitat. In

several cases, the NWI identified features in an active PA. In others, the feature had eroded away. In various cases, the BU feature is a shoreline restoration that would protect resources in the interior of the BU feature, such as M4. The bottom of the table summarizes the acreage that after considering the aerial review would likely be impacted. For each impact at each site, measures that could minimize or replace the impacted habitat are identified.

Table 3.1: Channel Impacts to Gulf and Estuarine Bottom (See Sheet 2 through 4 of 17)

Channel Impacts to Waters of the U.S.		Channel Acres		
Segment	Impact	Toe to Toe	Total Including Side Slope	Side Slope Acreage
New Entrance Channel Extension	Deepening from natural depth (varies -62 ft to -80 ft MLLW) to -77 ft MLLW +2 ft adv. maint.+ 1 ft overdredge **(-80 ft MLLW)**	639.6	770.3	130.7
CCSCIP Authorized Entrance Channel Extension	Deepening from -56 ft MLLW to -77 ft MLLW + 2 ft adv. maint + 1ft overdredge **(-80 ft MLLW)**	160.7	272.4	111.7
Existing Channel	Deepening from -56 ft MLLW to -77 ft MLLW +2 ft adv. maint +1 ft overdredge (-80 ft MLLW) and from -54 ft MLLW to -75 ft MLLW +2 ft adv. maint +1 ft overdredge **(-78 ft MLLW)**	428.2	685.5	257.3
Turning Basin (area outside of the existing basin footprint) and Flare	Deepen portions of the Lydia Ann Channel from between -54 ft MLLW to **-75 ft MLLW**	36.1	-	-
TOTAL		1,265	1,728	

Table 3.2: Impacts to Tidal Marsh (See Sheet 5 of 17)

Site ID	Total Site Acres	Mapped Habitat					Open Water WOUS (acres)
		Wetland			Seagrass		
		Acres	Predominant Type	Comment	Acres	Comment	
B1	124.0	-	-	-	-	-	124
B2	124.0	-	-	-	-	-	124
B3	124.0	-	-	-	-	-	124
B4	124.0	-	-	-	-	-	124
B5	124.0	-	-	-	-	-	124
B6	124.0	-	-	-	-	-	124
M3	361.3	-	-	-	17.1	Restoration of larger area to create estuarine/aquatic habitat including elevations suitable for seagrass establishment.	361.3
M4	685.9	68.0	Estuarine and Marine Wetland	Interior wetlands would be avoided and placement to restore shoreline would be integrated with exterior wetlands. Design of project elements will be coordinated to support TPWD's existing permitted project.	559.0	Interior acreage would not be impacted except at fringes. BU feature would protect this from further loss. Design of project elements will be coordinated to support TPWD's existing permitted project.	554.7
M9	329	-	Estuarine and Marine Wetland	-	-	Restoration of larger area to create estuarine/aquatic habitat including elevations suitable for seagrass establishment.	329
M10	770	-	Estuarine and Marine Wetland	-	-	Restoration of larger area to create estuarine/aquatic habitat including elevations suitable for seagrass establishment.	770
NW_ODMDS	1,180.4	-	-	-	-	-	1,180.4
PA4	163.1	51.5	Freshwater Emergent Wetland	Identified within active PA or Feature appears to have eroded away	0.01	Minor Impact. BU would protect much larger seagrass area from future losses.	35.7
PA6	331.9	174.6	Lake	Identified within active PA	-	-	2.1

Site ID	Total Site Acres	Mapped Habitat					Open Water WOUS (acres)
		Wetland			Seagrass		
		Acres	Predominant Type	Comment	Acres	Comment	
SJI	265.7	512.2	Estuarine and Marine Wetland	Consists of entirely of shoreline to be restored	-	-	107.8
SS1	325	141.5	Estuarine and Marine Wetland	Would be replaced by created upland to protect seagrass area behind it from future loss	80.5	Restoration of shoreline to bolster against future erosion of much larger area of seagrass behind feature	134.9
SS2	94.8	36.5	Estuarine and Marine Wetland	Eroded away during Harvey	-	-	-
TOTALS	5,251.4	984.3			656.6		4,219.9
						Sum of all Habitats	**5,860.9**
Summary of Aerial Review of Mapped Habitat							
		262.6	Portion inside an active PA or eroded away		559.0	Portion in interior to be largely avoided except at fringes, and would be protected by proposed BU.	
		721.7	Portion not inside an active PA (WOUS)		17.1	Portion that BU can be reconfigured to replace impacted seagrass acreage	
		512.2	Portion to directly restore as beach or dune (SJI)				
		68.0	Portion avoided or that would be integrated (M4)				
		141.5	Portion that would be impacted		80.5	Remaining portion that would be impacted by SS1	
		141.5	Portion that would be directly impacted by BU feature (SS1)				
Sum of Estimated Wetlands, Seagrass, and Open Water WOUS that would be impacted							
						Wetland WOUS	721.7
						Seagrass WOUS	97.6
						Total WOUS	4,219.9

3.2 Threatened and Endangered Species

The U.S. Fish and Wildlife Services (USFWS) Information for Planning Conservation (IPaC) report identified 16 federally listed or proposed to be listed species that have the potential to occur within Nueces and Aransas Counties. According to TPWD, there are 36 state listed species that have the potential to occur within Nueces and Aransas Counties. The National Marine Fisheries Service (NMFS) lists 15 marine species with the potential to occur along the Texas Gulf Coast. Table 3.3 summarizes species that are listed as endangered, threatened, or candidate by USFWS, TPWD, or NMFS.

Of the federally-listed species, the following species are expected to have the relevant type of habitat present in the waters and aquatic habitat of Corpus Christi and Redfish Bays, and along the barrier islands of Mustang Island and San Jose Island, in the vicinity of the proposed project: Piping Plover (*Charadrius melodus*), Red Knot (*Calidris canutus rufa*), West Indian Manatee (*Trichechus manatus*) Green sea turtle (*Chelonia mydas*) Hawksbill sea turtle (*Eretmochelys imbricate*), Kemp's Ridley sea turtle (*Lepidochelys kempii*), Leatherback sea turtle (*Dermochelys coriacea*), and Loggerhead sea turtle (*Caretta caretta*)

In addition to the federally-protected species, the TPWD maintains separate county-specific lists of threatened and endangered species that may potentially occur as resident or migrant species in the project area. The TPWD protected species are listed in the following table. All species listed in the following table were compiled from USFWS and TPWD county-specific lists for Nueces and Aransas Counties. State-listed species with "rare" designation were not considered due to their non-regulatory status under the Endangered Species Act.

Table 3.3: Listed Threatened, Endangered, and Candidate Species for Nueces and Aransas Counties, TX

Common Name	Scientific Name	Listing Status		
		USFWS IPaC List	TPWD	NMFS
Amphibians				
Black-spotted newt	Notophthalmus meridionalis	NL	T	NL
Sheep frog	Hypopachus variolosus	NL	T	NL
South Texas siren (large form)	Siren sp 1	NL	T	NL
Birds				
American Peregrine Falcon	Falco peregrinus anatum	NL	T	NL
Eskimo Curlew	Numenius borealis	NL	E	NL
Least Tern*	Sterna antillarum	E	NL	NL
Northern Aplomando Falcon	Falco femoralis septentrionalis	E	E	NL
Peregrine Falcon	Falco peregrinus	NL	T	NL
Piping Plover	Charadrius melodus	T	T	NL
Red Knot	Calidris canutus rufa	T	NL	NL
Reddish Egret	Egretta rufescens	NL	T	NL
Sooty Tern	Onychoprion fuscatus	NL	T	NL
Texas Botteri's Sparrow	Peucaea botterii texana	NL	T	NL
White-faced Ibis	Plegadis chihi	NL	T	NL
White-tailed hawk	Buteo albicaudatus	NL	T	NL

