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BRAZOS ISLAND HARBOR, TEXAS FINAL INTEGRATED FEASIBILITY REPORT—ENVIRONMENTAL ASSESSMENT

COMMUNICATION

FROM

THE ASSISTANT SECRETARY OF THE ARMY, CIVIL WORKS, THE DEPARTMENT OF DEFENSE

TRANSMITTING

THE DEPARTMENT'S BRAZOS ISLAND HARBOR, TEXAS FINAL INTEGRATED FEASIBILITY REPORT—ENVIRONMENTAL ASSESSMENT FOR JULY 2014.

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DEPARTMENT OF THE ARMY
OFFICE OF THE ASSISTANT SECRETARY
CIVIL WORKS
108 ARMY PENTAGON
WASHINGTON DC 20310-0108

FEB 22 2016

Honorable Paul Ryan
Speaker of the House of Representatives
U.S. Capitol Building, Room H-232
Washington, DC 20515-0001

Dear Mr. Speaker:

In response to a study conducted under the authority of a resolution by the Committee on Public Works, U.S. House of Representatives dated May 5, 1966, the Secretary of the Army supports the authorization and construction of the Brazos Island Harbor, Texas navigation project. The proposal is described in the report of the Chief of Engineers dated November 3, 2014, which includes other pertinent reports and information. The Secretary of the Army plans to implement the project at the appropriate time, considering National priorities and the availability of funds.

The project study was conducted to formulate navigation improvements to increase the economic efficiency of the main navigation channel at Brazos Island Harbor, Port of Brownsville. The recommended plan is not the National Economic Development (NED) plan; however, the analysis indicated that net excess benefits were still increasing with deeper channel dimensions. The recommended channel deepening plan is the deepest plan that the non-Federal sponsor would support due to financial constraints. Therefore, the recommended plan qualifies as a Categorical Exemption to the NED plan.

The recommended plan includes the least cost disposal plan which provides for dredged material disposal in the existing channel and in ocean placement sites, as well as placement of maintenance material from the Entrance and Jetty Channels and the first 11,000 feet of the Main Channel into a nearshore Feeder Berm off South Padre Island. The recommended plan includes the following elements:

a. The entrance and jetty channels would be deepened along 2.4 miles (Station -13+000 to 0+000) from -44 feet to a depth of -54 feet Mean Lower Low Water (MLLW). However, the deepening will require an extension of the entrance channel from -17+000 to -13+000 or 0.8 miles resulting in a total length of approximately 3.2 miles (from -17+000 to 0+000). This would provide an additional 2 feet of depth, beyond the interior channel depth, to allow for the effects of vessel pitch, roll, heave, and yaw occurring as a result of strong currents, waves, and wind.

b. The main channel would be deepened along 15.9 miles (Station 0+000 to 84+200), from -42 feet to a depth of -52 feet MLLW.

c. The main channel would continue to be maintained at the existing depth of -42 feet MLLW for 0.3 miles (Station 84+200 to 86+000), since there is no forecasted change in the design drafts of vessels using this portion of the channel in the future.

d. The main channel would continue to be maintained at the existing depth of -36 feet MLLW for 0.7 miles (from Station 86+000 to the end of the Turning Basin), as ships will have been light-loaded or unloaded before entering the basin.

Based on October 2015 (FY 2016) price levels, the estimated project first cost of constructing the general navigation features (GNF), is $207,508,000. The Brownsville Navigation District, acting as the financial representative for the Port of Brownsville, fully supports the recommended plan and is legally capable of fulfilling the requirements to be the non-Federal sponsor for construction for all features. Based on a GNF cost of $207,508,000, the estimated Federal and non-Federal shares of the project first cost are $117,691,000 and $89,817,000 respectively, as apportioned in accordance with the cost sharing provisions of section 101 of the Water Resources Development Act (WRDA) 1986, as amended. Accordingly, the Federal and non-Federal cost sharing is as follows: 1) The cost for GNF for deepening the channel from -42 to -45 feet is $55,748,000 and will be shared at the rate of 75 percent by the Federal government ($41,811,000) and 25 percent ($13,937,000) by the non-Federal sponsor; 2) the cost for the GNF for deepening the channel from -45 to -52 feet is $151,759,000 and will be shared at the rate of 50 percent each by the Federal government and the non-Federal sponsor ($75,880,000 each).

In addition to the estimated share of the total first costs of construction of the GNF, the non-Federal sponsor must pay an additional 10 percent of the cost of the GNF of the project in cash over a period not to exceed 30 years, with interest. The additional 10 percent payment without interest is estimated to be $20,751,000. The feasibility study does not include any crediting of the value of lands, easements, rights-of-way, or relocations (LERRs) as the land is 100% owned by the non-Federal sponsor and this value has already been credited with the previous project construction in 1986. In accordance with section 101 of WRDA 1986, as amended, if additional LERRs are necessary, the value would be credited toward this additional 10 percent payment. There are also associated costs of $47,994,000 that include non-Federal costs of $47,885,000 for improvements to berths and local service facilities and Federal costs of $109,000 for navigation aids (a U.S. Coast Guard expense). Finally, any incremental cost for a locally preferred placement of maintenance dredged material directly on St. Padre Island beach would be a 100 percent non-Federal cost.

Based on an October 2015 price level, an FY 2016 discount rate of 3.125 percent, and a 50-year period of economic analysis, the total average annual costs of the project are estimated to be $15,309,000, including annual operations and maintenance costs of $2,971,000. The average annual benefits of the project are estimated to be $20,720,000 with a resulting net benefit of $5,411,000. The benefit-to-cost ratio (BCR) is 1.4 to 1.

Section 6009 – Offshore Oil and Gas Fabrication of Ports of the Emergency Supplemental Appropriations Act for Defense, the Global War on Terror, and Tsunami Relief, 2005 (Public Law 109-13) provided that in determining the economic justification for navigation projects involving offshore oil and gas fabrication ports, the Secretary is directed to measure and include in the National Economic Development (NED) calculation, the value of future energy exploration and production fabrication contracts and transportation costs savings that would result from larger navigation channels. Therefore, in accordance with Section 6009, the report includes benefits based on the value of future energy exploration and production fabrication contracts that could result from larger navigation channels. While these are considered NED benefits under section 6009, the benefits have been broken out and presented separately from traditional NED benefits. The report addendum documents the estimated section 6009 average annual benefits based on annualized contract value for the -52-foot channel deepening (with no width increase), to be $70,287,000 at a 3.125 percent discount rate. When compared with the average annual cost of $15,309,000, net benefits are estimated to be $54,978,000 with a BCR of 4.6 to 1. When the benefits for both the traditional NED category and the section 6009 category are combined, annual benefits increase to $91,007,000 and when compared with the average annual project costs of $15,309,000, net benefits increase to $75,698,000 and the BCR increases to 6.0 to 1.

An Environmental Assessment (EA) was prepared in accordance with the National Environmental Policy Act. The recommended plan has been identified as the environmentally preferred plan. Adverse environmental impacts have been avoided and minimized where practicable. The EA resulted in a Finding of No Significant Impact (FONSI) to the environment, therefore, preparation of an Environmental Impact Statement is not required. The FONSI was signed by the Galveston District Engineer, on February 19, 2016.

An Independent External Peer Review (IEPR) of the Draft Integrated Feasibility Report-Environmental Assessment was conducted by the Battelle Memorial Institute and a final IEPR Report, dated March 4, 2014 was prepared. The IEPR comments related to plan formulation, vessel fleet analysis, benefits, dredging and sedimentation, risk and uncertainty, and the cumulative impacts of changes in air quality were resolved by expanding narratives throughout the report to support the decision-making process and justify the recommended plan. All comments have been addressed and incorporated into the final documents.

The Office of Management and Budget (OMB) advises that there is no objection to the submission of the report to the Congress. However, OMB also advises that Congress should be informed that the Administration is requesting the Corps to update the project's benefits and costs using the traditional NED method, after it completes all pre-construction engineering and design work on the project. A copy of OMB's letter dated February 11, 2016, is enclosed. I am providing a copy of this transmittal and the OMB letter to the Subcommittee on Water Resources and Environment of the House Committee on Transportation and Infrastructure, and the Subcommittee on Energy and Water Development of the House Committee on Appropriations. I am also providing an identical letter to the President of the Senate.

Very truly yours,

Jo-Ellen Darcy

Jo-Ellen Darcy
Assistant Secretary of the Army
(Civil Works)

Enclosures

9 Enclosures

1. OMB Clearance letter, dated February 11, 2016
2. Finding of No Significant Impact, dated February 19, 2016
3. Chief's Report, November 3, 2014
4. Letter from the Texas Commission on Environmental Quality, dated August 6, 2014
5. Letter of Sponsor support, Port of Brownsville, dated April 16, 20146.
6. Project Slides
7. Addendum to Brazos Island Harbor Feasibility Study Economic Appendix
8. Addendum #2 - Whitepaper BIH Thruster Removal Benefit Methodology
9. Final Integrated Feasibility Report and Environmental Assessment, July 2014, Brazos Island Harbor, Texas (CD)

EXECUTIVE OFFICE OF THE PRESIDENT
OFFICE OF MANAGEMENT AND BUDGET
WASHINGTON, D.C. 20503

February 11, 2016

The Honorable Jo-Ellen Darcy
Assistant Secretary of the Army (Civil Works)
108 Army Pentagon
Washington, DC 20310-0108

Dear Ms. Darcy:

As required by Executive Order 12322, the Office of Management and Budget has reviewed a July 2014 Army Corps of Engineers (Corps) feasibility report (report) that proposes to deepen the main channel of the Brazos Island Harbor project, which serves the Port of Brownsville, Texas, at a first cost of $252 million (October 2014 prices).

The report uses two different methods to estimate of the benefits of the project. The first of these methods is the traditional method of benefit-cost analysis, which focuses on changes in the net value of the national output of goods and services. This method measures the significant gains and losses to the overall economy and the environment, and uses these data to estimate the return to the Nation from a proposed investment.

Under this first method, the Corps estimated that the benefit-to-cost ratio for the project is 1.5 to 1 at a discount rate of 3.5%, which is the discount rate that the Corps is required to use for FY 2014 under section 80 of the Water Resources Development Act of 1974 to evaluate and formulate its proposed water resources projects. According to the Corps, the equivalent benefit-to-cost ratio is 0.8 to 1.0 at a 7% discount rate, which suggests the project may not provide a positive return from a National investment perspective at this time. This is the discount rate that the Administration uses in the Budget to measure the performance of Corps construction projects whose primary purpose is to provide an economic return to the Nation. We would like to work with you to ensure that in the development of future Corps reports, non-Federal sponsors are made fully aware of the basis upon which the Executive Branch evaluates projects.

In response to section 6009 of Public Law 109-13, the report also presents an alternative estimate of benefits. Under this assessment, the report counts the value of certain estimated amounts one company may be able to charge its customers under potential future contracts as a benefit of the Corps project. In our view, this valuation method does not provide an appropriate basis for estimating the net effects of a Corps project on the broader economy or the return from a national perspective.

The Office of Management and Budget does not object to your submitting this report to Congress. However, when you do so, please advise the Congress that the Administration will be requesting the Corps, after it completes all pre-construction design and engineering work on this project, to update the estimates of the benefits and costs of this project using the traditional method of benefit-cost analysis before determining whether to recommend funding to construct this project. In addition, should the Congress authorize this project for construction, the project would need to compete with other proposed investments for funding in future budgets. We anticipate future Budgets will continue to be limited to investments that demonstrate a high return to the Nation.

Sincerely,

John Pasquantino
Deputy Associate Director
Energy, Science, and Water

Finding of No Significant Impact

BRAZOS ISLAND HARBOR
CHANNEL IMPROVEMENT PROJECT
FEASIBILITY STUDY

February 2016

The U.S. Army Corps of Engineers, Galveston District (Corps), has conducted an environmental analysis in accordance with the National Environmental Policy Act of 1969, as amended. The Corps assessed the effects of the following actions in the Final Integrated Feasibility Report and Environmental Assessment, dated July 2014, for the Brazos Island Harbor Channel Improvement Project, which is incorporated herein by reference:

- The Entrance and Jetty Channels will be deepened to a depth of 54 feet mean lower low water (MLLW) from station –17+000 to station 0+000 and the Entrance Channel will be extended 4,000 feet farther into the Gulf of Mexico; the actual dredging depth will be up to 4 feet deeper in the Entrance and Jetty Channels due to 2 feet of advance maintenance (AM) and 2 feet of allowable overdepth (AO);
- The Main Channel will be deepened to a depth of 52 feet MLLW from station 0+000 to station 84+200; no channel widening is proposed; the actual dredging depth will be up to 3 feet deeper in the Main Channel due to 2 feet of AM and 1 foot of AO;
- No deepening is proposed from station 84+200 to the end of the Turning Basin at station 89+500;
- New work and maintenance material will be distributed among the existing New Work Ocean Dredged Material Disposal Site (ODMDS), an existing nearshore Feeder Berm and existing upland, confined placement areas (PAs) 2, 4A, 4B, 5A, 5B, 7, and 8; maintenance material from the Entrance and Jetty Channels may be placed in the Maintenance ODMDS if the nearshore Feeder Berm is unavailable; construction to raise upland PA containment dikes to heights needed to accommodate new work and maintenance quantities will be done within the footprints of the existing PAs;
- The exterior toes of the PA 4A and 4B dikes will be armored on the side facing the channel from station 22+000 to station 33+800.

In addition to the "no action" alternative, three alternatives with varying scales of channel deepening were evaluated in the final screening, including the recommended plan. It is not known if the recommended plan is the National Economic Development

(NED) plan because the net excess benefits were still increasing with deeper channel dimensions and a deeper alternative was not included in the final screening. However, the recommended plan is the most cost effective plan and the deepest channel dimension that the non-Federal sponsor will support at this time. The recommended plan is the environmentally-preferred alternative. All practicable means to avoid and minimize adverse environmental effects have been incorporated into the recommended plan. The recommended plan will not result in any impacts to federally-listed threatened or endangered species or their designated critical habitat, will have no impact to sites listed on or eligible for inclusion on the National Register of Historic Places, will not affect any wetlands or water of the U.S., nor any important wildlife habitat, and is consistent with the goals and policies of the Texas Coastal Management Plan. Therefore, no compensatory mitigation is required.

Technical and economic criteria used in the formulation of alternative plans were those specified in the Water Resource Council's 1983 Economic and Environmental Principles for Water and Related Land Resources Implementation Studies. All applicable laws, executive orders, regulations, and local government plans were considered in the evaluation of the alternatives. It is my determination that the recommended plan does not constitute a major federal action that would significantly affect the human environment; therefore, preparation of an Environmental Impact Statement is not required.

19 FEB 2016
Date

RICHARD P. PANNELL
Colonel, EN
Commanding

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

DAEN

03 NOV 2014

SUBJECT: Brazos Island Harbor Channel Improvement Project, Texas

THE SECRETARY OF THE ARMY

1. I submit for transmission to Congress my report on navigation improvements for the Brazos Island Harbor (BIH) Channel Improvement Project, Texas. It is accompanied by the report of the district and division engineers. This report is an interim response to a resolution of the Committee on Public Works, U.S. House of Representatives, dated May 5, 1966. The committee authorized USACE to conduct a study of BIH, Texas, to determine whether the project should be modified in any way, particularly with a view to widening and deepening the existing channels. Additionally, the Emergency Supplemental Appropriations Act for Defense, the Global War on Terror, and Tsunami Relief, 2005 (P.L. 109-13), Section 6009, "Offshore Oil and Gas Fabrication Ports", provided that in determining the economic justification for navigation projects involving offshore oil and gas fabrication ports, the Secretary is directed to measure and include in the National Economic Development (NED) calculation the value of future energy exploration and production fabrication contracts and transportation cost savings that would result from larger navigation channels. Preconstruction engineering and design activities for this proposed project, if funded, would be continued under the 1966 authority. The existing BIH 42-foot navigation project was authorized by the Water Resources Development Act (WRDA) of 1986 (P.L. 99-662) and construction was completed in 1996.