Common Name	Scientific Name	Listing Status		
		USFWS IPaC List	TPWD	NMFS
Whooping Crane	Grus americana	E	E	NL
Wood stork	Mycteria americana	NL	T	NL
Fishes				
Opossum pipefish	Microphis brachyurus	NL	T	NL
Smalltooth sawfish	Pristis pectinata	NL	E	NL
Oceanic whitetip shark	Carcharhinus longimanus	NL	NL	T
Giant manta ray	Manta birostris	NL	NL	T
Mammals				
Gulf Coast Jaguarundi	Herpailurus yagouaroundi cacomitli	E	E	NL
Ocelot	Leopardus pardalis	E	E	NL
Red wolf	Canis rufus	NL	E	NL
Southern yellow bat	Dasypterus ega	NL	T	NL
West Indian Manatee	Trichechus manatus	T	E	NL
White-nosed coati	Nasua narica	NL	T	NL
Fin whale	Balaenoptera physalus	NL	NL	E
Sei whale	Balaenoptera borealis	NL	NL	E
Sperm whale	Physeter macrocephalus	NL	NL	E
Gulf of Mexico Bryde's whale	Balaenoptera edeni – subspecies	NL	NL	C
Corals				
Lobed star coral	Orbicella annularis	NL	NL	T
Mountainous star coral	Orbicella faveolata	NL	NL	T
Boulder star coral	Orbicella franksi	NL	NL	T
Elkhorn coral	Acropora palmata	NL	NL	T
Clams/Mollusks				
Golden Orb	Quadrula aurea	C	T	NL
Reptiles				
Green sea turtle	Chelonia mydas	T	T	T
Hawksbill sea turtle	Eretmochelys imbricata	E	E	E
Kemp's Ridley sea turtle	Lepidochelys kempii	E	E	E
Leatherback sea turtle	Dermochelys coriacea	E	E	E
Loggerhead sea turtle	Caretta caretta	T	T	T
Texas horned lizard	Phrynosoma cornutum	NL	T	NL
Texas indigo snake	Drymarchon melanurus erebennus	NL	T	NL
Texas scarlet snake	Cemophora coccinea lineri	NL	T	NL
Texastortoise	Gopherus berlandieri	NL	T	NL
Timber rattlesnake	Crotalus horridus	NL	T	NL
Plants				
Slender Rush-pea	Hoffmannseggia tenella	E	E	NL
South Texas Ambrosia	Ambrosia cheiranthifolia	E	E	NL

E = Endangered, T = Threatened, C = Candidate, DL - Delisted, NL = Not Listed
*Only needs to be considered for wind related projects within migratory route

Of the five turtle species that are listed by the NMFS and USFWS, only the Kemp's Ridley, green, and loggerhead sea turtles are likely to occur in bay waters in the vicinity of the proposed project area. The hawksbill and leatherback sea turtles are not likely to be found within the project area due to a lack of suitable habitats. Hawksbill sea turtles are unlikely to occur in the project study area, as they prefer clear offshore waters where coral reef formations are present. Leatherback sea turtles are unlikely to occur in the project study area, as they primarily inhabit the upper reaches of the ocean, and also frequently descend into deep waters from 650 to 1,650 feet in depth.

Critical habitat in the proposed project footprint is shown in Figure 3.2. Critical habitat for the loggerhead sea turtle (Sargassum habitat) was designated in 2014 for the offshore waters of the Gulf of Mexico (LOGG-S-2 Gulf of Mexico Sargassum) that includes an existing ocean dredge material disposal site (NW ODMDS) and 10.57 nautical miles of the outer channel and approach channel dredging segments. LOGG-S-2 Gulf of Mexico Sargassum critical habitat contains developmental and foraging habitat for young turtles where surface waters form accumulations of floating material, especially Sargassum.

Dredging operations for the proposed project would be conducted primarily using hydraulic cutterhead dredges, which move at slow enough speeds that turtles would be able to move out of the way of the hydraulic cutterhead. Non-hopper dredges are not known to take sea turtles.[1] It is anticipated that hydraulic dredging for the project would not cause adverse impacts to sea turtles.

Hopper dredging may be used for channel segments where material and placement is more suitable for hopper dredging. In those cases, material would be transported and placed by hopper dredge. The impact of hopper dredging is being determined in the Biological Assessment (BA) but is expected that impacts would not adversely affect loggerhead sea turtles that use critical habitat when Sargassum is present, following recent clarification to the 2007 Gulf of Mexico Regional Biological Opinion (GRBO) on hopper dredging.[2] The best management practices (BMPs) recommended in the GRBO would be employed when hopper dredging. Therefore, dredging associated with the proposed project is unlikely to have long-term negative effects on this species other than temporary displacement of individuals from the channel area, which would also be expected during regular maintenance dredging of the channel.

The proposed NW ODMDS may impact this critical habitat during the placement of dredged material; however, this ODMDS is already approved for use, and a 2016 NMFS memo clarified that any temporary turbidity plumes generated by dredged material placement would be unlikely to cause lasting impacts to Sargassum habitat or juvenile sea turtles that may be foraging in the area.[3]

Critical habitat for wintering piping plovers on the Texas Gulf Coast was designated by the USFWS in 2001 and was expanded to its current extent in 2009. Numerous factors determine critical habitat placement, including consistent winter occupancy, wetlands inventory data, habitat fragmentation, and availability of foraging, feeding, and roosting areas. Proposed PA SJI located on San Jose Island and SS2 located within Corpus Christi Bay (along the southern toe of the CCSC and adjacent to the Port

[1] NMFS. 2003. Endangered Species Act - Section 7 Consultation Biological Opinion – Dredging of Gulf of Mexico Navigation Channels and Sand Mining ("Borrow") Areas Using Hopper Dredges by COE Galveston, New Orleans, Mobile, and Jacksonville Districts (Consultation Number F/SER/2000/01287). National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southeast Regional Office, Protected Resources Division St. Petersburg, Florida

[2] NMFS. 2016. Roy E. Crabtree/NOAA Fisheries March 4, 2016 Memorandum to Alvin B. Lee, SES/USACE, South Atlantic Division, Subject: Continued Operations of Maintenance Dredging and Beach Sand Placement Actions under the 2007 Gulf of Mexico Regional Biological Opinion (GRBO)(I/SER/2015/17543).

[3] NMFS. 2016. Roy E. Crabtree/NOAA Fisheries March 4, 2016 Memorandum to Alvin B. Lee, SES/USACE, South Atlantic Division, Subject: Continued Operations of Maintenance Dredging and Beach Sand Placement Actions under the 2007 Gulf of Mexico Regional Biological Opinion (GRBO)(I/SER/2015/17543)

Aransas Nature Preserve) would impact designated final critical habitat. Both these proposed PAs experienced a significant amount of coastal erosion during Hurricane Harvey in 2017, and have been targeted for beach nourishment and beneficial use with this project.[4] Barrier island and beach erosion can be accelerated in the aftermath of large storm events[5]; therefore, preservation of this critical habitat is paramount in a time of increasing development and industrialization along the Texas Gulf Coast.

PA SJI is located almost entirely within critical habitat unit TX-15, designated as an essential feeding and foraging sparsely vegetated dune complex. Immediately behind and adjacent to PA SJI and TX-15 is a separate critical habitat unit, TX-16. TX-16 is composed primarily of tidal flats utilized by the piping plover for feeding and foraging. Although portions of the eroded foredunes within TX-15 may now operate as tidal flats, this habitat type is amply available within unit TX-16, which remained relatively intact despite the effects of Hurricane Harvey on other habitats along the coast. Restoring TX-15 to its former appearance and functionality will protect not only San Jose Island, but the function and durability of TX-16 as well.

PA SS2 along the southern toe of the CCSC and adjacent to the Port Aransas Nature Preserve would restore an eroded berm, originally composed of dredged material placed along the channel to combat vessel wake generated erosion. Hurricane Harvey and vessel wake from normal channel traffic have caused inflow into this tidal area at two locations, and placement of dredged material to shore up this berm would restore the channel shoreline to its former appearance and functionality. The U.S. Geological Survey (USGS) suggests that coastal areas that have demonstrated erosion after large storm events are more susceptible to erosion from normal tidal processes.[6] Fall or winter construction within PAs SJI and SS2 may temporarily displace wintering plovers from the area; however, the benefit of long-term habitat preservation of these areas accomplished by dredged material placement outweighs any negative short-term impacts that may result from construction.

As shown on the Figure 3.2, dredged material from maintenance work would be placed in the existing ODMDS No. 1 in the vicinity of the CCSC, proposed offshore feeder berms B-1 through B-6, or existing PA 2, as material suitability allows.

---

[4] Goff, J., Swartz, J.M., and S.P.S Gulick. 2017. An Outflow Event on the Left Side of Harvey: Erosion of Barrier Sand and Seaward Transport Through Aransas Pass. American Geophysical Union, Fall Meeting 2017. Available at: http://adsabs.harvard.edu/abs/2017AGUFMNH34B..01G

[5] Houser, C., Hapke, C., and S. Hamilton. 2007. Controls on coastal dune morphology, shoreline erosion, and barrier island response to extreme storms. Geomorphology. Vol 100:3-4. 18pp.