2. The reporting officers recommend authorizing a plan that will contribute significantly to the economic efficiency of commercial navigation in the region. The recommended plan includes channel deepening along a majority of the channel length with no widening. Since the recommended plan would not have significant adverse effects, no compensatory mitigation measures (beyond minimization and avoidance) would be required. The feasibility report did not identify a NED Plan; however, the analysis indicated that the net excess benefits were still increasing with deeper channel dimensions. The recommended channel deepening plan is the deepest plan that the non-federal sponsor would support due to financial constraints. Therefore, the recommended plan is a Categorical Exemption to the NED Plan. All project features are located in the State of Texas.

3. The Brownsville Navigation District, acting as the financial representative for the Port of Brownsville, is the non-federal cost sharing sponsor for all features. Based on October 2014 price levels, the estimated total project cost of the plan is $204,587,000 for deep-draft navigation.

DAEN
SUBJECT: Brazos Island Harbor Channel Improvement Project, Texas

In addition, there are non-federal associated costs of $47,257,000 for the dredging of berthing areas to include construction of Placement Area (PA) capacity associated with third party use and development of other local service facilities and federal associated costs of $108,000 for aids to navigation. Total project implementation costs including the associated costs are $251,952,000. The federal share of the total project implementation cost would be about $116,116,000 and the non-federal share would be about $135,836,000.

4. The reporting officers recommend a plan to modify the existing BIH Channel. No widening of the BIH Channel is proposed. The recommended plan consists of the following improvements:

a. The entrance and jetty channels from Station –17+000 to 0+000 would be deepened from 44 feet to a depth of 54 feet Mean Lower Low Water (MLLW). This provides an additional 2 feet of depth, beyond the interior channel depth, to allow for the effects of vessel pitch, roll, heave, and yaw occurring as a result of strong currents, waves, and wind.

b. From Station 0+000 to 84+200, the channel would be deepened from 42 feet to a depth of 52 feet MLLW.

c. From Station 84+200 to 86+000, the existing channel depth of 42 feet MLLW would be maintained since there is no forecast change in the design drafts of vessels using this portion of the channel in the future.

d. The channel would continue to be maintained at the existing depth of 36 feet MLLW from Station 86+000 to the end of the Turning Basin, as ships will have been light-loaded or unloaded before entering the basin.

5. Dredged material placement for this project would be provided in accordance with the Dredged Material Management Plan (DMMP) developed during the study that identified the least cost base plan for placement of dredged material. Deepening the BIH Channel would generate approximately 14.1 million cubic yards of new work material and 61.7 million cubic yards of maintenance material over the 50-year period of economic evaluation. New work material will be placed in the new work Ocean Dredged Material Disposal Sites (ODMDS) and the existing PAs. Maintenance material from the entrance and jetty channels and the first 11,000 feet of the main channel would be placed offshore in a nearshore feeder berm. If for some reason the feeder berm could not be used, this reach of maintenance material could be placed in the maintenance ODMDS. Material from the inland reaches would be placed in existing confined, upland PAs adjacent to each reach. No horizontal expansion of existing upland sites would be required.

6. The estimated total project first cost of constructing the project is $204,587,000 based on October 2014 price levels, which includes $204,582,000 for channel modification and dredged

material placement and $5,000 for the non-federal sponsor's provision of lands for the project. There are no costs for fish and wildlife mitigation expected for this project and no cultural resource mitigation costs are expected at this time. Additionally, there are no utility relocations expected with this project. This estimated first cost includes a federal cost of $116,008,000 and a non-federal cost of $88,579,000, as apportioned in accordance with the cost sharing provisions of Section 101 of WRDA 1986, as amended. This results in a blended cost sharing as follows:

a. The costs for the deepening of the channel from 42 to 45 feet will be shared at the rate of 75 percent by the government and 25 percent by the non-federal sponsor. Accordingly, the federal and non-federal shares of the estimated $54,872,000 cost in this zone will be approximately $41,150,000 and $13,722,000, respectively.

b. The costs for the deepening the channel from 45 to 52 feet will be shared at the rate of 50 percent by the government and 50 percent by the non-federal sponsor. Accordingly, the federal and non-federal shares of the estimated $149,715,000 cost in this zone will be approximately $74,858,000 and $74,858,000, respectively.

c. Additional 10 Percent Payment. In addition to payment by the non-federal sponsor for its share of the total first costs of construction of the general navigation features (GNF) as estimated and described in sub-paragraphs 6(a) and 6(b) above, the non-federal sponsor must pay an additional 10 percent of the cost of the GNF of the project in cash over a period not to exceed 30 years, with interest. The additional 10 percent payment without interest is estimated to be $20,459,000. There is no crediting of the value of lands, easements, rights-of-way, and relocations (LERRs) provided by the non-federal sponsor because this value has already been credited with previous project construction.

d. Operations and Maintenance (O&M) Costs. The additional annual cost of O&M for this recommended plan is estimated at $2,971,000. In accordance with Section 101(b) of WRDA 1986, as modified by Section 2102(b) of the Water Resources Reform and Development Act (WRRDA) of 2014 (P.L. 113-121), the non-federal sponsor will be responsible for an amount equal to 50 percent of the excess of the cost of the O&M of the project over the cost which would be incurred for O&M of the project if the project had a depth of 50 feet. Dike raising for the maintenance will be cost shared as O&M costs, with the costs for dike raising associated with deepening the channel from 42 to 50 feet being a 100 percent government expense and the costs associated with deepening from 50 to 52 feet being shared at the rate of 50 percent by the government and 50 percent by the non-federal sponsor. Costs for dike raising for dredging of berthing areas and development of other local service facilities is 100 percent a non-federal sponsor responsibility. The federal share for the annual cost attributable to O&M is $2,674,000 and the non-federal sponsor is responsible for $297,000.

e. Associated Costs. Estimated total project associated costs of $47,365,000 include non-federal costs of $47,257,000 associated with dredging of berthing areas to include construction of PA capacity associated with third party use and development of other local service facilities and associated federal costs of $108,000 for navigation aids (a U.S. Coast Guard expense).

f. Section 902 Calculation. For the purpose of calculating the maximum cost of the project pursuant to Section 902 of WRDA 1986, as amended, the total estimated project first cost is $204,587,000 which consists of an estimated federal share of $116,008,000 and an estimated non-federal share of $88,579,000. As explained in paragraph 6, above, the total estimated first cost for this purpose includes the estimates for GNF construction costs, any value of LERRs provided under Section 101(a)(3) of WRDA 1986, as amended.

7. Based on October 2014 price levels, a discount rate of 3.375 percent, and a 50-year period of economic analysis, the project average annual benefits and costs for the BIH improvements are estimated at $20,599,000 and $13,896,000, respectively, with a resulting net benefit of $6,703,000 and a benefit-to-cost ratio (BCR) of 1.5 to 1. Using the allocable benefits described in the Emergency Supplemental Appropriations Act for Defense, the Global War on Terror, and Tsunami Relief, 2005 (P.L. 109-13), Section 6009, "Offshore Oil and Gas Fabrication Ports", resulted in project annual benefits of $90,871,000, net benefits of 76,975,000 and a BCR of 6.5 to 1.

8. Risk and uncertainty were evaluated for economic benefits, costs, and sea level rise. Economic sensitivity analyses were conducted to determine the sensitivity of projected benefits to changes in key assumptions, such as commodity tonnage, fleet distribution, and other various growth rates. In accordance with the USACE Engineering Circular 1165-2-212, Sea-Level Change Consideration for Civil Works Programs, the study details the analysis performed to identify potential sea level rise rates. Low, intermediate, and high projections of relative sea level rise (RSLR) at the end of the 50-year period of analysis are estimated to be 0.63 feet, 1.06 feet, and 2.40 feet, respectively. The historic average rate for the project area is about 1.26 feet per 100 years. In general, RSLR (low, intermediate, and high) will not affect the function of the project alternatives. Upland PAs would be armored to withstand the effects of rising sea levels and the cost of this armoring is included in the total project cost estimate. Minor impacts in the project vicinity would likely occur due to RSLR, but not as a consequence of the proposed project.

9. In accordance with the USACE Engineering Circular on review of decision documents, all technical, engineering, and scientific work underwent an open, dynamic, and vigorous review process to ensure technical quality. This included an Agency Technical Review (ATR), an Independent External Peer Review (IEPR), and a USACE Headquarters policy and legal review. All concerns of the ATR have been addressed and incorporated into the final report. The IEPR was completed by Battelle Memorial Institute. A total of 13 comments were documented. The comments were related to plan formulation, vessel fleet analysis, benefits, dredging and sedimentation, risk and uncertainty, and the cumulative impacts of changes in air quality. In response, sections in the main report and EIS were expanded to include additional information.

DAEN
SUBJECT: Brazos Island Harbor Channel Improvement Project, Texas

10. Washington level review indicates that the project recommended by the reporting officers is technically sound, environmentally and socially acceptable, and economically justified. The plan complies with all essential elements of the 1983 U.S. Water Resources Council's Economic and Environmental Principles and Guidelines for Water and Land Related Resources Implementation Studies and complies with other administrative and legislative policies and guidelines. The views of interested parties, including federal, state, and local agencies were considered. There were no comments from public review of the draft integrated report. During state and agency review, a letter was received from the Texas Commission on Environmental Quality, which did not include concerns about the project.

11. I concur in the findings, conclusions, and recommendations of the reporting officers. Accordingly, I recommend that navigation improvements for the BIH be authorized in accordance with the reporting officers' recommended plan at an estimated cost of $204,587,000 with such modifications as in the discretion of the Chief of Engineers may be advisable. My recommendation is subject to cost sharing, financing, and other applicable requirements of federal and state laws and policies, including Section 101 of WRDA 1986, as amended. The non-federal sponsor would provide the non-federal cost share and all LERRs. Further the non-federal sponsor would be responsible for the non-federal cost share of the operation and maintenance, as described above. This recommendation is subject to the non-federal sponsor agreeing to comply with all applicable federal laws and policies, including but not limited to:

a. Provide 10 percent of the total cost of construction of the GNFs attributable to dredging to a depth not in excess of 20 feet; plus 25 percent of the total cost of construction of the GNFs attributable to dredging to a depth in excess of 20 feet but not in excess of 45 feet; plus 50 percent of the total cost of construction of the GNFs attributable to dredging to a depth in excess of 45 feet as further specified below:

(1) Provide 50 percent of design costs allocated by the government to commercial navigation in accordance with the terms of a design agreement entered into prior to commencement of design work for the project;

(2) Provide, during construction, any additional funds necessary to make its total contribution for commercial navigation equal to 10 percent of the total cost of construction of the GNFs attributable to dredging to a depth not in excess of 20 feet; plus 25 percent of the total cost of construction of the GNFs attributable to dredging to a depth in excess of 20 feet but not in excess of 45 feet; plus 50 percent of the total cost of construction of the GNFs attributable to dredging to a depth in excess of 45 feet;

b. Provide all LERRs, including those necessary for the borrowing of material and placement of dredged or excavated material, and perform or assure the performance of all relocations, including utility relocations, all as determined by the government to be necessary for the construction or operation and maintenance of the GNFs;

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SUBJECT: Brazos Island Harbor Channel Improvement Project, Texas

c. Pay with interest, over a period not to exceed 30 years following completion of the period of construction of the GNFs, an additional amount equal to 10 percent of the total cost of construction of GNFs less the amount of credit afforded by the government for the value of the LERRs, including utility relocations, provided by the non-federal sponsor for the GNFs. If the amount of credit afforded by the government for the value of LERRs, including utility relocations, provided by the sponsor equals or exceeds 10 percent of the total cost of construction of the GNF, the sponsor shall not be required to make any contribution under this paragraph, nor shall it be entitled to any refund for the value of LERRs, including utility relocations, in excess of 10 percent of the total costs of construction of the GNFs.

d. Provide, operate, and maintain, at no cost to the government, the local service facilities in a manner compatible with the project's authorized purposes and in accordance with applicable federal and state laws and regulations and any specific directions prescribed by the federal government;

e. Provide 50 percent of the excess cost of O&M of the project over that cost, which the federal government determines would be incurred for O&M if the project had a depth of 50 feet;

f. Give the federal government a right to enter, at reasonable times and in a reasonable manner, upon property that the non-federal sponsor owns or controls for access to the project for the purpose of completing, inspecting, operating and maintaining the GNFs;

g. Hold and save the U.S. free from all damages arising from the construction or O&M of the project, any betterments, and the local service facilities, except for damages due to the fault or negligence of the U.S. or its contractors;

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

i. Perform, or ensure performance of, any investigations for hazardous substances as are determined necessary to identify the existence and extent of any hazardous substances regulated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 USC 9601–9675, that may exist in, on, or under LERRs that the government determines to be necessary for the construction or O&M of the GNFs. However, for LERRs that the government determines to be subject to the navigation servitude, only the government shall perform such investigation unless the federal government provides the non-federal sponsor with prior specific written direction, in which case the non-federal sponsor shall perform such investigations in accordance with such written direction;

j. Assume complete financial responsibility, as between the federal government and the sponsor, for all necessary cleanup and response costs of any hazardous substances regulated under CERCLA that are located in, on, or under LERRs that the federal government determines to be necessary for the construction or operation and maintenance of the project;

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

l. Comply with Section 221 of the Flood Control Act of 1970, as amended (42 USC 1962d-5b), and Section 101(e) of the WRDA 1986, as amended (33 USC 2211(e)), which provides that the Secretary of the Army shall not commence the construction of any water resources project or separable element thereof, until the non-federal sponsor has entered into a written agreement to furnish its required cooperation for the project or separable element;

m. Comply with the applicable provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended (42 USC 4601-4655), and the Uniform Regulations contained in 49 CFR 24, in acquiring lands, easements, and rights-of-way, necessary for construction, O&M of the project including those necessary for relocations, the borrowing of material, or the placement of dredged or excavated material; and inform all affected persons of applicable benefits, policies, and procedures in connection with said act;

n. Comply with all applicable federal and state laws and regulations, including, but not limited to, Section 601 of the Civil Rights Act of 1964 (42 USC 2000d), and Department of Defense Directive 5500.11 issued pursuant thereto, as well as Army Regulation 600-7, entitled "Nondiscrimination on the Basis of Handicap in Programs and Activities Assisted or Conducted by the Department of the Army"; and all applicable federal labor standards requirements including, but not limited to, 40 USC 3141-3148 and 40 USC 3701-3708 (revising, codifying and enacting without substantive changes the provision of the Davis-Bacon Act (formerly 40 USC 276a et seq.), the Contract Work Hours and Safety Standards Act (formerly 40 USC 327 et seq.), and the Copeland Anti-Kickback Act (formerly 40 USC 276c);

o. Provide the non-federal share of that portion of the costs of mitigation and data recovery activities associated with historic preservation that are in excess of 1 percent of the total amount authorized to be appropriated for the project; and

p. Not use funds from other federal programs throughout, including any non-federal contribution required as a matching share, therefore, to meet any of the sponsor's obligations for the project costs unless the federal agency providing the federal portion of such funds verifies in writing that such funds are authorized to be used to carry out the project.

DAEN
SUBJECT: Brazos Island Harbor Channel Improvement Project, Texas

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

THOMAS P. BOSTICK
Lieutenant General, USA
Chief of Engineers

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Protecting Texas by Reducing and Preventing Pollution

August 6, 2014

Theodore A. Brown, P.E., Chief
Planning and Policy Division
Directorate of Civil Works
Department of the Army
Headquarters, CECW-P (SA)
7701 Telegraph Road.
Alexandria, VA 22315-3860

Re: TCEQ Grant and Texas Review and Comment System (TRACS) #2014-318, Brazos Island Harbor Channel Improvement Project, Cameron County.

Dear Mr. Brown:

The Texas Commission on Environmental Quality (TCEQ) has reviewed the above-referenced project and offers the following comments:

A review of the project for general conformity impact in accordance with 40 CFR Part 93 indicates that the proposed action is located in Cameron County, which is currently unclassified or in attainment of the National Ambient Air Quality Standards for all six criteria air pollutants. Therefore, general conformity rules do not apply.

The management of industrial and hazardous waste at the site including waste treatment, processing, and/or disposal is subject to state and federal regulations. Construction and Demolition waste must be sent for recycling or disposal at a facility authorized by the TCEQ. Special waste authorization may be required for the disposal of asbestos containing material.

Thank you for the opportunity to review this project. If you have any questions, please contact Ms. Elizabeth McKeefer at (512) 239-1786 or NEPA@tceq.texas.gov.

Sincerely,

Steve Hagle, P.E., Deputy Director
Office of Air

PORT OF BROWNSVILLE
• WORLD CLASS •

April 16, 2014

Col. Richard Pannell
US Army Corp of Engineers
Galveston District Commander
2000 Fort Point Road
Galveston, TX 77550

RE: SPONSOR LETTER OF INTENT ON BIH FEASIBILITY STUDY

Hon. Colonel Pannell,

As you know the Brownsville Navigation District, dba Port of Brownsville, continues to support and cost share the efforts to complete the Brazos Island Harbor (BIH) Channel Improvement Project Feasibility Study for the federal BIH channel. This cost share agreement began in 2006 and remains in effect to this day.

As the USACE is nearing the end of the Feasibility Study with anticipation of a Final Chief's Report later this year, our support has remained steadfast. As the non-Federal sponsor we fully intend to support the BIH Channel Improvement Project with full understanding of the estimated cost sharing responsibilities described in the Feasibility Study. According to the latest report, the total non-Federal cost share based on the project first cost is estimated to be $134,205,000, which funding is due during the construction of the channel, and which includes $47,257,000 in associated costs for berthing areas and dock modifications. Also, the additional non-Federal Sponsor cash contribution (per Section 101 of Public law 99-662) is $22,731,500. This additional cash contribution may be paid over a period not to exceed 30 years.

We are aware the amounts may vary slightly with the Project Partnership Agreement due to contingencies associated with pre-construction, engineering and design; nevertheless, we still understand the cost sharing responsibilities assigned to each proponent of all project phases.

Thank you for the opportunity to express our continued desire and support for improving the Federal channel that is so vital to the U.S. Economy and the nation's energy production.

Best regards,
PORT OF BROWNSVILLE

MR. EDUARDO A CAMPIRANO
Port Director and C.E.O.

EAC/AC/ng

Cc: Sergio Tito López, BND Board Chairman

Brownsville Navigation District
1000 Foust Road • Brownsville, Texas 78521 • Ph (956) 831-4592 • (800) 378-5395 • Fax (956) 831-5006
www.portofbrownsville.com

PORT OF BROWNSVILLE
• WORLD CLASS •

April 16, 2014

Col. Richard Pannell
US Army Corp of Engineers
Galveston District Commander
2000 Fort Point Road
Galveston, TX 77550

RE: NON-FEDERAL SPONSOR'S SELF-CERTIFICATION OF FINANCIAL CAPABILITY FOR AGREEMENTS

Hon. Colonel Pannell,

I, Eduardo A. Campirano, do hereby certify that I am the Port Director and C.E.O. of the Brownsville Navigation District (BND, the "Non-Federal Sponsor" for the Brazos Island Harbor (BIH) Channel Improvement Project and it's related Feasibility Study); that I am aware of the financial obligations of the Non-Federal Sponsor for the BIH Ship Channel; and that the Non-Federal Sponsor has the financial responsibility to satisfy the Non-Federal Sponsor's obligations under the Feasibility Study Agreement for the BIH Channel Improvement Project.

IN WITNESS WHEREOF, I have made and executed this certification this 22nd day of April, 2014.

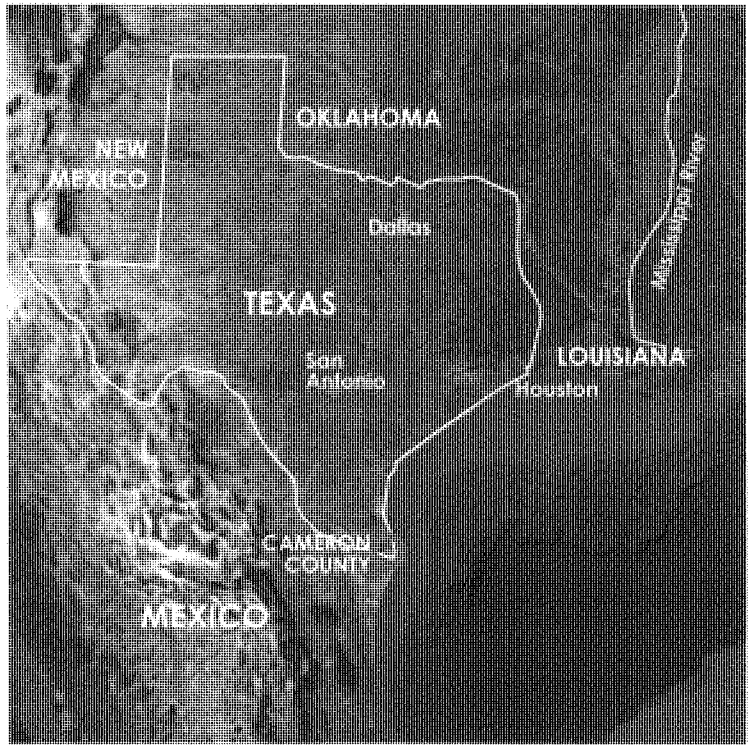
BY: ______________________
MR. EDUARDO A. CAMPIRANO

TITLE: Port Director and C.E.O.
Brownsville Navigation District

DATE: 4-22-2014

EAC/AC/ng

Project Location



BUILDING STRONG®

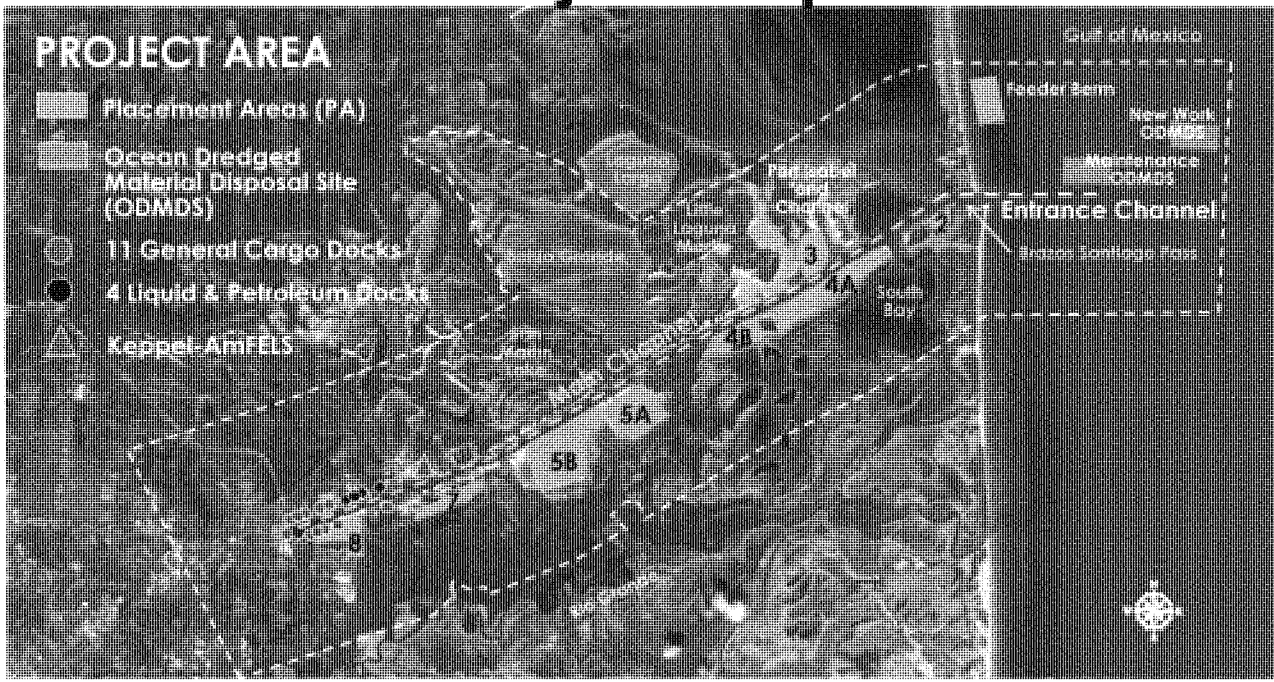
Problems

- Constraints of channel dimensions for the Port of Brownsville (POB) have resulted in inefficient navigational practices; and

- Limited ability for oil drilling rig fabrication, maintenance, and repair at the POB due to current channel dimensions.

BUILDING STRONG®

Project Map



TURNING BASIN/EXTENSION
Width: 325 to1200 feet wide
Depth: 42 to 36 feet
Length: 1.9 miles

MAIN CHANNEL
Width: 250 feet
Depth: 42 feet
Length: 15.1 miles

ENTRANCE & JETTY CHANNEL
Width: 300 feet
Depth: 44 feet
Length: 2.4 miles

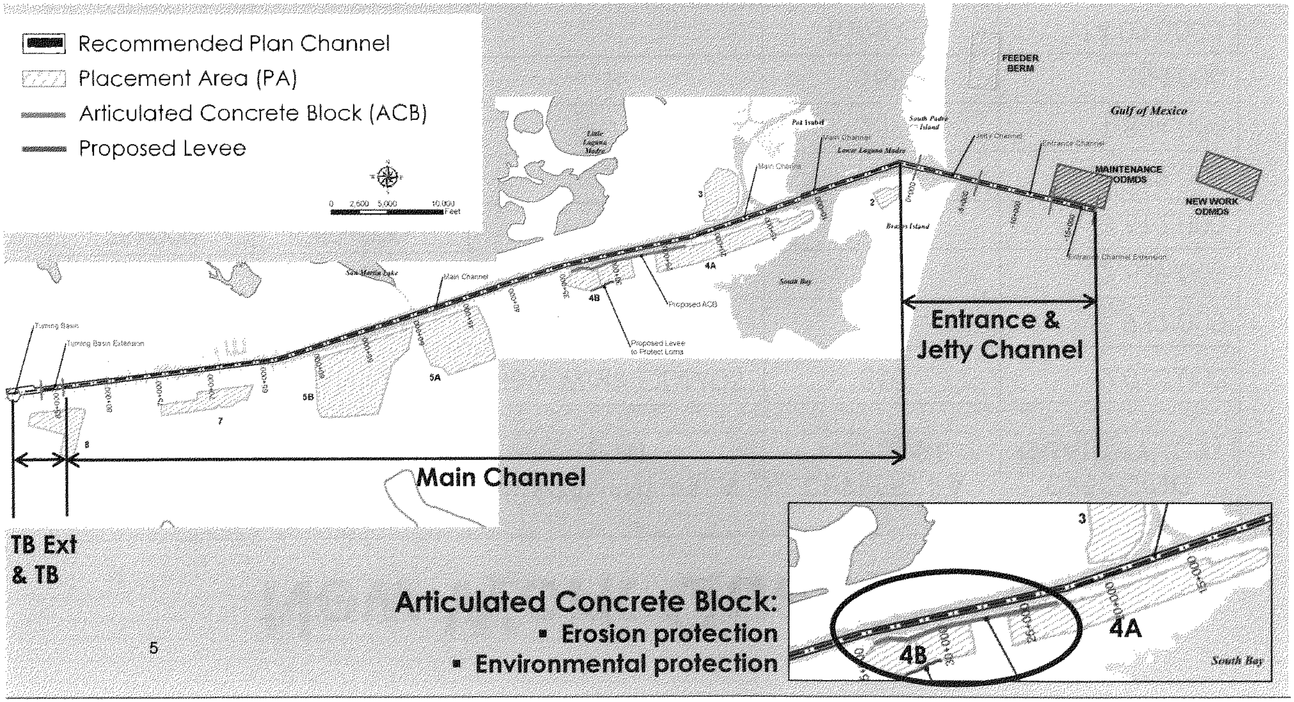
Recommended Plan

DEPTHS OF RECOMMENDED PLAN

STATIONS From	STATIONS To	RECOMMENDED PLAN	EXISTING CHANNEL
-17+000	-13+000	54	Beyond Existing Channel
-13+000	0+000	54	44
0+000	84+200	52	42
84+200	86+000	42	42
86+000	End of Turning Basin	36	36

Dredged Material Management Plan

- 2 Existing Ocean Dredged Material Disposal Sites (ODMDS)
- 7 Existing Upland Confined PAs (PA2, 4A, 4B, 5A, 5B, 7, and 8)
- Nearshore Feeder Berm for South Padre Island (Beneficial Use)



New Work Quantities

CHANNEL STATIONS		PLACEMENT AREA (PA)	CURRENT PA ACREAGE	DREDGING QUANTITY (CY)
-17+000	0+000	New Work ODMDS	350	2,066,000
0+000	7+000	2	71	937,000
7+000	25+000	4B	243	2,689,000
25+000	50+000	5A	704	3,612,000
50+000	70+000	5B	1020	2,599,000
70+000	82+000	7	257	1,804,000
82+000	89+500	8	288	386,000
			Total CY	14,091,000
Dredging quantities may not total due to rounding				

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Economic Summary

(October 2014 price level; 3.375% interest rate, costs in $1,000)

	Traditional Benefits	Benefits with Section 6009
Investment Costs		
Total Project Construction Cost	$251,952	$251,952
Interest During Construction Costs	10,176	10,176
Total Investment Cost	$262,128	$262,128
Average Annual Costs		
Interest and Amortization of Initial Investment	10,925	10,925
Incremental O&M	2,971	2,971
Total Average Annual Costs	$13,896	$13,896
Average Annual Benefits	20,599	90,871
Net Annual Benefits	6,703	76,975
Benefits-Cost Ratio	1.5	6.5

U.S. ARMY

BUILDING STRONG®

Cost Apportionment

(October 2014 price level; 3.375% interest rate)

	FEDERAL COSTS	NON-FEDERAL COSTS
Construction Dredging and PAs	$97,647,000	$72,174,000
Engineering & Design	10,860,000	10,860,000
Construction Management	7,493,000	5,538,000
Lands	8,000	3,000
Total Gen. Navigation Features ($204,582,000)	$116,008,000	$88,574,000
Other Federal Costs		
Aids to Navigation – Channel Markers	108,000	---
Other non-federal Costs		
Lands	---	5,000
Associated Costs: Berths & Dock Mods	---	47,257,000
Total Project Cost ($251,952,000)	$116,116,000	$135,836,000
Additional Cash Contribution (10% of GNF)	---	20,453,000
Total Costs	$116,116,000	$156,289,000

Environmental Compliance

- ✓ Draft Integrated Feasibility Report: Environmental Assessment (DIFR-EA) prepared and coordinated
- ✓ USEPA comments on ODMDS report resolved
- ✓ Endangered Species Act consultation complete
- ✓ Section 401 Water Quality Certification received
- ✓ Coastal Zone Consistency Determination received
- ✓ Cultural Resources coordination complete
- ✓ Biological Opinion received and accepted

Public Involvement

- Scoping meetings conducted
- DIFR-EA published December 6, 2013 for a 30-day public review period
- Notice of Availability (~250) sent to local media, neighborhood and business organizations, local, state, and Federal governments/agencies, environmental organizations and recognized Indian tribes
- DIFR-EA and supporting technical reports posted on Galveston District website

Public and Agency Comments

- No controversial issues or concerns
- All comments were supportive in nature and required no changes to the report

Addendum #2

Brazos Island Harbor Feasibility Study Economic Appendix

Discussion of Thruster Removal Methodology

WHITEPAPER FOR THRUSTER REMOVAL METHODOLOGY AT BRAZOS ISLAND HARBOR (BIH)

1. ISSUE

This whitepaper has been prepared to support the HarborSym model methodology for evaluating the NED costs of thruster removals related to oil and gas rig repair work at the BIH dry dock facility operated by Keppel AmFELS. With the proposed channel improvements (deepening), large rigs destined to AmFELS' dry dock for inspection, repair, or modification services will realize efficiencies of entrance and egress with their thrusters in place. In the absence of channel improvements, thrusters would be removed offshore to provide sufficient clearance and allow transit in the channel at existing depths and then, at the conclusion of the work, would re-attach the thrusters to the rig in the offshore mooring location.