[6] Ibid

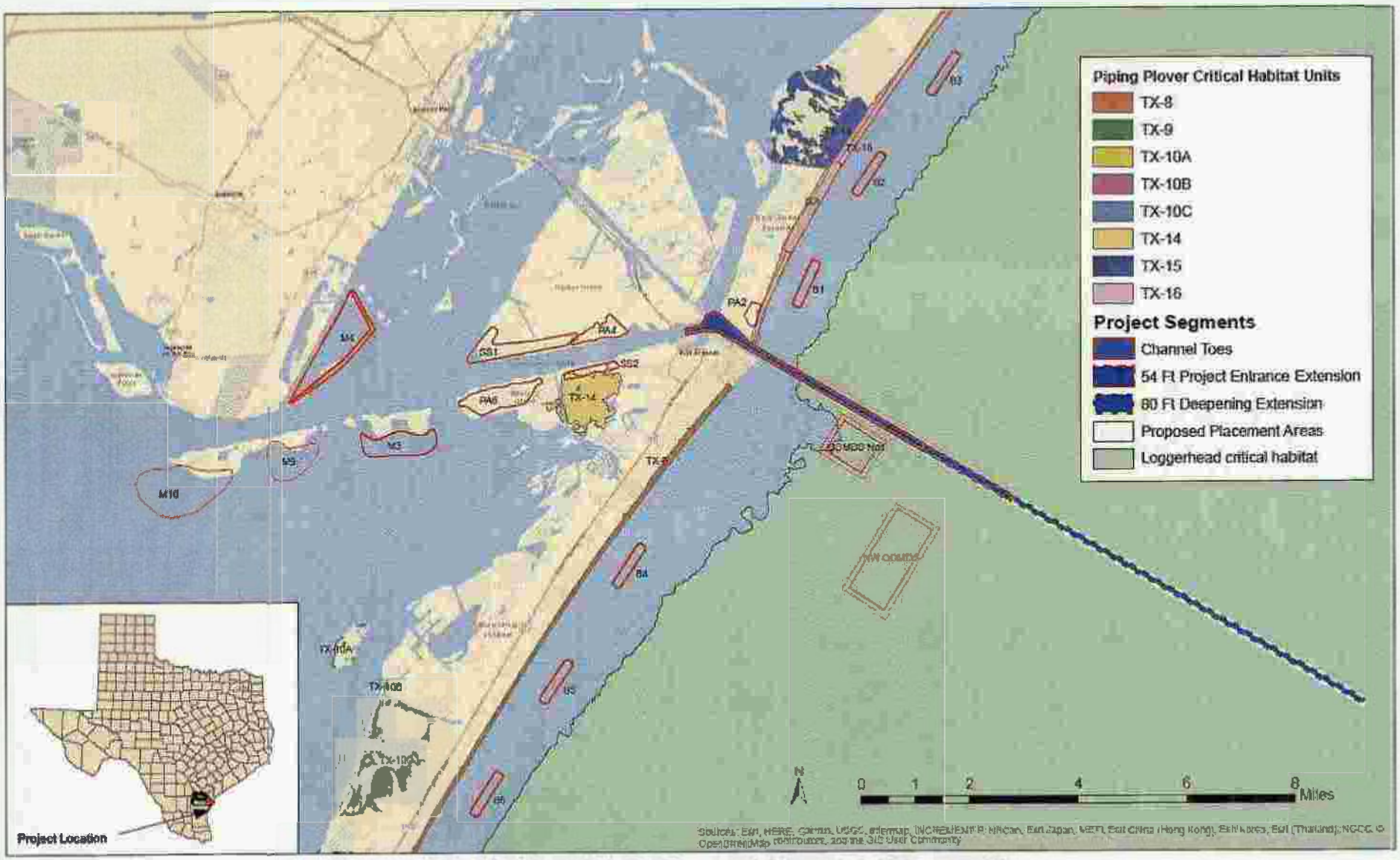

Figure 3.2: Critical Habitat within the Proposed Channel and Placement Areas

3.3 Cultural Resources

The majority of the proposed channel deepening project is within the footprint of the currently authorized channel bottom and side slopes. The exception is the extension of the entrance channel into the Gulf of Mexico to meet deeper Gulf contours. Some minor incidental widening of the channel slopes is expected to meet side slope requirements of the deepened channel. Previous cultural resources investigations conducted for the channel deepening project authorized in 2003 would apply to the proposed project.

A 2018 review of the Texas Archeological Sites Atlas (TASA) maintained by the Texas Historical Commission (THC), and the online National Register of Historic Places (NRHP) database maintained by the National Park Service revealed that multiple cultural resources have been documented within one mile of the proposed project. Of the 42 recorded archeological sites within the one-mile review area, only two sites were identified within the proposed project area. One site was determined to be ineligible for listing in the NRHP, and the other site was assessed as being not significant. No structures greater than 50 years in age, no cemeteries, and no historical markers were identified within the boundaries of the proposed project.

Seventy-two shipwrecks that have not been assigned archeological site numbers were identified within the project review area. Twelve of the identified shipwrecks were located within the boundaries of the proposed channel deepening and PAs; however, only two located east of Aransas Pass are classified as State Archeological Landmarks, which suggests that these two resources may be eligible for listing in the NRHP. Sixty-eight previously completed cultural resources investigations were identified within the project review area. Fourteen of the investigations overlapped portions of the proposed project, with most of these being marine archeological surveys that examined portions of the CCSC and/or Aransas Pass. Only minor portions of some of the dredged material PAs were included in the surveys.

4.0 PROJECT ALTERNATIVES FOR CHANNEL IMPROVEMENTS

4.1 Evaluation Criteria

Preliminary criteria were developed to evaluate how well initial alternatives fulfilled the purpose and need of the proposed project. The initial alternatives were screened using the following general criteria:

1) Increase Export Efficiency – Key factors that affected the ability to fully load vessels with crude oil due to constraints of the existing channel and authorized channel were considered. This included draft limitations along the CCSC segments between the Entrance Channel and Harbor Island. This criterion considered whether the alternative allowed a VLCC to move more fully loaded and whether it eliminated or reduced lightering. Lightering would be eliminated for vessels using Harbor Island and lightering would be reduced for vessels using docks at other locations within the CCSC system.

   Due to recent exponential growth in crude oil export, the Port of Corpus Christi has seen an increase in vessel tonnage. Several stakeholders' forecasts indicate that this trend will continue for a foreseeable future and beyond. As a result of PCCA's past investments in marine infrastructure and available capacity, PCCA has been capable of accommodating the recent historical shift in oil traffic from import to export. This trend is expected to continue as long as the Port's infrastructure allows it. There are concerns about future limitation to U.S. oil exports due to lack of or insufficient infrastructure capable of handling the export volumes. Lack of adequate infrastructure at U.S. ports including the Port Corpus Christi may lead to inefficient

shipping and ensuing crude price increase which may weaken the U.S.'s competitive edge (EIA 2018).

2) Ability to Serve Multiple Tenants – Part of the PCCA's mission is to meet the demand of commerce in the Coastal Bend region and throughout the world. To that end, PCCA plans its infrastructure to accommodate the needs of different stakeholders. PCCA has the ability to plan, fund, build and maintain marine infrastructures for common use such as navigation channels and dock infrastructure. PCCA owns and operates several public oil docks and bulk docks that are leased and used by different tenants. The ship channel is a common use infrastructure that is designed and operated to accommodate the different types of vessels used by PCCA's tenants. As cargo volume and vessel traffic increase, larger vessels are being used to improve shipping efficiency and reduce costs. To keep up with these trends, PCCA has undertaken several channel improvement programs. One is the dredging of the CCSC to a depth of 54-foot MLLW for which construction is imminent and will serve tenants all the way to the Inner Harbor. The other is this study to evaluate deepening up to the full depth required to accommodate fully loaded VLCCs. The terminal being planned by the PCCA at Harbor Island could be operated as a facility open for use to several users or companies. This criterion evaluates to what degree the alternative can benefit multiple tenants.

3) Flexibility to Accommodate Future Growth/ Expansion – This criterion considers the flexibility the alternative provides in being able to accommodate future growth in crude oil export tonnage and future growth in other sectors as well. Crude oil exports have exponentially increased in the last two years and are on pace to exceed the growth rate in 2018. Various long term projections predict much larger export tonnage if export infrastructure and the present bottlenecks in the supply chain end are improved. To that end, the ability to accommodate delivery from new crude export terminals or add capacity for exporting crude oil is important. In addition to crude oil, PCCA seeks to anticipate and be ready to accommodate all other future cargo needs and long term growth.

4) Minimize Environmental Impacts – All alternatives considered are located in the open waters of Corpus Christi Bay and the Gulf of Mexico. Therefore, environmental impacts would be limited to open water marine habitat and would primarily not involve terrestrial, wetland, or near-shore (tidal flats, beach, dunes etc.) impacts. Potential impacts to the marine environment are discussed below:

   Impact to Marine Habitats: Existing marine habitat mapping information including seagrasses, tidal wetlands, and oyster reef from TPWD, NOAA and TGLO were obtained and used to gauge the potential for impacts. As environmental marine field surveys were reviewed, preliminary site-specific habitat locations were identified. Because the channel will be constructed within the footprint of an existing channel, no new impact to undisturbed habitat would occur within that footprint. The incremental widening that may be required to maintain the recommended design slope would be minimal and would limit undisturbed habitat impacts.

   Other environmental impacts: Other environmental aspects that are considered for this criteria include potential impact of oil spills and air emissions from vessels and fuel transfer operations as described below. In conjunction with considerations of risk in #5 below, potential impacts to environmental resources considers the location of major habitat resources (coastal shore, seagrass etc.), climatic (e.g. prevailing wind), and spill response factors. Impacts on air emissions considers how the alternative reduces transit and loading emissions from what would occur during lightered crude oil transfer operations.

5) Risk, Safety and Security – Safety and security are primary concerns for all vessels operating at the Port of Corpus Christi. Safety and security concerns include risk and challenges associated with oil spills and ensuing responses, fire and fire suppression activities as well as worker safety as they relate to offshore and onshore operations. Security also considers vulnerability to challenges to physical and operational security such as sabotage, and vandalism. Vulnerability to weather related events including wave height, winds and hurricanes is considered as well.

6) Ability to Contribute to Beneficial Uses – PCCA's environmental precepts include a) wildlife habitat development, improvements, and replacement when modification to existing habitat is necessary, and b) environmental sustainability in the development of port facilities and in ongoing port operations. Although this is normally in the context of executing projects in a manner that restores resources from the impacts of a project, the ability to contribute to resource restoration as a result of project actions regardless of project impact can be considered also. Continuing the practice of considering and incorporating BU where practicable in managing dredged material of its channel projects, as was done in the currently authorized -54-foot project, is desirable. The ability to do this under a given alternative is considered for this criterion.

4.2 Initial Alternatives Considered

The existing channel dimensions and the authorized channel dimensions are summarized as follows. As of July 2018, the CCSC has a dredged depth of -47 feet MLLW and plans are currently underway to dredge the channel to the authorized -54-foot MLLW depth, which would constitute the "No-Action" condition for the proposed channel deepening project. The CCSC is also planned to be extended into the Gulf of Mexico by 1.4 miles to the -56-foot MLLW contour as part of the federally-authorized project. The width of the channel varies as follows: from the current outer limit of the dredged channel (in the Gulf) to the Port Aransas jetties, the CCSC Entrance Channel is -47 feet MLLW deep with a width of 700 feet, and is authorized to -54 feet MLLW with a width of 700 feet. From the jetties to Harbor Island, the CCSC Entrance Channel is 600-feet wide. The remainder of channel to the La Quinta Junction has a width of 500 feet and is authorized to a width of 530 feet. It was against the limitation of the existing and authorized channel dimensions that initial alternative concepts were developed.

Initial alternatives considered to meet the project purpose included deepening the existing channel and offshore options that pump crude oil from onshore storage to offshore loading facilities. There are two basic types of such facilities: the simpler offshore single point mooring (SPM) buoy system, and the larger, more complex offshore platform or terminal system. An SPM system consists of onshore storage tanks (i.e. above ground storage tank farm) and pumps connected to pipelines leading offshore and terminating at an offshore buoy. The buoy is anchored to the seafloor that has floating loading hoses and mooring lines for the VLCC to hook up to and conduct loading operations. An SPM-based system can be built to provide loading abilities to a few vessels by adding SPMs, but would potentially require multiple pipelines depending on pipeline size and onshore pump capacity. An offshore platform or terminal system similarly uses onshore storage and pumps like the SPM, but the pipeline terminates into a pile-driven platform with conventional manifolds, loading arms and pipe racks, often with berths for several vessels. It is more complex and expensive than SPMs but typically provides more loading capacity. For both these options, the SPM or platform would have to be located in sufficiently deep offshore waters to account for draft, under keel and sea state. This would be between 13 or more miles offshore of Corpus Christi Bay at minimum considering the design depth. The following were the initial alternatives considered:

- **Alternative A – No Action**. No channel improvements and maintaining the channel at its existing depth. This option is equivalent to continuing with lightering and reverses lightering operations to offload and top off large vessels including VLCC's.

- **Alternative B – Channel Deepening**. This alternative consists of deepening the CCSC to -80 feet MLLW from the Gulf of Mexico to Harbor Island, including the approximate 10 mile-extension to the Entrance Channel necessary to reach sufficiently deep waters. As a result of one-way transit assumed for VLCCs, the planned widths for the -54-foot MLLW currently authorized project are nominally sufficient. Therefore no widening other than the minor incidental widening to keep these bottom widths and existing channel slopes at the proposed deeper depths, would occur. Deepening would take place largely within the footprint of the currently authorized -54-foot MLLW channel. As discussed earlier, PCCA is studying the feasibility of developing an export terminal at Harbor Island. The Harbor Island terminal is being planned independently of this proposed deepening project. Therefore, there is a strong possibility that this terminal would be developed at Harbor Island to accommodate partially loaded VLCCs even if the deepening project were not implemented. It is assumed 2 to 3 berths would be built at Harbor Island, and existing VLCC berth plans at Ingleside would provide three berths. Under this alternative, light-loaded VLCCs at Ingleside would top off at Harbor Island rather than lightering.

- **Alternative C – Offshore Single Point Mooring (SPM) Facility**. This alternative is an SPM-based system consisting of constructing onshore storage facilities, shore-to-SPM pipelines, and a series of SPMs to load several vessels simultaneously. Conceptually, the onshore storage could be those that would be installed in any one of the marine terminal facilities at Harbor Island or Ingleside if they were converted to offshore delivery, or it could be a new location on other undeveloped property. For purposes of the initial screening, it is assumed 3 to 4 SPMs, and the requisite onshore storage, pumps, and pipelines would be built to load 3 to 4 VLCCs. This number is in the range of facilities built in past offshore terminal projects such as the Louisiana Offshore Oil Platform (LOOP), Iraq's Al Basra Oil Terminal (ABOT), and Bulgarian/Greek Burgas-Alexandroupolis SPM facilities (Trans-Balkan Pipeline B.V.). This alternative would be located somewhere between 13 to 15 miles offshore.

- **Alternative D – Offshore Platform**. This alternative would be similar to Alternative C, except it would be constructed as an offshore platform or terminal. With a more complex system of pile-driven structures and loading arms, it is assumed that pipelines, arms, and berths to service a minimum of 4 vessels simultaneously would be constructed. A four-berth terminal was the constructed capacity of the ABOT. Similar to Alternative C, this alternative would be located in the 13 to 15 miles offshore band, and conceptually could rely on pumping from existing/planned storage either at Harbor Island or Ingleside, or a new location.

4.3 Performance of Alternatives

Alternative A (No Action) would not meet the purpose of the project, as it would neither provide for the short term need to more efficiently export crude oil, or provide the Port the capacity to respond to long term changes and future economic growth. However, it is retained only for NEPA purposes to compare and contrast action alternatives.

Alternative B (Channel Deepening) does respond to both the short term and long term aspects of the purpose. It improves the efficiency of crude transport by enabling full loading of VLCCs and eliminating or reducing lightering, and provides a deeper channel that could accommodate vessels for other commodities should tenants, cargo, and shipping needs change. The existing or planned terminals

would provide more loading berths than the typical size of multiple point/berth offshore options, although offshore options that match the onshore berth numbers could be built at greater cost. The capacity to accommodate growth in crude is more flexible as new tenants or terminals can be developed on remaining water frontage near the channel. Onshore loading (as would be used in Alternative B) is generally faster due to the greater flow rates of loading arms achievable at onshore berths compared to pumping 13 or more miles to SPM loading hoses under Alternative C. Pumping and loading arms under Alternative D, offshore platform can be made to provide high capacity loading. Dredging approximately 38.9 MCY would be required for Alternative B within the existing channel and proposed extension. Most of the impact would occur in already deepened channel, and approximately 770.3 acres of undredged Gulf bottom would be dredged to provide the entrance extension. Benthic impacts would be temporary and benthic communities would be expected to recover within 1-2 years. No seagrass, wetland or oyster reef would be impacted. This option would provide ample material to beneficially use in the many seagrass, and shoreline, habitat sites impacted by Hurricane Harvey and long term erosion. The option could potentially reduce more than 485,000 metric tons (MT) of CO_2 emissions by eliminating or reducing reverse lightering when annual export rate averages additional 3.5 MMBPD. This option could reduce between approximately 38 and 112 tons of oxides of nitrogen (NO_x), and between 2,200 and 9,270 tons of volatile organic compounds (VOC), both USEPA criteria pollutants, depending on whether elimination of lightering at current (approximately 1.5 VLCCs/week serviced) or potential future export rates (4 to 8 VLCCs per week) is assumed.