2. BACKGROUND

Large rigs, i.e. semi-submersible structures and drillships may be towed to Keppel AmFELS' BIH dry dock facility [herein referred to as BIHDD] or others for three major reasons: to be inspected by the American Bureau of Shipping (ABS), to be refurbished (including being repaired), or to be upgraded. Inspection of offshore structures by the ABS is required for insurance purposes, just as all maritime vessels are required to be classified and inspected by a classification society for insurance. It is common for rig operators (owners) to employ a more frequent and rigorous maintenance schedule than the minimum required by the ABS to insure their assets' longevity. Repairs, refurbishments, and upgrades are likely to occur in conjunction with maintenance, beyond the 10-year inspection requirements.

Once at the dry dock, the first operation is to remove the thrusters to allow unencumbered access to the structure and balance it safely in the dry dock. BIHDD has an approved Department of Army regulatory permit (SWG-2013-00282) issued on 17 June 2013 to commence work on a mooring system that would allow for safe removal of the thrusters in a protected area off-shore. The off-shore mooring area is expected to be in place in 2015.

3. THRUSTER REMOVAL COSTS

In the without project condition, an hourly foreign cost in port is assumed to represent the thrusters being removed at-sea to allow the rigs to enter the channel. The thruster removals at the off-shore mooring area would occur during a 4-8 day period, depending on the number of thrusters to be removed. In the with- project condition, when the rig is able to travel the channel with thrusters still attached, the thrusters would still be removed, albeit at the BIHDD, which only takes 2-3 days and involves less supporting equipment and crew. Thus, the net costs reflect 2-5 days of time and costs incurred by removing the thrusters outside the jetties at the mooring area. The costs for thruster removal was calculated in coordination with Keppel-AmFELS and the Institute of Water Resources, to include such daily costs for tractor tugs, crane barges, divers, technical support staff, work crews, a standby transport vessel, as well as mobilization and demobilization costs.

Without project thruster removal cost offshore – With project thruster removal cost at dock = rig transportation cost savings

Theoretical equation

Without project thruster removal costs offshore:

6 days X $1.25 million = 7.5 million X 2 transits = $15 million

With project thruster removal costs at dock:

2.5 days X $1 million = 2.5 million X 2 transits = $5 million

$15 million – $5 million = $10 million in savings

HarborSym Equation

Without project in port hourly vessel operating cost X (tons/unloading rate per ton) = Vessel operating cost of removing thrusters offshore:

$5,000 X (14/.01) = $7,000,000

Note: As shown in Table 7-2: BIH HarborSym Vessel Commodity Rates of the Economic Appendix, the unloading rates range from .0033 to .02 with .01 being the most likely unloading rate. As shown in Table 7-3: BIH HarborSym Oil Rig Operating Costs in dollars of the Economic Appendix, the oil rig vessel operating costs ranged from a minimum of $3,000 to $7,000 an hour with $5,000 being the most likely operating cost.

With project in port hourly vessel operating cost X (tons/unloading rate per ton)= Vessel operating cost of removing thrusters at dock:

$1 X (14/.01) = $1400

Note: $1 is a placeholder in HarborSym since it does not allow 0s.

$7,000,000 - $1400 = $6,998,600 for the one large semi submersible vessel call a year

Note: The actual values in the out years may vary due to the standard deviations around the mean that take place in the Monte Carlo simulations within HarborSym.

The estimated thruster removal costs were then doubled to reflect reattachment of thrusters at the conclusion of the work effort. The costs were estimated as an hourly equivalent to satisfy the HarborSym model input requirements and variances are based on the number of thrusters that a rig may need to have removed. Also, because the rigs are in dry dock for a minimum of two months, depending on the work required, costs were not included for the at-sea or in-port conditions since it would be unreasonable for costs to accrue like a bulker that spends a week in-port unloading its commodities.

4. COMMODITY TRANSFER RATES

The drilling rigs have very different commodity transfer rates than the typical commodities because the average bulk commodity will enter the port, unload and load and exit the port within days or weeks. This is not the same for drilling rigs. The drilling rigs enter the port and then stay for varying lengths of time. For example, a rig may need to be inspected and stay for 60 days or may need modifications and stay for six months or more. Therefore, the unloading rates for drilling rigs range from 0.0033 to 0.02 to represent the time that a rig will stay at the dock, and thus are used in the HarborSym system to calculate congestion, etc. on the channel. The commodity transfer rates for drilling rigs are based on calculations related to the number of hours and days a rig is expected to stay in the channel during a year. In addition, as shown in Table 7-2 of the Economic Appendix, there are loading rates for a rig as well because a new rig that is built at Keppel AmFELS will need to leave the dock and transit the channel, which also needs to be accounted for in HarborSym as an export since it never enters the channel as a vessel call.

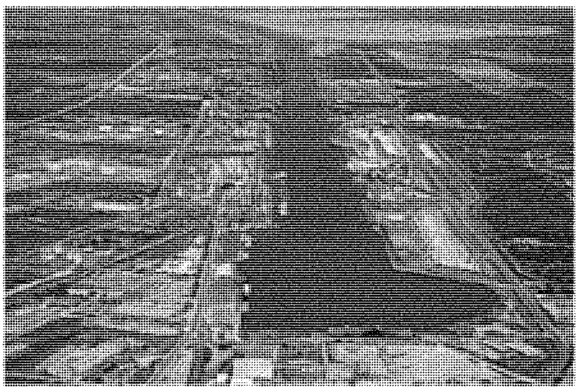
U.S. Army Corps
of Engineers

Galveston District
Southwestern Division

Brazos Island Harbor, Texas

Channel Improvement Project

Final Integrated Feasibility Report–
Environmental Assessment



July 2014

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

Brazos Island Harbor, Texas

Channel Improvement Project

Final Integrated Feasibility Report – Environmental Assessment

July 2014

EXECUTIVE SUMMARY

STUDY DESCRIPTION

This Final Integrated Feasibility Report and Environmental Assessment (FIFR-EA) presents the results of a United States Army Corps of Engineers (USACE) study to determine whether channel improvements to the existing Brazos Island Harbor (BIH) project are feasible and in the Federal interest. The non-Federal sponsor is the Brownsville Navigation District (BND) acting as the financial representative for the Port of Brownsville (POB). The feasibility study was authorized by a resolution of the Committee on Public Works, U.S. House of Representatives dated May 5, 1966. Additionally, Section 6009 of the Emergency Supplemental Appropriations Act for Defense, the Global War on Terror, and Tsunami Relief, 2005 (Public Law 109-13) – Offshore Oil and Gas Fabrication Ports provides that in determining the economic justification for navigation projects involving offshore oil and gas fabrication ports, the Secretary is directed to measure and include in the National Economic Development (NED) calculation the value of future energy exploration and production fabrication contracts and transportation cost savings that would result from larger navigation channels.

The BIH Project, also known as the Brownsville Ship Channel (BSC), is an existing deep-draft navigation project located on the lower Texas coast. The channel uses the natural Brazos-Santiago Pass to connect the Gulf with the inland portion of the BSC. The BSC is the southernmost navigation channel in the State of Texas and the western terminus of the Gulf Intracoastal Waterway system (GIWW). The GIWW is a shallow-draft navigation channel 125 feet wide and 12 feet deep that traverses the entire length of the Laguna Madre.

The project area, shown in Figure ES-1, includes the BSC channel and property directly adjacent to the channel, including the POB and upland placement areas (PAs), as well as offshore PAs and a nearshore Feeder Berm. Nearly all of the property adjacent to the land-locked portion of the channel is owned by the POB. The Port infrastructure includes railroad and highway systems allowing access to the Port facilities. The existing BSC navigation channel is 19.4 miles in length. The Entrance and Jetty Channels extend east to west for approximately 2.4 miles, from the open Gulf of Mexico, through the jetties to the Laguna Madre. The flared North and South Jetties flank Brazos Santiago Pass, which connects the Gulf with the Lower Laguna Madre. The Main Channel extends 17 miles westward from the Laguna Madre to the Turning Basin, which is located on the eastern outskirts of the city of Brownsville.

There are ten PAs available for the placement of dredged material from the BIH Project— two existing Ocean Dredged Material Disposal Sites (ODMDSs), which can be used for the Entrance Channel, seven upland PAs for containment of material from the Main Channel, and one nearshore Feeder Berm that can be used for beach-quality sediments from the Entrance and Jetty

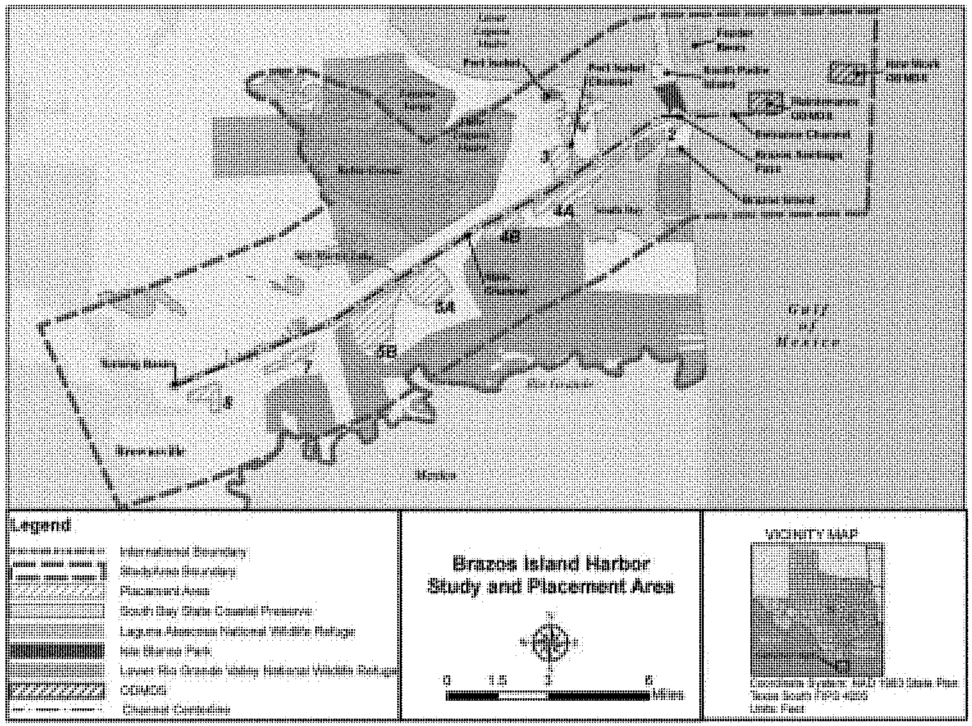


Figure ES-1. Brazos Island Harbor Study Area

Channels, and a portion of the Main Channel. The ODMDSs and Feeder Berm are all dispersive and by their nature have unlimited capacity.

PLANNING OBJECTIVE

The USACE studied navigation inefficiencies of the BIH caused by channel depth and width constraints. In addition to offshore oil rig repair and shipbreaking, Brownsville is a bulk commodity port accommodating both liquid and dry cargo handling. The POB is the only deep-draft port available to industry along the U.S.–Mexico border. Recent increases in traffic are a direct result of North American Free Trade Agreement in that a majority of the increased commodity traffic meets industrial needs in Mexico. Opportunities for the POB include increasing navigational efficiency of deep-draft vessels using the channel and increasing the ability of the channel to accommodate offshore rigs for maintenance and repair as well as the fabrication of new rigs. To develop solutions to these problems and opportunities, the following planning objective was used in formulation and evaluation of alternative plans:

- Increase navigational efficiency of cargo vessels and offshore rigs using the channel during the 50-year period of analysis.

ALTERNATIVES

Measures used to formulate alternatives included both nonstructural and structural measures, as well as a No Action Alternative. Nonstructural measures included utilization of another port, and alternative modes of commodity transport. Structural alternatives included deepening only, deepening and widening, widening only, and construction of a new turning basin to improve access to the Gulf of Mexico. Measures were evaluated to determine if they addressed the study objective with those that did not contribute to the objective being dropped from the alternative formulation.

Measures were evaluated and screened by the project delivery team through several arrays of alternatives. The No Action Alternative was included for all phases of the screening. Consistent with new SMART Planning concepts, this effort included a qualitative analysis of an Initial Array, a qualitative/quantitative analysis of an Evaluation Array, and a detailed quantitative analysis of a Final Array of alternatives. Each level consisted of more-detailed analysis when compared to the previous level.

The Final Array of alternatives consisted of a no action alternative and three action alternatives: no widening; 50-foot widening; and 100-foot widening. Four depth scales were evaluated for each action alternative: 45, 48, 50, and 52 feet mean lower low water (MLLW). Operations and maintenance (O&M) costs were developed to better estimate project costs of each proposed depth. It was determined that none of the alternatives would require additional PAs since new work construction and maintenance material could be placed in existing PAs (with necessary containment dike raisings) or in the ODMDS. Structural alternatives evaluated during this screening appeared to address the navigation problems with the existing BIH while having minimal impact on the environment.

RECOMMENDED PLAN

The Recommended Plan was identified as Alternative F-1d, deepening of the channel to 52 feet without channel widening, which includes the least cost disposal option. The least cost dredging disposal alternative includes the beneficial use of maintenance material from the Entrance and Jetty Channels, and the first 11,000 feet of the Main Channel for placement into the nearshore Feeder Berm off South Padre Island. No environmental mitigation would be required for the Recommended Plan, as the plan would cause only negligible environmental impacts. The Recommended Plan meets the objective of this study while complying with all constraints.

It is not known if Alternative F1-d, deepening only to 52 feet, is the NED plan, which maximizes net excess benefits because the net excess benefits were still increasing with deeper channel dimensions and a deeper alternative was not included in the Final Array of alternatives. However, Alternative F1-d was the most cost effective of the Final Array of alternatives considered and the deepest channel dimension that the non-Federal sponsor would support at this time. If a plan with lesser benefits is preferred by the sponsor due to financial constraints, USACE guidance allows for a categorical exemption to be granted and this lesser plan to be selected as the Recommended Plan. Therefore, Alternative F1-d, deepening the channel to 52 feet MLLW with no widening, is considered the Recommended Plan.

RECOMMENDED PLAN COMPONENTS

Table ES-1 presents the depths of the Recommended Plan by stationing. No widening of the BIH Channel is proposed. The Entrance and Jetty Channels from Station –17+000 to 0+000 would be deepened to a depth of 54 feet MLLW. This additional 2 feet of depth is to allow for the effects of vessel pitch, roll, heave, and yaw occurring as a result of strong currents, waves, and wind. From Station 0+000 to 84+200, the channel would be deepened to a depth of 52 feet. From Station 84+200 to 86+000, the existing channel is 42 feet deep. There is no forecast change in the design drafts of vessels using this portion of the channel in the future so no deepening is proposed for this reach. The channel would be maintained at a depth of 36 feet MLLW from Station 86+000 to the end of the Turning Basin, as ships will have been light-loaded or unloaded before entering the basin.

Channel side slopes would remain the same as the existing project – 1 foot vertical over 6 feet horizontal (1V:6H) in the Entrance and Jetty Channels; 1V:3H from station 0+000 to 35+000 and 1V:2.5H from station 35+000 through 89+500 in the Main Channel. The actual dredging depth would be up to 4 feet deeper in the Entrance and Jetty Channels due to 2 feet of advance maintenance (AM) and 2 feet of allowable overdepth (AO), and up to 3 feet deeper in the Main

Table ES-1. Channel Depths of Recommended Plan

Stations		Recommended Plan Depth	Existing Channel Depth
From	To		
−17+000	−13+000	54	Beyond Existing Channel
−13+000	0+000	54	44
0+000	84+200	52	42
84+200	86+000	42	42
86+000	End of Turning Basin	36	36

Channel due to 2 feet of AM and 1 foot of AO. No improvements are proposed for the existing jetties. If the project is authorized, the 3-year construction period could begin in fiscal year (FY) 2018.

The proposed project would generate approximately 14.1 million cubic yards (MCY) of new work material from initial construction and approximately 61.7 MCY of maintenance material over the 50-year period of analysis. Maintenance dredging quantities would increase approximately 14.0 percent over the existing project. New work and maintenance material would be distributed among the existing New Work ODMDS, a nearshore Feeder Berm, and existing upland confined PAs 2, 4A, 4B, 5A, 5B, 7, and 8. The new work material would consist primarily of clay with minor amounts of sand, silty sand, and clayey sand, and maintenance material would consist of silt and clay sediments from the Main Channel and primarily sandy sediment from the Entrance/Jetty Channels and the first 11,000 feet of the Main Channel.

None of the existing ODMDSs and upland PAs would need to be expanded, and no new ODMDSs or upland PAs would be needed. Construction to raise upland PA containment dikes to heights needed to accommodate new work and maintenance quantities would be done within the footprints of the existing PAs. New work sediments would be stockpiled within the PAs and later used to raise PA dikes incrementally as needed to contain maintenance material for the 50-year period of analysis. Final elevations of the PA dikes would range from a total elevation of 17 feet North American Vertical Datum (NAVD) 88 around PA 5A to a total elevation of 38 feet around PA 7. Armoring of the exterior toe of the PA 4A (which will be used for maintenance material placement) and 4B dikes on the side facing the channel would be implemented to prevent erosion from station 22+000 to 33+800.

Maintenance material from the Entrance and Jetty Channels and the first 11,000 feet of the Main Channel would generally be placed in the nearshore Feeder Berm. Sediment removed by maintenance dredging would therefore be regularly placed back into the littoral system, available for cross-shore and longshore sediment transport to South Padre Island. If for some reason the Feeder Berm could not be used, maintenance material from the Entrance and Jetty Channels (station −17+000 to 0+000) could be placed in the Maintenance ODMDS.

ENVIRONMENTAL COMPLIANCE

USACE has prepared an environmental assessment (EA) of the Recommended Plan and alternatives that is integrated into this feasibility report. The environmental impact analyses have determined that the Recommended Plan would have only negligible environmental impacts, and therefore no mitigation is required. A Notice of Availability that describes the proposed action and the availability of the Draft Integrated Feasibility Report and Environmental Assessment (DIFR-EA) was issued to interested parties, including Federal and State resource agencies on December 6, 2013. Comments on the draft EA and the District's responses have been included in Appendix D of this final report. The EA was prepared in accordance with requirements of the National Environmental Policy Act (NEPA) of 1969 and Council on Environmental Quality (CEQ) regulations.

The proposed project would result in only minor changes to the physical and hydrological characteristics of the study area. Benthic organisms would be impacted by dredging, but they would rapidly recolonize. No special aquatic sites or sensitive habitats, such as coastal dunes, wetlands, seagrass beds, black mangroves, lomas, tidal-algal flats, or oyster reef, would be impacted by the proposed project. Only minor and temporary increases in turbidity, noise, and air emissions are anticipated during construction. No impacts to historic properties are anticipated. No new impacts would be associated with placement of dredged material. Hydrodynamic modeling has determined that only negligible differences in water surface elevations, tidal velocity, and salinity would occur with construction of the proposed project and that there would be no effect on the tidal range in the Laguna Madre. Storm surge modeling has identified only minor potential impacts. The proposed project would not exacerbate the projected minor effects of relative sea-level rise in the study area.

The Recommended Plan is compliant with all applicable environmental laws and regulations. A Clean Water Act §404(b)(1) evaluation of the proposed action (Appendix G) describes the effects of the proposed discharges, and has determined that the Recommended Plan is the least environmentally damaging practicable alternative. The Texas Commission on Environmental Quality has issued water quality certification for the Recommended Plan. USACE has concluded that the Recommended Plan is fully consistent to the maximum extent practicable with the enforceable policies of the Texas Coastal Management Program (TCMP) and the Texas General Land Office has issued a consistency determination (Appendix H). Coordination with the U.S. Fish and Wildlife Service (USFWS) regarding potential endangered species impacts has been concluded, and conservation measures recommended by USFWS will be adopted to prevent potential impacts to threatened and endangered species that may occur in the study area. Consultation with the National Marine Fisheries Service (NMFS) has been concluded regarding potential adverse impacts from new work construction by hopper dredges to 4 species of threatened and endangered sea turtles (green, Kemp's ridley, loggerhead, and hawksbill). Reasonable and prudent measures (RPMs), developed in consultation with the NMFS, will be adopted to minimize potential impacts to these species, which are not likely to jeopardize the continued existence or recovery of these sea turtle species. Based upon recent chemical analyses of water and sediment collected from within the channels, the potential for encountering hazardous material during dredging operations is considered minimal. Shoaled sediments that would be placed in the offshore Feeder Berm have been determined to be of sufficient quality for beneficial use and the US Environmental Protection Agency (EPA) has concluded that sediments are suitable for placement in the existing New Work and Maintenance ODMDSs. In compliance with requirements of the Clean Air Act and the State of Texas, the Recommended Plan has been evaluated for potential impacts to air quality, and a conformity determination would not be required because the area is in attainment with air quality standards. No impacts to historic properties have been identified.

BENEFITS AND COST OF THE RECOMMENDED PLAN

Benefits and costs were calculated with a base year of 2021 and a 50-year period of analysis using the October 2013 discount rate of 3.5 percent. Benefits were calculated using the USACE approved HarborSym Model for traditional NED benefits. In addition, separate benefit-cost ratios were calculated using the Section 6009 benefits, which are included in a separate addendum, as the detailed calculations include proprietary information and are for official use only.

Economic benefits from this navigation improvement project derive primarily from reductions in transportation costs for petroleum product tankers, dry bulk and iron and steel bulk carriers, as well as the cost reduction from not having to remove thrusters from the oil drilling rigs before entrance to the channel. Specific transportation savings would result from the use of larger vessels, more-efficient use of existing and future larger vessels, and reductions in wait time. The deepening of the BIH Channel would generate total average annual benefits of $20,539,000 with total average annual costs of $14,163,000 producing a benefit-to-cost ratio (BCR) of 1.5 at the 3.5 percent discount rate. The benefits were also calculated using Section 6009 of the Emergency Supplemental Appropriations Act for Defense, the Global War on Terror, and Tsunami Relief, 2005 (Public Law 109-13) – Offshore Oil and Gas Fabrication Ports, which led to a BCR of 6.4.

The construction costs were developed by USACE – Galveston Cost Engineering using October 2013 price levels. The total project cost of all project components totals $251,952,000. The fully funded project cost of all components totals $279,817,000. Project costs and price escalation (calculated by estimating the midpoint of the proposed contracts) are combined to create the Fully Funded Cost. Costs include implementation costs and associated costs. Implementation costs include preconstruction planning and design (PED) costs, construction costs, construction contingency costs, and O&M costs. Construction costs include costs for dredging and placement area construction. No fish and wildlife or historic properties mitigation costs are anticipated. Aids to navigation (currently estimated at $108,000) will be provided by the U.S. Coast Guard

(USCG), and are a Federal cost included in the economic justification, but are not subject to project cost sharing. Construction General funding will be utilized for the Federal share of all project construction.

COST SHARING

The Recommended Plan first cost for all project components is separated into expected non-Federal and Federal cost shares and detailed in Table ES-2. These costs are accurately apportioned at different cost share rates based on the work being done at different depths. All of the channel segments proposed for deepening under the Recommended Plan are currently 42 feet deep, or 44 feet in the offshore channels. For a majority of the work where the existing channel is currently at –42-foot MLLW, the work would be cost shared 75 percent Federal/25 percent non-Federal to a depth of 45 feet MLLW and 50 percent Federal/50 percent non-Federal for the depth greater than 45 feet. The costs are separated into expected Federal and non-Federal shares and detailed in Table ES-3.

Table ES-2. Cost Apportionment
(rounded with October 2013 Price Level and 3.5% interest rate)

Cost Apportionment Navigation*	First Cost ($)	Fully Funded Cost ($)
Federal Navigation:		
BIH Channel	116,000	128,811
Lands & Damages	8	9
Total Federal GNF	116,008	128,820
non-Federal Navigation:		
BIH Channel	88,571	98,487
Land & Damages	$3	3
Total non-Federal GNF	88,574	98,490
Total GNF	204,582	227,310
Other Federal Costs		
Federal: ATON	108	118
Total Other Federal Costs	108	118
Other non-Federal Costs		
Lands	5	5
Associated Costs: Berths and Docks	47,257	52,384
Total Other non-Federal Costs	47,262	52,389
Total Project Costs	251,952	279,817

* Costs include PED and Construction Management totals

Table ES-3. Recommended Plan First Cost Allocation
(October 2013 price levels, $ in 1,000s)

General Navigation Features	Costs Allocated for Depth Increment from 42 to 45 feet: Total ($)	Costs Allocated for Depth Increment from 42 to 45 feet: Federal Share ($) (75% of 45-Ft Costs)	Costs Allocated for Depth Increment from 42 to 45 feet: Non-Federal Share ($) (25% of 45-Ft Costs)	Costs Allocated to Depth Increment From 45 to 52 feet: Total ($)	Costs Allocated to Depth Increment From 45 to 52 feet: Federal Share ($) (50% of Cost - Depth Increment Greater than 45 Feet)	Costs Allocated to Depth Increment From 45 to 52 feet: Non-Federal Share ($) (50% of Cost - Depth Increment Greater than 45 Feet)	Total Federal Share ($)	Total Non-Federal Share ($)	Total First Cost ($)
Construction Dredging and Placement Areas	50,946	38,210	12,737	118,874	59,437	59,437	97,647	72,174	169,820
Engineering and Design	-	-	-	21,719	10,860	10,860	10,860	10,860	21,719
Construction Management	3,910	2,932	977	9,122	4,561	4,561	7,493	5,538	13,032
Lands	11	8	3	-	-	-	8	3	11
Subtotal	54,867	41,150	13,717	149,715	74,858	74,858	116,008	88,574	204,582
Lands, Easements, ROW, and Relocations (LERRs)	100% Non-Federal			100% Non-Federal					
Lands	5	-	5	-	-	-	-	5	5
Subtotal	5	-	5	-	-	-	-	5	5
Total First Costs	54,872	41,150	13,722	149,715	74,858	74,858	116,008	88,579	204,587
Other Federal Costs	100% Federal			100% Federal					
Aids to Navigation - USCG Channel Markers	-	-	-	108	108	-	108	-	108
Subtotal	-	-	-	108	108	-	108	-	108
Associated Non-Federal Costs	100% Non-Federal			100% Non-Federal					
Berthing Areas & Dock Modifications		-	-	47,257	-	47,257	-	47,257	47,257
Subtotal	-	-	-	47,257	-	47,257	-	47,257	47,257
Total Project Costs	54,872	41,150	13,722	197,080	74,966	122,115	116,116	135,836	251,952

Note: Figures may not add to totals due to rounding

Non-Federal costs include non-Federal sponsor and berthing/dock owner costs. The non-Federal sponsor would be responsible for 100 percent of lands, easements, rights-of-way, and relocations (LERRs). All project construction is on lands that are currently owned by the non-Federal sponsor. No pipeline relocations, defined as "deep-draft utility relocations" pursuant to Planning Guidance Letter 44, are anticipated. Owners of berth and dock facilities that require modification in conjunction with the project would be responsible for 100 percent of those associated costs. Berth deepening and structural modifications that would be incurred are included in the project cost. The USCG is responsible for 100 percent of the cost of aids to navigation.

The maintenance of project features, such as dredging, dike raisings, and DAMP work costs, would be funded through annual appropriations of the O&M program. The actual amounts would vary on a year-to-year basis because of variability in the volume of material removed during each dredging cycle and the variability of the cycles. Costs for maintenance of the BIH would be in accordance with Section 101(b) of WRDA 1986, as modified by Section 2102(b) of the Water Resources Reform and Development Act (WRRDA) of 2014, which allocates the increment of costs for maintenance of channel depths to 50 feet as 100 percent Federal and the increment of costs for channel depths below 50 feet as 50 percent non-Federal and 50 percent Federal. Costs for dike raising for dredging of berthing areas and development of other local service facilities is 100 percent a non-Federal sponsor responsibility. Additional PA capacity for the Recommended Plan would be constructed regularly over the 50-year period of analysis in conjunction with maintenance dredging cycles. The increase in O&M costs has been calculated to be an additional $2,971,000 annually. The cost allocation for this O&M is an increase in approximately $2,674,000 in Federal cost and $297,000 in non-Federal cost annually.

PUBLIC COORDINATION

The USACE and BND developed a public involvement plan as part of the study process to ensure responsiveness to the needs and concerns of stakeholders and to ensure public involvement through an open, interactive process. A scoping meeting was held in Brownsville in January 2007 at which public input was solicited on problems and opportunities associated with channel modifications to the BSC, and potential environmental impacts. Comments and concerns expressed at this meeting were addressed in study analyses. The general public and resource agencies were given an opportunity to review the draft report, and responses to those comments are provided in Appendix D of the final report.

NON-FEDERAL SPONSOR SUPPORT

The BND fully supports the project and is willing to sponsor project construction in accordance with the items of local cooperation set forth in this report. The non-Federal sponsor has indicated financial capability to satisfy its obligations for the construction of the Recommended Plan.

AREAS OF CONTROVERSY AND UNRESOLVED ISSUES

As of the publication of this final report, there are no unresolved issues. Costs for modifications to Aids to Navigation have been estimated by USACE and included in the project cost estimate, and coordination has been initiated with the USCG to obtain an estimate from that agency. Modifications are expected to be minor, and any difference in cost is not expected to significantly affect the BCR. In order for the New Work or Maintenance ODMDS to be used, a new Site Management and Monitoring Plan (SMMP) needs to be executed in conjunction with the U.S. Environmental Protection Agency (EPA). Coordination with EPA is ongoing regarding a new format for these plans, and a new SMMP for the 52- by 250-foot deepening project will be developed in consultation with EPA during PED and prior to construction. Consultation with NMFS regarding potential impacts to threatened and endangered sea turtles has been concluded, and a final Biological Opinion (BiOp) is provided in Appendix I. RPMs recommended by NMFS have been adopted and costs for these measures are included in the cost estimate. Water quality certification and a Coastal Zone Management conformity determination have been received.