Offshore Alternatives C (SPM) and D (Offshore Platform) do respond to the short term need of the purpose by enabling full loading of VLCCs and partially eliminating or reducing lightering. However, they are limited in responding to the longer term needs of future economic growth and changes in port tenants and shipping needs, because they are less flexible in accommodating different grades of crude due to pump distances and flushing that could be required to switch grades. The capacity to accommodate growth in crude would require building not only more onshore storage and pumps, but new pipelines and SPMs or platforms, which would tend to be more costly and difficult to add. These options could similarly reduce CO_2, NO_x and VOC emissions through lightering elimination or reduction, as Alternative B. However, more vessel hoteling and pumping emissions would be produced due to the offshore location. In contrast to Alternative B, for Alternatives C and D, offshore operations in the Gulf would present more safety and spill risk challenges. The main concern are proximity of these operations to sensitive receptors and coastal habitats such as the Padre Island National Seashore, San Jose Island, and the associated Kemp's ridley turtle nesting grounds and Piping plover critical habitat, and greater exposure to wind and wave climate of the open Gulf, which would make spill containment more difficult. These options would also be in a location where response times would be greater, and access by unauthorized personnel would be greater, again due to distance from the onshore location, further increasing the national security risk.

A summary of the initial screening of alternatives is provided in Table 4.1.

4.4 Screening and Selection of Channel Alternatives

The project alternatives were assessed using the screening criteria of increasing export efficiency, serving multiple tenants, accommodating future growth and expansion, and minimizing environmental impacts. The alternatives were compared with respect to their ability to meet the project need and purpose. Following the screening of possible action alternatives, the PCCA identified the No Action and the proposed channel deepening to Harbor Island as the alternatives to be evaluated for this project. The channel deepening project alternative would be completed primarily within the footprint of the existing CCSC, maintaining the same channel bottom width and necessitating only minor incidental widening to maintain the required side slopes. The proposed channel deepening alternative would meet the purpose and need of the project compared to the No Action alternative, as described below.

No Action Alternative: No channel improvements would be constructed and the existing channel would be maintained at its width and depth following the completion of the ongoing -54-foot deepening project. This alternative would not meet the need and purpose of the proposed project, as it would neither provide for the short-term need to more efficiently export crude oil, or provide the PCCA the capacity to respond to long-term changes and future economic growth. The No Action alternative is retained for comparison against the proposed action alternative.

Channel Deepening to Harbor Island: The action alternative would be the deepening of the CCSC to a depth of -80 feet MLLW (-77 feet MLLW plus two feet of advanced maintenance and one foot of allowable overdredge) from the Gulf of Mexico to Harbor Island. This alternative would meet the project need and purpose by supporting the efficient export of crude products from the Port through the elimination or reduction of reverse lightering operations. The channel deepening is proposed to be constructed primarily within the footprint of the existing CCSC. The incremental widening expected to be required to maintain the recommended design slope would be minor, and impacts to undisturbed habitat in the Gulf of Mexico would be limited.

The PCCA's environmental precepts include a) wildlife habitat development, improvements, and replacement when modification to existing habitat is necessary and b) environmental sustainability in the development of PCCA facilities and in ongoing port operations. The PCCA's goal is to execute projects in a manner that restores resources impacted by a project, and to contribute to resource restoration as a result of project actions even if the project impacts are minimal. The PCCA's practice is to consider and incorporate beneficial use activities where practicable in managing dredged material generated by channel projects.

Table 4.1: Alternative Performance

Screening Criteria	OPTIONS			
	Alternative A **No Action**	**Alternative B** **Channel Deepening Project**	**Alternative C** **Offshore SPM Facility**	**Alternative D** **Offshore Platform**
1) Increase Export Efficiency	• No increase in export efficiency. Inefficient lightering process, involving more vessel calls, transit, and longer VLCC loading process will still occur • Would involve light-loaded VLCC transit on lower 3rd of CCSC • Increase in congestion with future growth from more lightering vessels	• Lightering can be eliminated or reduced, decreasing vessel traffic and shortening the duration of VLCC loading process • Would still require VLCC transit on lower 3rd of CCSC, but elimination or reduction of lightering transit would free up channel availability for future growth. • Multiple tenant accommodation discussed below would allow more fully loaded VLCC participation, increasing efficiency for more exporters	• Lightering can be eliminated or reduced, thereby reducing vessels involved and shorten VLCC loading process • Would eliminate VLCC transit. • Exporting participants would be more limited than channel option, and exporting nonparticipants who couldn't fully load VLCCs would resort to smaller vessels or lightered VLCCs, leaving this congestion component in place as growth occurs. See multiple tenant and future growth discussion below.	• Same as SPM for all attributes except where noted
2) Ability to Serve Multiple Tenants	• No Change	• Port can operate VLCC berths as public docks, servicing multiple tenants and shipping lines, encouraging healthy competition and raising revenue for the Port and local communities. • Centralized and integrated land use planning of developable land assets at Harbor Island. • Loading of different grades from onshore terminals would be easier compared to offshore options	• Difficult to plan multiple offshore SPMs connected individually to individual tank farms. • Accommodating different grades from different customers would be more cumbersome, requiring flushing of longer lengths of line to switch grades, compared to onshore terminals.	• Same as SPM for all attributes except where noted
3) Ability to Accommodate Future	• No accommodation of future growth • Vessel draft limitations	• Local and regional economy is enhanced as revenues are collected for ships calling at	• Multiple single SPMs may need to be planned by the industry. Multiple permits	• Same as SPM for all attributes except where noted • Expansion of platform to add

Screening Criteria	OPTIONS			
	Alternative A No Action	Alternative B Channel Deepening Project	Alternative C Offshore SPM Facility	Alternative D Offshore Platform
Growth/Expansion	• Increased vessel traffic due to large increase in reverse lightening	and products moving through the PCCA. • Efficient use of capital to achieve growth and meet overall crude export forecast for the nation • Allows for future growth within the PCCA under a single permitting process for deepening the channel	required for each individual project. • Future expansion of offshore SPM facility more difficult to accommodate new users. Limited users can access the facility at any one time due to complex financing and project development challenges.	more users even more difficult and costly than SPM
4) Environmental Impact	• No habitat impact • Increase in air emissions due to increase from reverse lightering activities. • CO_2 emissions would be greater than other options due to continuing lightering activities	• Construction largely being undertaken within existing channel limits. • New entrance channel extension would temporarily disturb 770.3 acres of 60-ft deep Gulf bottom, convert it to deeper bottom, but benthos would recolonize within a year, and water column would remain. Amount of conversion to deeper bottom would be insignificant compared to available Gulf Habitat. • Dredged material will be evaluated for beneficial use and building resilient community. • Potential to reduce more than 485,000 MT of CO_2 emissions by eliminating or reducing reverse lightering when annual export rate averages additional 3.5 MMBPD.	• Puts active loading facility and new pipelines in previously undisturbed part of Gulf of Mexico. • Permanent but negligible size (compared to available Gulf Habitat) of conversion of Gulf bottom and water column to SPM platform • No potential beneficial use of dredged material • Similar potential to reduce CO_2, NOx, and VOC from eliminating or reducing lightering vessel emissions. • Spillages are more likely to happen and not as easily confined or cleaned up. • Potential for higher vapor emissions and higher CO_2 emissions from vessels hoteling due to reduced loading rates. • Tugs needed for hose tending and VLCC	• Same as SPM for all attributes except where noted • Permanent but negligible size of conversion of Gulf bottom and water column to SPM platform – larger than SPM, but still negligible

Screening Criteria	OPTIONS			
	Alternative A No Action	Alternative B Channel Deepening Project	Alternative C Offshore SPM Facility	Alternative D Offshore Platform
		• Potential to eliminate 38-112 tons annual NOx and 2,200-9,270 tons of VOC from elimination of some lightering activity • Enables faster loading rates than SPM, reducing CO_2 emissions from hoteling vessels. • Ability to provide vapor recovery system and shore power to operate vessel systems for reduced emissions.	positioning during loading will have to transit over 30 miles (assuming support facilities are home based at Port Aransas) from the CCSC to service the platform increasing air emissions generated. • No technically feasible method for providing vapor recovery of vapour combustion systems for reducing emissions.	
5) **Risk, Safety and Security**	• More vessels in Harbor will make monitoring harder	• Severity of accidental spills would be reduced compared to offshore options as facilities and vessels are in a more controlled Port environment. • Environmental accidents better controlled at onshore facilities in protected waters. • Comprehensive spill response would be quicker than offshore options due to proximity to response resources • Incidents at onshore terminal can be more easily contained to avoid affecting other users. • Risk of in-channel vessel incident or allision present, but would be reduced greatly by slow vessel speed, multiple tug assist, and one way transit when bringing VLCCs in the	• Damage to subsea pipelines or the platform will render the facility unusable until repaired. • Environmental conditions such as high winds, high waves, and strong currents can be designed for, however potential is there for conditions that could restrict use of the facility. • Avoids potential for in-channel vessel incident, but trades it for more risk of pipeline failures due to miles of multiple necessary pipelines. • Comprehensive spill response times to address environmental accidents longer compared to onshore terminals	• Same as SPM for all attributes except where noted

Screening Criteria	OPTIONS			
	Alternative A No Action	Alternative B Channel Deepening Project	Alternative C Offshore SPM Facility	Alternative D Offshore Platform
		Port. • Loading spill incident would be closer to Redfish Bay seagrass and marsh areas, but would not significantly expose National Seashore or San Jose Island beaches to impact – Prevailing SE winds directed towards terminal shore which would help containment – Tidal transport may vary however • Strong security presence within the port environment to protect against deliberate damage and sabotage.	• Loading spill incident would not significantly expose Redfish Bay seagrass and marsh areas to impact, but an offshore facility may be potentially expose National Seashore or San Jose Island beaches to impact depending on the location – Prevailing SE winds directed towards beaches which would hamper containment • More accessible by non-authorized persons; can lead to accidental damage, deliberate damage and sabotage. • Higher risk to human safety with offshore operations. • Response time to the facility by emergency services will be greater and more costly due to offshore location.	
6) Ability to Contribute to BU	• Beneficial use occurring under the -54 foot project would continue. As before, since there would be no change in dredging or other actions that could contribute.	• New work dredging would provide 38 MCY of varying sandy, clayey and some silty material some of which could be used for ecological or construction BU. Channel maintenance material could also be used long term for future BU such as restoring subsided or submerged marsh.	• Would require virtually no dredging, and therefore would not provide material that could be used to construct BU features.	• Would require virtually no dredging, and therefore would not provide material that could be used to construct BU features.

5.0 ATTEMPTS TO AVOID JURISDICTIONAL AREAS AND MINIMIZE WATER QUALITY IMPACTS

The proposed project would require the dredging of earthen material from the existing CCSC and from the bottom of the Gulf of Mexico to create a channel of sufficient depth to allow for the operation of VLCCs. Because the purpose of the proposed project is to deepen the current CCSC to reduce navigation inefficiencies associated with the current channel, the proposed channel improvements must occur in navigable waters of the U.S. Alternatives to achieve the need and purpose of the proposed project that would avoid jurisdictional waters of the U.S. are not available.

The proposed channel deepening activities represent the minimum impact to the Gulf of Mexico and Corpus Christi Bay to achieve the proposed project objective of increasing navigational efficiency of the CCSC. The proposed project alternative is the least environmentally damaging practicable alternative. This alternative meets the proposed project need and purpose with the least impact to the Gulf of Mexico and Corpus Christi Bay environments. The proposed depth and channel dimensions were optimized by taking several factors into consideration. First, world fleet registry data from IHS Fairplay was used to analyze and identify the appropriate target vessel dimensions (including draft) from the variation in size among the VLCC fleet to identify the majority of vessels expected rather than the maximum possible. Second, the fully loaded draft for the design vessel was calculated assuming the American Petroleum Institute gravity for West Texas Intermediate (WTI) crude oil, which will be the predominant controlling grade of crude oil exported from the Port of Corpus Christi. This was done in lieu of assuming the largest VLCC carrying the heaviest crude oil possible for this Port (heavy sour). Appropriate under keel clearance in consideration of sea state and climatic factors and guiding navigation standards (USACE and World Association for Waterborne Transport Infrastructure [PIANC]) was added. Ship simulation was accomplished in December 2018 at the Maritime Institute of Technology and Graduate Studies (MITAGS) to verify the depths and under keel clearances were navigable under a range of conditions. Therefore, the depth of the proposed deepening has been optimized. Another factor that will be considered under 33 U.S.C. Section 408 approval and coordination with USACE Operations is to use the steepest channel side slopes and narrowest bottom width allowable for one way passage. December 2018 ship simulation at MITAGS also examined alternate channel bottom widths for one way VLCC transit. This is also being coordinated with the USACE for acceptability under 33 U.S.C. Section 408 approval. If approved and possible, steeper side slopes and narrower bottom widths will be planned for implementation.

Dredged material generated from the project is proposed to be placed within an ODMDS adjacent to the CCSC, and, for material judged by the project engineer to be suitable, would be placed in several locations along the coast and within Corpus Christi and Redfish Bays for beneficial use. The new work and maintenance dredge material from the proposed project would be placed in an environmentally acceptable and economically feasible manner, considering technical and logistical feasibility. The section below describes the process of the identification and evaluation of the dredge material placement alternatives that meet these requirements and represent the least environmentally damaging practicable placement alternative(s).

5.1 Initial Placement Alternatives Considered

To help meet the planning objective of identifying practicable dredged material placement that considered engineering, economics and the environment, initial alternatives ranging from use of existing PAs and surrounding uplands, to potential beneficial use (BU) concepts were considered.

5.1.1 New Terrestrial Sites

New terrestrial sites are more constrained by available contiguous land and parcel size, easement and access across roads, properties etc. needed for hydraulic pipelines. During initial planning of the channel project, the project limits under consideration extended to the La Quinta Junction near Ingleside. Near Harbor Island, surrounding uplands are limited, as they consist of Mustang Island and San Jose Island. Mustang Island has no sizable contiguous tracts within 10 miles that are not developed or are not natural barrier island, State or National refuge/parks, or aquatic habitat. The preponderance of tracts is small waterfront parcels. San Jose Island is a privately owned island that is almost entirely undeveloped natural barrier island and beach. Along with the planned crude terminal, Martin Midstream, and Gulf Copper are located on Harbor Island at the channel entrance which leave no available tracts for placement of dredged material. Therefore, BU and offshore placement in this vicinity was planned.

The next nearest mainland with larger tracts of land is Ingleside, 8 miles farther in, where several crude oil export facilities are being planned on the land nearest water. Flint Hills Resources, OXY Ingleside Energy Center, Kiewit Offshore, Chemours, Oxychem, Ingleside Ethylene, Cheniere, and Voestalpine Texas are are existing facilities located along Ingleside. These limit upland placement options, and options to use material beneficially would be cost competitive due to the distance. Once the proposed channel project terminus was determined to be at Harbor Island, new terrestrial sites became even less likely to be cost effective or desirable. New upland sites would be less cost effective due to farther distances required to reach sizable contiguous tracts of land, could involve impacts to terrestrial wetlands, would require new property purchases, and routing and burial of temporary hydraulic pipelines across existing roads and properties. Depending on land elevation, pumping hydraulic pressure head limitations could be reached, which would force less cost effective transport by truck. These factors would complicate the usability and viability of terrestrial sites.

5.1.2 Initial Concepts

Therefore, initial planning focused on existing PAs and potential beneficial use, as new upland placement opportunities were limited. Initial BU concepts were generated by considering existing agency restoration plans such as TGLO's Texas Coastal Resiliency Master Plan, recent storm damage caused by Hurricane Harvey, and BU features implemented elsewhere on the Gulf Coast. Since the proposed action consists entirely of dredging the CCSC, practical limitations associated with placement of dredged material were a primary constraint. For dredged material placement, distance over which material must be pumped or transported by scow, required water depths for hopper or scow use, and access to stage and route hydraulic pipelines, all constrain where cost effective dredge material placement can be achieved. For hydraulic dredging, most cost effective dredging occurs within 5 miles, requiring one to multiple booster pumps beyond this distance, which rapidly diminishes the cost effectiveness. An initial cost effectiveness limit of 10 miles was considered. Use of hoppers and scows can achieve placement over greater distances, but this is primarily in water and requires minimum depths for vessel draft. These technological constraints factored in planning dredged material placement. The major component of dredging driving placement capacity needed is new work dredging to construct the Proposed Action. Initial planning focused on accommodating projected new work dredging volumes.