MAJOR FINDINGS AND CONCLUSIONS

The proposed actions of this report are in the national interest and include reduction in costs of navigation associated with vessel movement entering and leaving the POB, improvement of channel dimensions to accommodate current and future offshore rigs into the POB for fabrication, maintenance, and repair, and avoidance and minimization of environmental impacts to the greatest extent possible.

The proposed project meets the requirements for a categorical exemption due to the sponsor's financial constraint and is recommended as the Recommended Plan. Additional deepening beyond 52 feet was not evaluated in this study so the NED plan could not be identified. This constrained Recommended Plan consists of deepening of the channel to 52 feet as described above.

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APPENDICES

List of Acronyms

AAEQ	Average Annual Equivalent
AM	advance maintenance
AO	allowable overdepth
ATON	Aids to Navigation
BA	Biological Assessment
BCR	benefit-to-cost ratio
BiOp	Biological Opinion
BIH	Brazos Island Harbor
BMP	Best Management Practice
BND	Brownsville Navigation District
BSC	Brownsville Ship Channel
CAR	Coordination Act Report
CBRA	Coastal Barrier Resources Act
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CO_2e	carbon dioxide equivalents
CWA	Clean Water Act
cy	cubic yards
cy/yr	cubic yards per year
DIFR-EA	Draft Integrated Feasibility Report and Environmental Assessment
DMMP	Dredged Material Management Plan
DWT	dead weight tons
EA	Environmental Assessment
EC	Engineer Circular
EFH	Essential fish habitat
EIS	Environmental Impact Statement
EJ	Environmental Justice
EOP	Environmental Operating Principles
EO	Executive Order
EPA	U.S. Environmental Protection Agency
EQ	environmental quality
ER	Engineer Regulation
ERDC	Engineer Research and Design Center
ESA	Endangered Species Act

FAA	Federal Aviation Administration
FEMA	Federal Emergency Management Agency
FIFR-EA	Final Integrated Feasibility Report and Environmental Assessment
FM	Farm-to-Market Road
FWOP	Future Without-Project
FY	fiscal year
GHG	greenhouse gases
GIWW	Gulf Intracoastal Waterway
GLO	General Land Office
GNF	General Navigation Feature
GRBO	Gulf Regional Biological Opinion
HTRW	Hazardous, Toxic and Radioactive Waste
IDC	interest during construction
IHW	industrial and hazardous waste
JSS	Joint Storm Surge Study
LANWR	Laguna Atascosa National Wildlife Refuge
LERRs	lands, easements, rights-of-way, and relocations
LRGV	Lower Rio Grande Valley
LRGVNWR	Lower Rio Grande Valley National Wildlife Refuge
MBTA	Migratory Bird Treaty Act
MCACES	Micro Computer Aided Cost Engineering System
MCY	million cubic yards
MLLW	mean lower low water
MLT	mean low tide
MPRSA	Marine Protection, Research, and Sanctuaries Act
MSWLF	Municipal Solid Waste Landfill Sites
NAVD	North American Vertical Datum
NED	National Economic Development
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NOV	notices of violation
NO_x	nitrogen oxide
O&M	operations and maintenance
ODMDS	Ocean Dredged Material Disposal Site
°F	degrees Fahrenheit

OSE	other social effects
P&G	Principles and Guidelines
PA	placement area
PDT	Project Delivery Team
PED	Preconstruction Engineering and Design
PGL	Planning Guidance Letter
Pilots	Brazos Santiago Pilots Association
POB	Port of Brownsville
ppt	parts per thousand
RPM	Reasonable and Prudent Measures
RCRAC	Resource Conservation and Recovery Act-Corrective Action Facilities
RCRAGR	Resource Conservation and Recovery Act-Generator Facilities
RED	Regional economic development
RHA	Rivers and Harbors Act
RRC	Texas Railroad Commission
RSLR	relative sea level rise
SAV	submerged aquatic vegetation
SH	State Highway
SHPO	State Historic Preservation Officer
SOC	Species of Concern
SOL	SOL Engineering Services, LLC
SpaceX	Space Exploration Technologies
TCEQ	Texas Commission on Environmental Quality
TCMP	Texas Coastal Management Program
TPWD	Texas Parks and Wildlife Department
TWDB	Texas Water Development Board
USACE	United States Army Corps of Engineers
USCG	U.S. Coast Guard
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VE	Value Engineering
WRDA	Water Resources Development Act

1 STUDY INFORMATION

1.1 INTRODUCTION

This is a Final Integrated Feasibility Report and Environmental Assessment (FIFR-EA) for channel improvements of the Brazos Island Harbor (BIH), Texas deep-draft navigation channel. The Feasibility Cost - Sharing Agreement for the feasibility study was signed on June 28, 2006, with the Brownsville Navigation District (BND) acting as the financial representative for the Port of Brownsville (POB). The study alternatives have been screened, resulting in identification of the Recommended Plan. The BND and U.S. Army Corps of Engineers (USACE) propose to modify the BIH navigation channel to improve present and future navigation efficiency associated with cargo vessels and oil drilling rig fabrication, maintenance, and repair.

1.2 STUDY AUTHORITY

1.2.1 General Authority

The Congress authorized USACE to conduct a study of BIH, Texas, to determine whether the project should be modified in any way, particularly with a view to widening and deepening the existing channels, pursuant to a resolution of the Committee on Public Works, U.S. House of Representatives dated May 5, 1966. The resolution states:

> *Resolved by the Committee on Public Works of the House of Representatives, United States, that the Board of Engineers for Rivers and Harbors is hereby requested to review the report on Brazos Island Harbor, Texas, published as House Document Numbered 428, Eighty-Sixth Congress, Second Session, and prior reports, with a view to determining whether the project should be modified in any way at this time, particularly with a view to widening and deepening the existing channel.*

Additionally, in the Water Resources Development Act (WRDA) of 1986 (Public Law 99-662) dated November 17, 1986, Section 105 established cost share requirements. Additional legislation was passed in the Fiscal Year (FY) 2003 Omnibus Appropriations Bill, stating that any work performed by the BND as part of the restoration of wetlands in Bahia Grande would be used as credit towards the mitigation requirements of the BIH deepening project.

1.2.2 Additional Study Guidelines

The Director of Civil Works issued Implementation Guidance for Section 6009 of the Emergency Supplemental Appropriations Act for Defense, the Global War on Terror, and Tsunami Relief, 2005 (Public Law 109-13) – Offshore Oil and Gas Fabrication Ports in September 2012. Section 6009 provides that in determining the economic justification for navigation projects involving offshore oil and gas fabrication ports, the Secretary is directed to measure and include in the National Economic Development (NED) calculation the value of future energy exploration and production fabrication contracts and transportation cost savings that would result from larger navigation channels.

1.3 STUDY PURPOSE AND SCOPE

The purpose of this report is to present the findings of the feasibility investigations and analyses conducted to determine if there is a Federal interest in making channel improvements to the existing BIH. The FIFR-EA describes the problems and opportunities of the existing BIH, and identifies the alternatives and analyses conducted to meet the planning objective of the study. Channel improvements are needed to reduce operating costs of deep-draft vessels using the channel to import and export both liquid and dry bulk commodities, and to reduce restrictions on the transit of large oil drilling rigs. Channel improvements would allow the transit of larger new rigs that are constructed at a facility on the channel, and reduce transit costs for rigs that enter the channel for maintenance and repair. The study evaluates a wide array of alternatives, including channel deepening and/or widening, among others, which would allow the existing deep-draft vessel fleet to load more fully and allow larger deep-draft vessels and oil drilling rigs to use the channel. The FIFR-EA also provides all of the information normally included in an Environmental Assessment and meets the requirements of the National Environmental Policy Act (NEPA). It thoroughly compares the environmental impacts of the Final Array of alternatives and fully describes the impacts of the Recommended Plan.

The study alternatives include a No Action plan and various combinations of structural and nonstructural measures. The economic and environmental impacts of each alternative, as well as other factors, were evaluated in order to identify the most economically feasible and environmentally acceptable plan. The report concludes with the identification of the plan that will be recommended for Congressional authorization. The Port Isabel side channel that connects to the BIH is not included in this feasibility study.

1.4 NON-FEDERAL SPONSOR

The USACE, Galveston District was responsible for the overall management of the study and the report preparation. As the non-Federal sponsor, the BND was actively involved throughout the study process.

1.5 STUDY AREA

The study area includes the BIH Project, also known as the Brownsville Ship Channel (BSC), an existing deep-draft navigation project located on the lower Texas coast. The channel uses the natural Brazos Santiago Pass to connect the Gulf of Mexico with the inland portion of the BSC. The POB is located at the western end of the BIH navigation channel and includes a man-made basin located 3 miles north of the Rio Grande and the Mexican border and 5 miles east of the City of Brownsville. The BSC is the southernmost navigation channel in the State of Texas (Figure 1-1) and the western terminus of the Gulf Intracoastal Waterway (GIWW) system. The GIWW is a shallow-draft navigation channel 125 feet wide and 12 feet deep that traverses the entire length of the Laguna Madre.

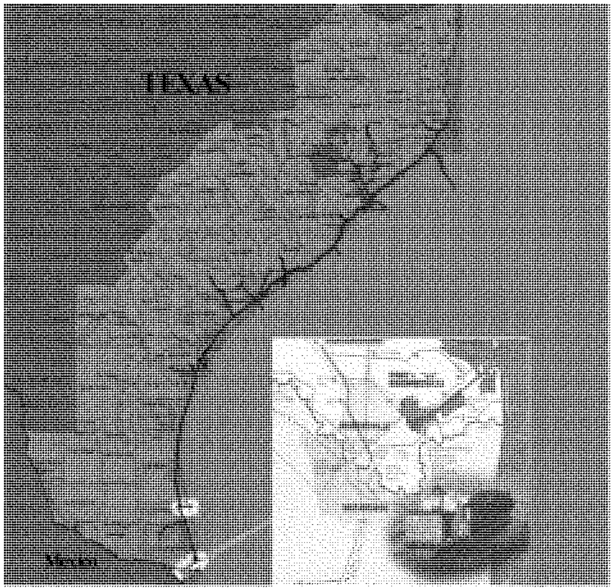

Figure 1-1. Project Location Map

The study area is located entirely within Cameron County, Texas, and encompasses the entire BIH and the surrounding region. The area is located in the Lower Rio Grande Valley (LRGV) and encompasses approximately 103,250 acres (160 square miles), extending 3 miles north, south, and west of the BIH, and continuing 5 miles offshore into the Gulf of Mexico (Figure 1-2). These 3-mile limits were established to ensure that environmental effects to areas adjacent to the Main Channel would be analyzed. In particular, they encompass the large and environmentally sensitive Bahia Grande Complex that lies north of, and is hydrologically connected to, the Main Channel, and all of the placement areas (PAs) that are located south of the Main Channel. The 5-mile offshore limit was established to encompass the existing Ocean Dredged Material Disposal Sites (ODMDSs). The study area also is extended for 10 miles along both sides of Brazos Santiago Pass for the purpose of evaluating potential shoreline impacts from deepening and extending the Entrance Channel.

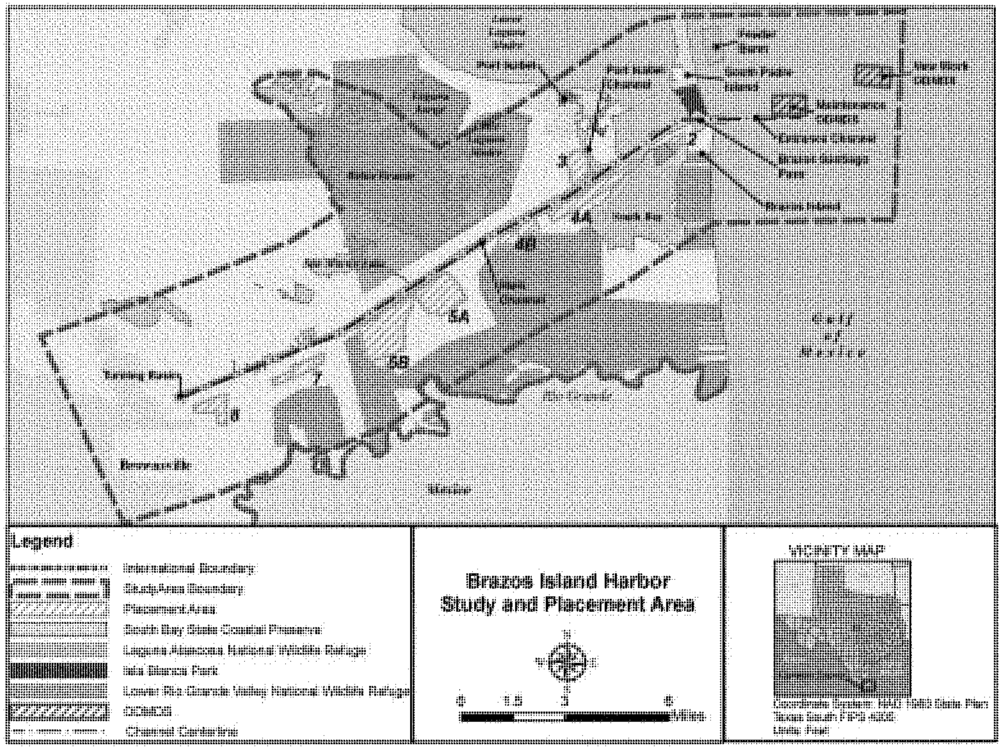

Figure 1-2. Study Area

The LRGV is one of the most biologically diverse areas in North America because biological communities from the desert, coastal, temperate, subtropical, and tropical zones converge. The diversity of ecosystems located within the study area provide habitat for an array of terrestrial and coastal flora and fauna, including a variety of threatened and endangered species, as well as providing an important stopping point for a substantial number of migratory birds. It marks the northernmost range of many tropical species found in Mexico and Central America.

Consistent with much of the Texas Gulf Coast, the study area includes barrier islands, shallow inland lagoons, and a relatively flat inland area. South Padre Island and Brazos Island, which border the Jetty Channel to the north and the south, respectively, are barrier islands. Unique to the area are extensive mud tidal flats and clay dune formations, or lomas, several of which lie adjacent to the ship channel. Emergent elevations within the study area range from sea level to a maximum of 12 feet above sea level, with an average land elevation of 1.2 feet above sea level (U.S. Geological Survey [USGS] Digital Elevation Model).

The major inland bay is the Laguna Madre. The Laguna Madre is a long, narrow, shallow, hypersaline lagoon extending from Corpus Christi Bay to the mouth of Rio Soto la Marina, Tamaulipas, Mexico. In Texas, the Laguna Madre lies between the Texas mainland and Padre Island, is approximately 120 miles long, and ranges from 4 to 6 miles wide. The lower portion of the Laguna Madre in Texas is within the study area. Brazos Santiago Pass is one of two main inlets in Texas connecting the Lower Laguna Madre to the Gulf of Mexico; the second is the Port Mansfield Channel, which is located well north of the study area. Extending into Mexico, the Laguna Madre de Tamaulipas is one of the most important bird wintering habitats on the Gulf Coast. In 2005, the Mexican government declared the Mexican portion of the Laguna Madre and the Rio Bravo's (Rio Grande) Delta a Natural Protected Area, providing legal protection to the rich natural resources of the Laguna Madre in Mexico.

In Texas, Bahia Grande is a 6,500-acre shallow bay located north of the BSC and immediately west of the Lower Laguna Madre. The construction of the BSC in the 1930s, placement of dredged material along the north side of the ship channel, and the construction of State Highway (SH) 48 isolated Bahia Grande from the Laguna Madre, effectively cutting off the natural hydrologic connection. This transformed the Bahia Grande from a wetland complex rich in biological resources to a 6,500-acre dry and barren salt/mudflat that was only periodically inundated during substantial precipitation events and occasional storm surges. The U.S. Fish and Wildlife Service (USFWS) purchased the Bahia Grande in 1998, incorporated the area into the Laguna Atascosa National Wildlife Refuge (LANWR), and initiated the largest estuary restoration project in the U.S in conjunction with several local, State, and Federal agencies. Restoration efforts are continuing in an effort to restore appropriate tidal flows and circulation into the entire Bahia Grande complex.