To help, further develop dredged material placement that considered environmental impact and BU opportunities, the Applicant conducted an initial agency coordination meeting held in Corpus Christi Texas on September 21, 2018 obtain the input of Federal, State and local resource agencies, including the USACE Galveston District. Representatives from the following agencies participated in the meeting

and provided input on the initial planned PA use and preliminary BUs concepts presented during the meeting:

- University of Texas Marine Science Institute (UTMSI)
- UTMSI/Mission-Aransas National Estuarine Research Reserve
- Coastal Bend Bays and Estuaries Program
- Texas Parks and Wildlife Department (TPWD)
- Texas General Land Office
- Natural Resources Conservation Services
- U.S. Army Corps of Engineers (USACE)
- U.S. Environmental Protection Agency (USEPA) Region 6
- U.S. Fish and Wildlife Service (USFWS)
- Texas Department of Transportation

At the time of conception of initial placement alternatives, the new work quantities considered the additional new work quantities generated from the proposed project used to devise placement concepts. Figure 5.1 below, depicts the initial concepts presented during the agency coordination meeting. These concepts represented general categories of placement alternatives and the general vicinity where they would be located. Agency input generated a few more smaller initiatives, but did not result in major new BU sites being identified. However some concepts were reinforced and better defined based on discussions with agency representatives about site specific information and their knowledge of the ecosystem of Corpus Christi and Redfish Bays. These concepts were then analyzed in consideration of agency feedback, further conceptual development and volumetric analysis, and more research on constraints and impacts. The initial evaluation considered cost, existing technology, and logistics in light of the navigation purpose of the Propose Action. Inherent in cost and existing technology was consideration of the aforementioned dredging method constraints, and inherent in logistics was consideration of needed placement capacities. The following synopsizes the initial concepts, evaluation, and initial screening.

5.1.2.1 Existing PAs for the Current Federally-authorized CCSCIP

The Applicant is the Non-Federal Sponsor for the authorized Federal project, and is therefore aware of commitments and long-term capacity of existing upland PAs required for the authorized project. The following uses for existing PAs were considered

- Use of existing capacity – Most of the existing PA capacity is dedicated to accommodating the new work dredging and 50-year maintenance of the Federally-authorized -54 foot project. Due to lack of uncommitted capacity, only two existing PAs were identified for use: PA4and PA6

- Expansion of existing PA – M3, M9, and M10 expand existing PAs by using dredged material beneficially. M3 would convert featureless bay bottom to approximately 330 acres of estuarine/aquatic habitat behind Pelican Island. M9 and M10 would convert featureless bay bottom to approximately 329 and 770 acres of estuarine/aquatic habitat behind PA9 and PA10, respectively.

5.1.2.2 Existing 54 foot project BU sites

Existing BU sites were examined for inclusion where possible. According to PCCA, only a handful of sites were available while others lack capacity especially with priority and consideration given to the

placement needs for the CCSCIP which is expected to be constructed over the next three years. Therefore, focus was shifted to expanded existing sites by adding adjacent estuarine/aquatic habitat features or dike raisings. Open-water, unconfined BU sites were avoided completely.

5.1.2.3 Bird Islands

Rookery islands or bird islands serve as nesting, breeding, foraging and rearing areas for these birds because they are isolated from the mainland and are too small to sustain populations of predators. Dredged material is often used beneficially to construct or restore bird islands.

A recent study identified several existing or new bird islands in Aransas and Nueces counties. However, most were too small in regards to capacity or sited too far (more than 15 miles away) from the project to make construction economically feasible especially with the revised project footprint. The few options that were within the preferred pumping distance were surrounded by seagrass.

5.1.2.4 Oyster Pads

Beneficially using dredged material as the pad to restore or create new for oyster reef was considered during initial planning. As identified in the TGLO's Texas Coastal Resiliency Master Plan, this option would provide vertical relief need for the restoration of oyster reefs. However, agency feedback indicated that the salinity in the area was not optimal for recruiting or supporting oyster growth.

5.1.2.5 Marsh Restoration at Mustang Island

Marsh restoration opportunities along the bayside of Mustang Island were examined during early planning. However, the area is too far away from the project to make construction economically feasible. Additionally, public feedback during open houses held in September 2018 indicated concerns regarding impacts to existing, established marsh habitat during construction.

5.1.2.6 13A New BU Site

Creating a BU feature similar to existing BU 6 was contemplated adjacent to the existing PA13. Once the project terminus changed to Harbor Island, this became a less favorable option due to distance. It was reconfigured in the second stage of placement plan development as a contingency upland extension to PA13.

5.1.2.7 New Work ODMDS

Use of the portion of this site for new work placement that is not being used by the -54 foot Federal Project was proposed. This site is a dispersive site, and Multiple Dump Fate (MDFATE) modeling was conducted to analyze the capacity for project use.

5.1.2.8 San Jose and Mustang Island Feeder Berms or Shoreline Repair

The project team reviewed recent aerials and LiDAR data on San Jose Island to determine that there was a substantial amount of repair for dune breaches and foreshore erosion. Similarly, the Texas General Land Office (TGLO) identified areas of both Mustang and San Jose Islands that have experienced historical receding at the rate of 2 feet or more per year. The large amount of sand that would be produced by the project could be used to repair or indirectly nourish these islands

5.1.3 Screening of Initial Concepts

Table 5.1 provides a summary of the screening of initial concepts. Some of these placement options have since been eliminated from further evaluation because of a change in project scope. The initial full built project, deepening the channel to La Quinta Junction, was eliminated from further consideration. The preferred alternative was determined to be deepening the channel to Harbor Island, a shorter reach, which requires less placement areas. As a result some of the concepts identified during the agency coordination meeting were also eliminated from further consideration. However, some of these were reconceived as different BU initiatives, such as expansion of existing PA and BU sites.