Army regulations and USACE Headquarters guidance on tidal datum, provided in Engineering Technical Letter 1110-2-349 Requirements and Procedures for Referencing Coastal Navigation Projects to Mean Lower Low Water Datum, dated April 1, 1993, and Engineering Manual (EM) 1110-2-1003, dated April 1, 2002, stress the necessity of converting local datum, such as mean low tide (MLT) to mean lower low water (MLLW). EM 1110-2-1003 further states that MLLW should be tied to the North American Vertical Datum (NAVD) 88. The predominant reason for conversion to MLLW is the need for consistency within the shipping and dredging industries with regard to channel depths.

Historically, USACE–Galveston used the MLT datum for its navigation channels. As noted in the regulations and guidance above, this datum was recently converted to MLLW for consistency with other USACE Districts. MLLW datum was used for all quantity calculations during plan formulation. For the BIH conversion, on average, the MLT/MLLW difference is +0.31 foot. Because this difference was so small and it would have little to no effect on dredging quantities, the study addresses MLT as equal to MLLW for conversion from historic dredging records and drawings. Therefore, –42 feet MLT is considered equal to –42 feet MLLW. The elevations of the PAs are referenced to NAVD 88.

1.6 PROJECT AREA

The project area includes the BSC and property directly adjacent to the channel, including the POB and upland PAs, as well as offshore PAs and a nearshore Feeder Berm. The POB owns all lands adjacent to the Main Channel. The port infrastructure consists of railroad and highway systems allowing access to the port facilities. The existing BIH navigation channel is 19.4 miles in length. The Entrance and Jetty Channels extend east to west for approximately 2.5 miles, from the open Gulf of Mexico, through the jetties to the Lower Laguna Madre. The flared North and South Jetties are 6,330 feet long and 5,092 feet long, respectively. They lie 1,200 feet apart, flanking Brazos Santiago Pass, which connects the Gulf of Mexico with the Lower Laguna Madre. The Main Channel begins at the Lower Laguna Madre and extends westward 14.8 miles to the Brownsville Turning Basin Extension Channel. The Turning Basin Extension transitions into the 1,200-foot diameter Turning Basin, which is the channel terminus at the POB.

There are 10 PAs available for the placement of dredged material from the BIH Project – two existing ODMDSs that can be used for the Entrance and Jetty Channels, seven upland PAs for containment of material from the Main Channel through the Turning Basin, and one nearshore Feeder Berm that can be used for beach-quality sediments from the Entrance Channel, Jetty Channel, and a portion of the Main Channel. The ODMDSs and Feeder Berm are all dispersive and by their nature have unlimited capacity.

Plans of the existing channel with stationing are included in Appendix B.

1.7 HISTORY OF THE INVESTIGATION

A reconnaissance study was undertaken to determine whether commercial navigation benefits would be produced by deepening and widening the BIH were sufficient to offset the costs and environmental consequences of any proposed improvements. The reconnaissance study concluded that channel deepening and widening appeared to be feasible and that it would be in the Federal interest to conduct more-detailed, feasibility-level studies, at a 50/50 cost shared basis with the non-Federal Sponsor, the BND. The feasibility study began in July 2006 after the signing of the Feasibility Cost Sharing Agreement. A Project Management Plan was developed to identify the investigations and analyses required to conduct the feasibility study and submit a feasibility report to Congress for authorization. A Feasibility Scoping Meeting was held in May 2008 to discuss the report submittal and Policy Compliance Review on the March 2008 submittal. Alternatives analysis and identification of the Recommended Plan have continued to present.

1.8 PRIOR STUDIES, REPORTS, AND EXISTING WATER PROJECTS

1.8.1 Prior Studies and Reports

The following studies were reviewed as part of feasibility study investigations. These reports provide information on previous Federal and local evaluation of water resource problems in the study area.

- *Dredged Material Management Plan, Preliminary Project Assessment, Brazos Island Harbor, Texas, February 1997.* This document evaluated placement capacity for the project for 20 years. Even though the report determined that sufficient capacity exists for the next 20 years, a better assessment of the shoaling rates was recommended to accurately forecast the capacity of PAs beyond the 20-year timeframe.
- *Channel Improvements for Navigation, Project Design Memorandum, November 1990.* The memorandum summarizes the design and cost data, project evaluation, and other information as part of the Preconstruction Engineering and Design (PED) Phase of the 42-foot project. Several departures from the authorized plan were made with this report. Most significant were an enlargement of the Turning Basin to 1,200 feet in diameter and a reduction in the width of the Main Channel to 250 feet from the Entrance Channel to the Goose Island Passing Basin, and then deepening only to the Turning Basin Extension, a total channel distance of approximately 14.8 miles.
- *Reevaluation Report for the Authorized Brazos Island Harbor, Texas (42-foot Project), October 1988.* This report details completion of a reevaluation of the authorized 42-foot project. The recommended plan detailed in the report includes enlarging the inland 14.8 miles of channel to 42 feet in depth and 300 feet in width. The Entrance Channel was also to be enlarged to a depth of 44 feet and a width of 400 feet. The plan also added an additional 240 acres of confined disposal areas and

795 acres of offshore disposal area to accommodate construction and future maintenance requirements.

- *Feasibility Report on Brazos Island Harbor, Texas, Brownsville Channel Improvements for Navigation, December 1979*. This is the original authorization report for the 42-foot channel improvement project. The plan included enlarging 14.8 miles of the Brownsville Channel to 42 feet by 300 feet and enlarging 2.5 miles of the Entrance Channel to 44 feet by 400 feet.

1.8.2 Existing Water Projects

Since 1880 with the first Federal involvement in navigation improvements, the BIH has evolved from a shallow-draft navigation channel with a depth of only 10 feet to a deep-draft navigation channel with its current 42-foot depth (Figure 1-3). The Rivers and Harbors Acts (RHAs) of 1880 and 1881 provided for deepening of the natural channel through the Brazos Santiago Pass to 10 feet, widening the channel through the pass to 70 feet, and the construction of two parallel jetties at the pass. Construction of the South Jetty was started in 1882 and continued until 1884, when operations were suspended due to a lack of funds.

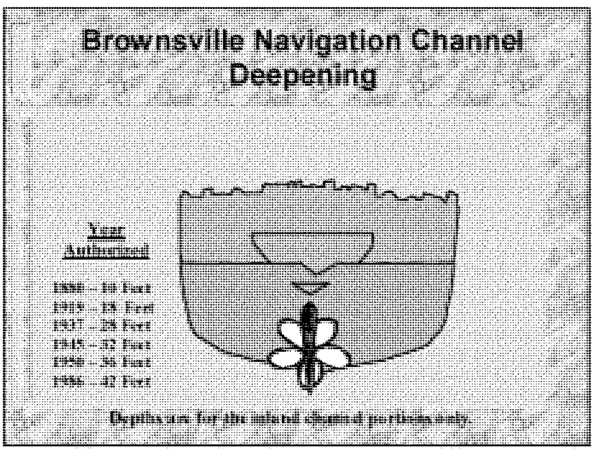

Figure 1-3. History of Channel Deepening

The RHA of 1919 provided authorization to deepen the channel to 18 feet with a 400-foot width through the pass. Under this authorization, two short stone jetties were constructed and some channel dredging was performed. As authorized in the RHA of 1930, jetties at the Brazos Santiago Pass were constructed in 1935 in conjunction with the construction of a navigation channel to Port Isabel. More channel improvements were completed in 1936 when the Main Channel to the Brownsville Turning Basin was dug through the Rio Grande deltaic plain to provide a navigation channel and turning basin for the City of Brownsville. After these channel improvements, the small fishing community of Port Isabel, located on the mainland overlooking the Laguna Madre and Brazos Santiago Pass, began to grow and industrial facilities were constructed along the western end of the Main Channel, near the Turning Basin and the City of Brownsville.

Several improvements to the waterway were authorized by the RHA of 1960. Most of the project improvements were constructed:

- Widening 1.3 miles of the Brownsville Turning Basin Extension from 300 feet to 500 feet in 1964;
- Construction of a third basin to the Brownsville Fishing Harbor in 1968;
- Widening the upper 3-mile reach of the BIH from 200 to 300 feet in 1980; and
- Deepening a locally dredged extension of the Brownsville Turning Basin from its 32-foot depth to 36 feet in 1980.

The construction of a 1,000-foot extension to the North Jetty, which was authorized by the RHA of 1960, was deauthorized under Section 1001 of the WRDA of 1986; however, the current project dimensions were authorized under Section 201, Public Law 99-662. Some of the authorized improvements (e.g. recreational facilities, jetty walkways and comfort stations, and dust control measures) were not implemented. The authorized increase of the turning basin by 1,000 feet, also included in the RHA of 1960, was modified to a 1,200-foot width based on subsequent engineering analyses. Construction of the WRDA 1986 channel improvements was completed in 1996.

2 EXISTING CONDITIONS

2.1 GENERAL

The BIH provides for –42-foot deep MLLW navigation on the inland portion of the channel and a 44-foot depth in the offshore Entrance and Jetty Channels (USACE, 1990). The BIH is essentially a straight waterway with no bridges or other obstructions for the entire 19.4-mile length of the waterway and is operated for single-lane, one-way traffic only. The existing waterway consists of the Entrance Channel, Jetty Channel, Main Channel, Turning Basin Extension, and Turning Basin. Table 2-1 presents the dimensions of the channel components.

Table 2-1. Dimensions of Existing Brownsville Ship Channel

Channel Reach	Constructed Depth (feet)	Constructed Bottom Width (feet)	Channel Length (miles)
Entrance Channel (Gulf of Mexico to offshore end of jetties)	44	300	1.3
Jetty Channel (Gulf of Mexico to Laguna Madre)	44	300_A	1.1
Main Channel (Laguna Madre to Turning Basin Extension)	42	250_B	15.1
Turning Basin Extension	Transitions from 42 to 36	Transitions from 400 to 325	1.3
Turning Basin	36	Transitions from 325 to 1,200	0.6

Notes:

A. Includes 0.2 mile by 400 feet transition to Main Channel. Remainder of Jetty Channel (0.9 mile) is 300 feet wide.

B. Includes 0.4 mile by 400 feet transition from Jetty Channel, 3.2 mile by 400 feet transition to Turning Basin and approximately 3 miles by 300 feet of Main Channel before the Turning Basin Extension. Remainder of Main Channel (11.5 miles) is 250 feet wide.

Approximately 1.1 million cubic yards (MCY) of shoaled material accumulates annually in the BIH channel, which equals 55.0 million MCY over the 50-year period of analysis (USACE, 2013a). There are nine PAs available for the placement of dredged material from the existing BIH Project—one site that can be used for the offshore section of the channel, seven upland confined sites for containment of material from the landlocked reach of the channel (PAs 2, 4A, 4B, 5A, 5B, 7, and 8), and a nearshore Feeder Berm. The two PAs for material from the offshore section of the channel are dispersive in nature and therefore have unlimited capacity. The Maintenance ODMDS is utilized for maintenance material deemed not suitable for beach or nearshore placement and is located approximately 2.5 nautical miles from shore. The nearshore Feeder Berm site is used for the close placement of beach quality sediment to augment the South Padre Island shoreline profile.

The majority of the inland portion of the channel is 250 feet wide and currently operates as a single-lane/one-way channel. The barge traffic does not interfere with deep-draft vessel movements. The rigs are generally so large that all other traffic has to be suspended while they transit the channel. Therefore, existing vessel management practices and scheduling are sufficient to maintain efficient channel operation.

2.2 PHYSICAL DESCRIPTION OF THE EXISTING PROJECT

Prior to the construction of the Federal navigation channel, the mainland adjacent to the Lower Laguna Madre was a mosaic of shallow estuarine bays and lakes, interspersed with tidal flats, islands, and clay lomas. Tidal access to the area was through the Brazos Santiago Pass, as it is today. The barrier islands, South Padre Island to the north of the Pass and Brazos Island to the south, were essentially undeveloped. The area was rich in biological resources and contained important waterfowl habitat.

2.2.1 Tides

The BIH channel is a natural tidal inlet (Brazos Santiago Pass) connecting the offshore Main and Jetty Channels to the Main Channel, a dead-end, nearly straight, man-made navigation channel. The BIH channel exchanges waters with Lower Laguna Madre, Bahia Grande, and South Bay. The Laguna Madre flows into the channel immediately west of the jetties, and this has minor impacts on the tide timing and elevations. Tides in the BIH study area range from a low ebb tide of 0.8 foot to a high flood tide of 1.4 feet. Mean range is 1.15 feet, and the diurnal range is 1.37 feet (National Oceanic and Atmospheric Administration [NOAA], 2013a).

2.2.2 Currents and Circulation

Offshore in the Gulf of Mexico, the dominant wave direction is from the southeast, producing currents flowing north and transporting sediment northward. The largest waves tend to propagate from the north-northeast and southeast, representative of strong frontal passages and tropical storms, respectively. Large waves from the north can cause significant southerly transport of sediments, though the short duration and infrequent occurrence results in less cumulative influence than the predominant northward current. Circulation in the Jetty Channel is driven by both tidal and meteorological forces. Tidal flow through the Jetty Channel flows northward into the Lower Laguna Madre, westward into the Main Channel, and a very small component southward into South Bay. The small tidal range and shallow depths of the Lower Laguna Madre and South Bay result in weak tidal circulation with these bays. Currents within the Main Channel are also very low, because it is a dead-end channel with very small freshwater inflows.

2.2.3 Relative Sea Level Rise

The range of relative sea level rise (RSLR) in the study area has been determined in compliance with the requirements of Engineer Circular (EC) 1165-2-212 (Sea-Level Change Considerations for Civil Works Programs). Low, intermediate and high projections of RSLR at the end of the 50-year period of analysis are estimated to be 0.63 foot, 1.06 feet, and 2.4 feet, respectively. Detailed discussion on RSLR is included in Section 6.3.2.

2.3 ENVIRONMENTAL AND HISTORIC RESOURCES

2.3.1 Protected/Managed Lands

All or parts of several Federal refuges and State parks and preserves are present in the study area. Federal protected lands include two national wildlife refuges managed by USFWS–LANWR and the Lower Rio Grande Valley National Wildlife Refuge (LRGVNWR) (Texas Parks and Wildlife Department [TPWD], 2003a, 2003b). State-protected lands include the Brazos Island State Scenic Park on Brazos Island and the South Bay Coastal Preserve (TPWD, 2012). Isla Blanca Park on the south end of South Padre Island, managed by Cameron County, is located in what is considered a prime surfing location.

2.3.2 Physical and Hydrological Characteristics of the Study Area

The study area is located in a unique environment—the southern end of the Texas portion of the Laguna Madre, one of perhaps six hypersaline lagoons in the world. Salinity in the Lower Laguna Madre generally ranges from 31 to 37 parts per thousand (ppt), with an average annual salinity of 33 ppt; however, salinity can vary wildly depending on rainfall and freshwater inflow, ranging from extremes of as low as 2 ppt after major tropical storms or hurricanes to as high as 120 ppt during extreme drought. Salinity in the western Gulf of Mexico ranges from 28 to 32 ppt. The waterbody is shallow, averaging approximately 4.6 feet deep, and, including the South Bay and the Bahia Grande complex, contains approximately 180,000 acres of aquatic habitat in Texas. Although no major rivers contribute fresh water to the system, some freshwater inflow is provided by the Arroyo Colorado, which flows into the Laguna Madre just north of the study area. The main outlet into the Gulf of Mexico for the southern reach of the Lower Laguna Madre is Brazos Santiago Pass (USACE, 2003).