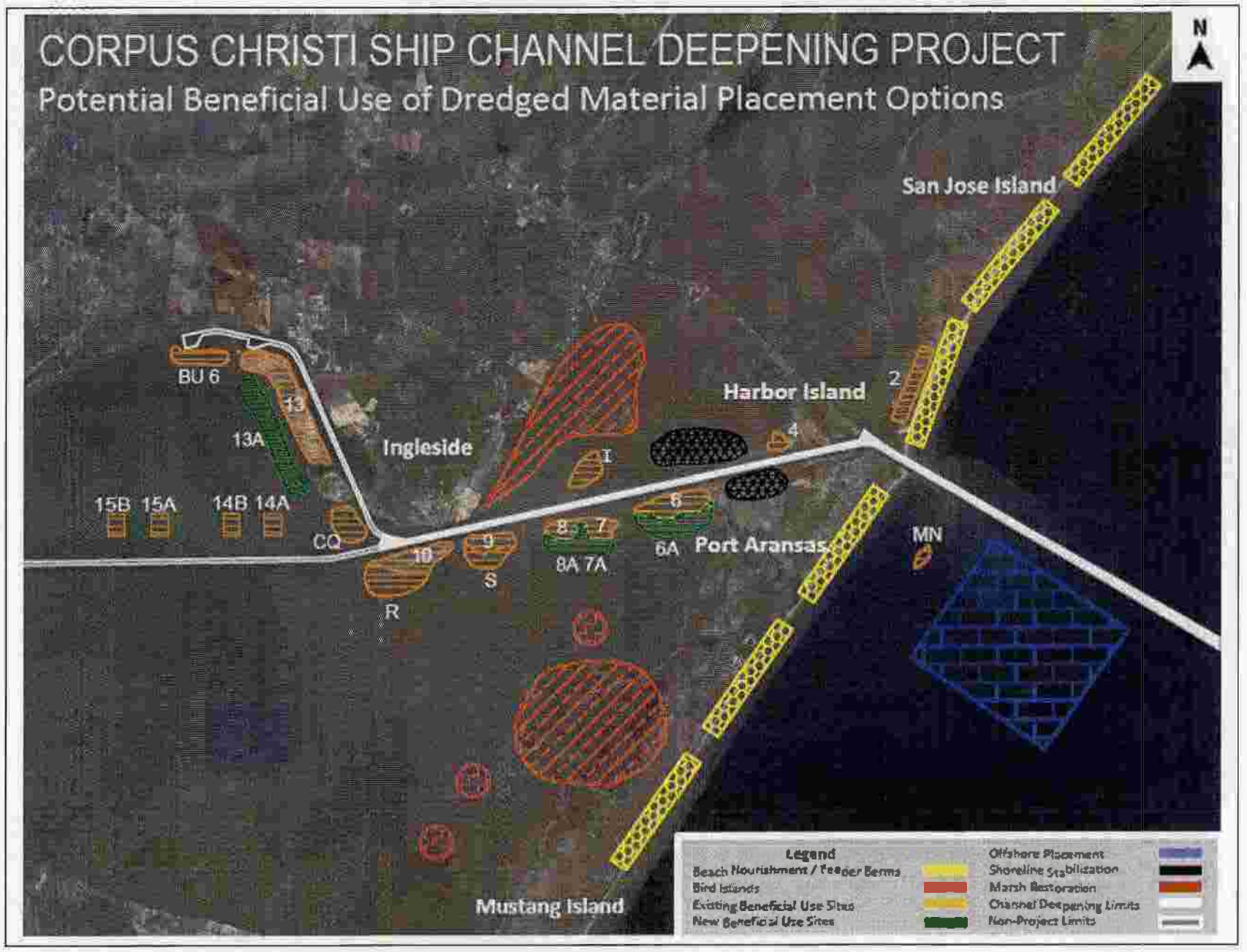

Figure 5.1: Initial Dredged Material Placement Concepts

Table 5.1: Initial Placement Area Screening

Concept	Logistics	Technology	Cost	Determination
New Terrestrial Upland Site	Too many issues involving infrastructure, distance, limited parcel size and availability	Pump distance and potential pumping constraints further inland	Logistics factors could make it costly to implement.	Eliminated
Existing PAs for the Current Federally-authorized -54 foot MLLW project	Limited available placement capacity	Feasible	Would be cost effective, but no capacity.	Eliminated for existing, but reconceived for expansion.
Existing 54 foot project BU sites	Limited available placement capacity	Feasible	Would be cost effective, but limited capacity.	Eliminated for existing, but reconceived for expansion.
Bird Islands	12 acre site size criteria limits capacity to place	Feasible	Would likely have higher unit implementation cost due to small size	Eliminated due to distance, and limited capacity
Oyster Pads	Distance from Harbor Island would be far.	Salinity in the area not cptimal	Rock for cultch recruitment surface could be a major expense	Eliminated
Marsh Restoration at Mustang Island	Public concerns about impacting existing habitat	Feasible	Cculd be cost feasible	Eliminated
13A new BU Site	Distance from Harbor Island is far.	Feasible	Distance would make it more costly	Eliminated, but reconceived as contingency upland expansion site
NW ODMDS	Channel adjacent. Good option.	Feasible	Near channel. Minimal construction. Would be cost effective	Advanced
San Jose and Mustang Island Feeder Berms or Shoreline Repair	Channel adjacent. Good option.	Feasible	Near channel. Minimal construction. Would be cost effective	Advanced

5.2 Placement Alternatives Evaluated Further

The initial alternatives that were advanced or reconceived were refined. Given the large amount of materials that could be beneficially used, especially the large volume of sand in one the of the channel segments, and proximity of some of the desirable BU options, it became clear, a mix of existing offshore, expansion of existing BU sites and the Gulf side BU initiatives would be a viable, cost effective approach. Of 11 initiatives further refined, 10 were BU features that aimed to achieve a variety of shoreline restoration, land loss restoration, marsh cell expansion, and Gulf-side shoreline initiatives. The following alternatives were developed.

- M3 – Creation of an estuarine/aquatic habitat extension at Pelican Island. This would bring the elevation of an extension at this BU site to an elevation suitable to restore either marsh or seagrass.
- M4 – Restoring historic land and marsh loss at Dagger Island. This is an ecosystem restoration measure included in USACE's Coastal Texas study and the TGLO Coastal Resiliency Master Plan. Design of project elements will be coordinated to support TPWD's existing permit for this project.
- M9 – Creation of an estuarine/aquatic habitat extension at PA9. This would bring the elevation of an extension at this BU site to an elevation suitable to restore either marsh or seagrass.
- M10 – Creation of an estuarine/aquatic extension at PA10. This would bring the elevation of an extension at this BU site to an elevation suitable to restore either marsh or seagrass.
- PA6 – Raising the existing dike by 2 feet and filling it with new work material at the existing PA6.
- SS1 – Restoring eroded shoreline and armoring to protect the very large seagrass area behind Harbor Island. This shoreline restoration is desired for a nature center located there.
- SS2 – Restoring a shoreline washout along the Port Aransas Nature Preserve as a result of Hurricane Harvey. Piping plover sand flat critical habitat located behind this breach would be protected again.
- PA4 – Reestablish eroded shoreline and land loss behind PA4. The shoreline has undergone major erosion over the last few decades, and if it continues, would eventually expose the Harbor Island seagrass area to erosion and loss.
- SJI – Dune & shore restoration at San Jose Island using new work sands to repair sever damage caused by Hurricane Harvey
- New Work ODMDS – Placement on part of the New Work ODMDS
- B1-B6 – Feeder berms offshore of SJI and Mustang Island that would be located within the active transport zone in front of the depth of closure, and indirectly nourish these barrier islands.

5.3 Applicant's Proposed Placement Plan

All the proposed options would be viable due to proximity, material volume capacity, and need for material to achieve ecological restoration. The large volume of sands indicates that material placement would be better used for BU restoration of important coastal resources that were damaged by Hurricane Harvey and experience continuing erosion. The availability of other new work material such as clays could opportunely be used to stem land losses that would expose sensitive habitats to continual erosion. These materials would be better used in these initiatives than in upland placement that avoids the marine environment and provides no benefit. All options were selected, with M9 and M10 providing extra capacities as a contingency for unavailability of SJI. Therefore, more capacity was identified to provide flexibility in the plan. Table 5.1 lists the selected placement plan elements.

Table 5.2: Selected New Work Placement Plan (See Sheet 5 of 17)

Placement Option	Description	Placement Capacity (CY)	Proximity to New Work Dredging Operations	Provides Environmental Benefit
M3	Estuarine/aquatic habitat creation adjacent to Pelican Island	4,328,400	Located approximately 6 miles from Harbor Island	This option will convert featureless bay bottom to approximately 330 acres of estuarine/aquatic habitat.
M4	Restoring historic land and marsh loss at Dagger Island	867,000	Located approximately 7 miles from Harbor Island	This option will restore eroding marsh habitat for native shorebirds and coastal wildlife. Design of project elements will be coordinated to support TPWD's existing permitted project.
M9	Estuarine/aquatic habitat creation adjacent to PA9	3,500,000	Located approximately 8 miles from Harbor Island	This option will convert featureless bay bottom to approximately 329 acres of estuarine/aquatic habitat.
M10	Estuarine/aquatic habitat creation adjacent to PA10	10,933,600	Located approximately 10 miles from Harbor Island	This option will convert featureless bay bottom to approximately 770 acres of estuarine/aquatic habitat.
PA6	2 foot dike raise and fill	3,704,900	Located approximately 4 miles from Harbor Island	This option does not create any environmental benefit.
SS1	Restoring eroded shoreline and armoring to protect Harbor Island seagrass area	1,682,000	Located approximately 3 miles from Harbor Island	This option restores an eroding shoreline to its historic profile.
SS2	Restore shoreline washout along Port Aransas Nature Preserve as a result of Hurricane Harvey	695,600	Located approximately 2 miles from Harbor Island	This option restores two washouts of shoreline along the Port Aransas Nature Preserve as a result of Hurricane Harvey.
PA4	Reestablish eroded shoreline and land loss behind PA4	3,020,000	Located approximately 2 miles from Harbor Island	This option does not create any environmental benefit.
SJI	Dune & shore restoration San Jose Island	7,000,000	Located directly next to Channel Dredging Operations	This option restores several miles of beach profile that was washed away as a result of Hurricane Harvey.
NW ODMDS	Place on part of New Work ODMDS	13,800,000	Located directly next to Channel Dredging Operations	This option does not create any environmental benefit.
B1-B6	Feeder berms offshore of SJI and Mustang Island	7,200,000	Located less than 10 miles from Channel Dredging Operations	This option will nourish beach shoreline by natural sediment transport processes.
Scenarios for new work placement capacity provided and needed.		56,731,500	**Total Capacity Provided**	
		49,731,500	**Total capacity less SJI** (should that option become unavailable)	
		38,926,000	Total NW placement capacity required for Channel Preferred Alternative – Base Option	
		10,805,500	Additional Capacity less SJI (should that option become unavailable)	

6.0 SUMMARY OF PROPOSED PROJECT IMPACTS AND MITIGATION FOR AQUATIC HABITATS

The majority of placement options involves BU to protect impacted resources, and would overall benefit seagrass, estuarine/aquatic habitats, and coastal habitats. The remaining impacts to seagrass or wetlands provided in Table 3.2 would be offset by reconfiguring these sites to be able to host the impacted habitat. As an example, at M3, part of the impacted seagrass could be offset by dedicating part of the created habitat to seagrass colonization, since planned elevations would be conducive to recruitment and establishment.

7.0 CONCLUSION

The PCCA understands that discharges into waters of the United States should not occur unless it can be shown that the discharge would not result in an unacceptable adverse impact on the aquatic ecosystem. It is also understood that if there is a practicable alternative to the discharge, the discharge should not occur. A practicable alternative is not available that would meet the proposed project requirements and achieve the project purpose. The proposed project would increase crude oil export efficiency for the Nation, reducing trade deficits, and fostering economic development. The result of the proposed action would be a more efficient channel to export crude oil. The proposed project meets the project purpose and need. The placement alternatives were developed in coordination with resource agencies, and considered public input during open house meetings at the start of the project. The resultant proposed placement alternatives make extensive use of BU to address ecological restoration needs that agencies desire. The volume of material and volume of sands are valuable assets, and the dredging and placement presents a unique and major opportunity to address restoration needs in this estuary and barrier island system.