Located in the West Gulf Coastal Plain physiographic province, the study area topography developed from sediments deposited in a mostly marine environment and later uplifted and tilted toward the Gulf (Texas Water Development Board [TWDB], 1990). Surface soils are composed of sand, silt, mud, and clay deposits of Holocene and recent ages deposited by alluvial, eolian, and marine processes (Brown et al., 1980; Page et al., 2005). In the area around Port Isabel and the barrier islands, landforms include beach ridges, tidal channels, tidal deltas, washover fans, sand and clay dunes, wind-tidal flats, and marine-plain flats. Extending inland from the marine plain through the western edge of the study area are floodplain deposits of mud, silt, and sand. Topography in this area is almost flat to gently undulating with the greatest relief occurring near the Rio Grande. Overall, there is a gradual rise in elevation from sea level to approximately 12 feet in the vicinity of the Turning Basin. The greatest topographic relief throughout the study area is exhibited by clay dunes or lomas (reaching from near sea level to 30 feet in elevation) and PA containment dikes. Beneath the surface deposits lies the Beaumont Formation, a massive and complex alluvial deposit of clay, silt, sand, and gravel deposited during the Pleistocene. Offshore, the Beaumont Formation lies beneath a thin mantle of sand and extends as far as the continental shelf, with thicknesses ranging from 450 to 900 feet (TWDB, 1990).

The BIH study area has a humid, subtropical climate, dominated by the influence of the Gulf of Mexico (Larkin and Bomar, 1983). Average monthly temperatures in the study area range from 65 degrees Fahrenheit (°F) in winter to 82°F in late summer, and monthly precipitation ranges from 0.94 inch during March to 5.3 inches in September, with an average annual rainfall of 27.6 inches (National Climatic Data Center, 2012). Extreme weather events such as hurricanes, floods, and droughts are significant influences on South Texas Coastal habitats and wildlife.

Hypersaline conditions (salinity greater than 40 ppt), which occur frequently in the Lower Laguna Madre and the Bahia Grande, are caused by a combination of shallow water depths, limited freshwater inflow, a regional climate with high evaporation rates, and limited surface water exchange with the Gulf of Mexico (USACE, 1990). Tidal exchange for the Bahia Grande complex occurs solely through a 2,200-foot-long pilot channel that connects to the Main Channel (USFWS, 2003). The POB donated property for the construction of the pilot channel, and the channel was excavated in 2005. Interior channels were later opened to restore circulation among the Laguna Larga, Little Laguna Madre, and the Bahia Grande (USFWS et al., 2009). Fish and wildlife have begun to reenter and utilize the area, but restoration efforts continue in regard to restoring appropriate tidal flows, circulation and salinity regimes (Hicks et al., 2010). The tidal range is typically less than 1 foot with minimal velocities. A combination of high evaporation rates and poor circulation has resulted in salinity levels in Bahia Grande as high as 170 ppt during the summer since the opening of the pilot channel.

Precipitation accounts for a majority of freshwater input into the Main Channel as no major rivers discharge into it. The highest salinity levels usually occur in July or August or during extended periods of drought. The limited tidal exchange with the Gulf of Mexico restricts flushing of the Main Channel to occurrences of hurricane-induced storm surge and hurricane-related precipitation events. Circulation within the Main Channel is wind-dominated, resulting in weak currents that are driven by the prevailing wind direction (USACE, 2012a).

2.3.3 Biological Communities in the Study Area

Cameron County and the southern tip of Texas occur in a region where coastal, subtropical, desert, temperate, and tropical biomes converge (McMahan et al., 1984). The following describes biological communities and wildlife habitat occurring in the study area. PAs, located adjacent to the Main Channel, currently consist of large expanses of dried soils with some areas of ponded water after significant rainfall events. Vegetation within the PAs consists of scattered grasses, cactus, and shrubs. Grasses include Gulf cordgrass (*Spartina spartinae*), silver bluestem *(Bothriochloa saccharoides)*, curly mesquite *(Hilaria belangeri)* and the introduced species, guinea grass (*Urochloa maxima*). Salt cedar *(Tamarix ramosissima)*, giant sumpweed (*Cyclachaena xanthifolia*), mesquite (*Prosopis glandulosa),* and prickly pear cactus (*Opuntia engelmannii)* are typical tree and shrub species found in the PAs. The PAs are not considered high-quality wildlife habitat due to recurring disturbance and lack of established native vegetation. The sparse vegetation in the PAs consists mainly of opportunistic species that thrive on disturbed soils and do not contribute significantly as food or detritus sources or scrub habitat.

2.3.3.1 Thornscrub Forest and Brush

Thornscrub forest and brush habitat are typically characterized by thorny brush and forest, mesquite savannahs that occur on upland sites like fluvial riparian zones of resacas and the Rio Grande, and on lomas throughout the study area. Impenetrable brush with a relatively closed canopy can serve as travel corridors for the federally listed ocelot (*Leopardus pardalis*) and jaguarundi (*Herpailurus yaguarondi*). Many birds only found in the LRGV use thornscrub forest and brushland as habitat. Within the study area, thornscrub forest occurs along resacas within and near the City of Brownsville. Resacas are relict oxbow lakes of the Rio Grande scattered throughout this area that provide aquatic habitat and support riparian fringe brush (Jahrsdoerfer and Leslie, 1988). Thornscrub brush exhibits a patchy occurrence in the study area, found mainly on high depositional ridges and lomas throughout the Rio Grande Delta.

2.3.3.2 Mesquite Savannahs

Mesquite savannahs mostly occur south of the Main Channel and north of the Rio Grande (Jahrsdoerfer and Leslie, 1988). The open grassland or savannah habitats have scattered mesquite trees or yucca (*Yucca* spp.). The grassland is a good hunting area for northern aplomado falcon (*Falco femoralis*), and the yuccas serve as resting and nesting habitat.

2.3.3.3 Clay Lomas

Clay lomas are brush-covered clay dunes situated within tidal and wind-tidal flats. Since lomas are dunes situated within tidal zones, the abrupt topographic reliefs create unique habitats. Lomas can reach a height of 30 feet above surrounding flats. Texas fiddlewood (*Citharexylum berlandieri*), Texas ebony (*Ebenopsis ebano*), and other woody brush typically colonize lomas.

Base vegetation usually consists of sea ox-eye daisy (*Borrichia frutescens*) and glasswort (*Salicornia* spp.), which are common high-salt, marsh plants (Jahrsdoerfer and Leslie, 1988). Clay lomas occur within wind-tidal flats north and south of the Main Channel and are located primarily in the eastern portion of the study area. In one PA, existing containment dikes tie into one loma, essentially using it as part of the PA containment dike system.

2.3.3.4 Tidal and Algal Flats

Tidal flats provide important habitat for a variety of coastal wildlife from migratory waterfowl, shorebirds (like the federally listed piping plover [*Charadrius melodius*]), wading birds, and other estuarine-dependent species like shrimp and various finfish (White et al., 1986). Cameron County is avian rich as evidenced by the 413 species of birds recorded at nearby LANWR (USFWS, 2008) and the 403 species of birds at Santa Ana National Wildlife Refuge (USFWS, 2011). Texas contains more tidal flats than any other state (23 percent of the nation's total, approximately 14 percent of which are located around the Laguna Madre). Some portions of study area tidal flats are unique in that wind and storm events dictate inundation, as opposed to typical, astronomically driven tidal regimes. Since wind and storm events only rarely inundate flats, these areas are called wind-tidal flats. Often these areas are dry, or consist of hypersaline, warm shallow water (Tunnell and Judd, 2002).

Conditions on wind-tidal flats are not conducive to marsh vegetation, and consequently these flats are usually barren except for large areas colonized by blue-green algae mats called algal flats. Algal flats are large, flat areas occurring at sea level to less than 3.3 feet above sea level that are rarely inundated and only during extreme tidal events, storms, and floods. The unique processes that result in algal flat formations only exist in several locations worldwide, including the Persian Sea, Red Sea, and eastern Mediterranean Sea (Morton and Holmes, 2009). Within the study area, wind-tidal flats (including algal flats) mostly occur on the north end of Bahia Grande, within the San Martin Lake complex (located just west of the Bahia Grande Complex), and on the eastern portions of South Bay.

2.3.3.5 Coastal Dunes

Coastal dunes are mounds or ridges associated with barrier islands and beaches that are formed from sands that are transported and deposited by the wind and the Gulf longshore current. Coastal dunes occur in the study area on Brazos and South Padre Islands. In the study area, coastal dunes on barrier islands generally follow a pattern where primary dunes occur immediately landward of the beachfront and are usually the largest. Immediately behind the primary dunes, secondary, and back island dunes form. Although a variety of wildlife species use coastal dunes and barrier islands, coastal dune habitats are especially known to include species like the Gulf Coast kangaroo rat (*Dipodomys compactus*), keeled earless lizard (*Holbrookia propinqua*), and the spotted ground squirrel (*Spermophilus spilosoma*). Migrating peregrine falcons also use study area coastal dunes and barrier islands as stopover habitat (Tunnell and Judd, 2002).

2.3.3.6 Bays and Deepwater Habitats

Bays and deepwater habitats are extensive in the study area and include the Main Channel, South Bay, the GIWW, the Laguna Madre, and the open Gulf of Mexico (USFWS, 2012). These bays and deepwater areas are important habitats for a variety of marine species, such as benthos, commercially and recreationally important finfish, federally endangered sea turtles, and marine mammals. The Lower Laguna Madre is one of the most productive estuaries in Texas, supporting a diversity of fish species, plankton, and benthic organisms and has great importance as a finfish and shellfish nursery area (Armstrong et al., 1987; Tunnell and Judd, 2002).

The Laguna Madre is the largest estuarine system on the Texas coast and is characterized as a hypersaline lagoon having little freshwater inflow, clear waters, and dominated by submerged aquatic vegetation (SAV) (Tunnell and Judd, 2002). In the Lower Laguna Madre, SAV covers approximately 118,000 acres of water bottom, or slightly more than 65 percent of the total water bottom. Seagrasses grow in patchy strips along the banks of navigation channels where water depths and clarity allow light penetration, including along portions of the GIWW channel. Although shoal (*Halodule wrightii*), turtle (*Thalassia testidunium*), and manatee (*Syringodium filiforme*) grasses are the primary SAV in the study area, widgeon grass (*Ruppia maritima*) may occur where salinity levels are lowest; South Bay contains small patches of star grass (*Halophila engelmannii*) (White et al., 1986).

2.3.3.7 Wetlands

Estuarine wetlands in the study area mostly consist of emergent or herbaceous vegetation, although some estuarine scrub-shrub vegetation can occur, mostly consisting of black mangrove (*Avicennia germinans*) or salt cedar. Black mangrove is a tropical shrub found in coastal wetlands in subtropical or tropical areas. Single black mangroves occur scattered throughout tidal areas of the study area; however, solid black mangrove stands occur along tidal margins (primarily channels) in the Lower Laguna Madre, South Bay, and the Bahia Grande. Stands of mangroves provide important habitat for various estuarine species and wading birds. The hypersaline conditions created by the Lower Laguna Madre, combined with the flat and low topography of the Rio Grande Delta, have resulted in estuarine wetlands that exhibit high salinity levels and foster salt-tolerant vegetation. Unlike bays in the more northern Gulf coastal areas, where smooth cordgrass (*Spartina alterniflora*) salt marshes are common along natural shorelines, smooth cordgrass marshes are very limited in the study area due to hypersalinity (TPWD, 1997; USFWS, 2012).

Freshwater wetlands occurring in the study area include palustrine emergent and scrub-shrub wetlands. These wetlands form in low areas beyond the tidal reach, interdunal depressions, and coastal prairie depressions. Most freshwater wetlands within the study area exhibit herbaceous or emergent vegetation, although areas of scrub-shrub vegetation also occur (TPWD, 2012).

2.3.3.8 Oyster Reef

The only living oyster reefs in the study area are found in South Bay (Tunnell and Judd, 2002). The Eastern oysters (*Crassostrea virginica*) occurring there are a genetically distinct population from other oysters inhabiting the Texas coast and have adapted to the hypersaline conditions (White et al., 1986). Oysters have not been commercially harvested from the Lower Laguna Madre since 1993. However, most areas within the study area are open to shellfish harvesting except the GIWW, the Main Channel, and a small portion on the backside of South Padre Island, Vadia Ancha, the Bahia Grande, and San Martin Lake. All of South Bay is open to harvest (Texas Department of State Health Services, 2011).

2.3.4 Essential Fish Habitat

Essential fish habitat (EFH) consists of those habitats necessary for spawning, breeding, feeding, or growth to maturity of species managed by Regional Fishery Management Councils, as described in a series of Fishery Management Plans, pursuant to the Magnuson-Stevens Fishery Conservation and Management Act. The Gulf of Mexico Fishery Management Council has identified habitats in the Lower Laguna Madre as EFH for brown, pink, and white shrimp (*Farfantepenaeus aztecus*, *Farfantepenaeus duroarum*, and *Litopenaeus setiferus*), Gulf stone crab (*Menippe adina*), several kinds of shark (Atlantic sharpnose [*Rhizoprionodon terraenovae*], blacktip [*Carcharhinus llimbatus*], bonnethead [*Sphyrna tiburo*], bull [*Carcharhinus leucas*], finetooth [*Carcharhinus isodon*], lemon [*Negaprion brevirostris*], scalloped hammerhead [*Sphyrna lewini*], spinner [*Carcharhinus brevipinna*], and silky [*Carcharhinus falciformis*]), gag (*Mycteroperca microlepis*), scamp (*Mycteroperca phenax*), cobia (*Rachycentron canadum*), dolphin (*Coryphaena hippurus*), greater and lesser amberjack (*Seriola dumerili* and *Seriola fasciata*), red snapper (*Lutjanus campechanus*), gray snapper (*Lutjanus griseus*), lane snapper (*Lutjanus synagris*), vermilion snapper (*Rhomboplites aurorubens*), red drum (*Sciaenops ocellatus)*, little tunny (*Euthynnus alletteratus)*, king mackerel (*Scomberomorus cavalla*), and Spanish mackerel (*Scomberomorus maculatus*). No Habitat Areas of Particular Concern were identified in the study area (NOAA, 2013b).

In addition to EFH, wetlands and seagrasses in the study area provide nursery and foraging habitat that support various forage species and recreationally important fishery species such as spotted seatrout (*Cynoscion nebulosus*), flounder (*Paralichthys* sp.), Atlantic croaker (*Micropogonias undulatus*), black drum (*Pogonias cromis*), striped mullet (*Mugil cephalus*), and blue crab (*Callinectes sapidus*). These estuarine-dependent organisms also serve as prey for other fisheries managed by the Fisheries Management Council (e.g., red drum, mackerels, snappers, and groupers) and highly migratory species, such as billfishes and sharks, managed by the National Marine Fisheries Service (NMFS). EFH for those species that may occur in the study area and may be affected by the proposed action include the sand substrate and seagrass beds at the project site.

2.3.5 Threatened and Endangered Species

Federally listed species potentially occurring within the vicinity of the study area include the jaguarundi and ocelot, the West Indian manatee (*Trichechus manatus*), 5 whale species (blue [*Balaenoptera musculus*], finback [*Balaenoptera physalus*], humpback [*Megaptera novaengliae*], sei [*Balaenoptera borealis*], and sperm [*Physeter macrocephalus*]), 2 bird species (piping plover and northern aplomado falcon), 5 sea turtle species (green [*Chelonia mydas*], hawksbill [*Eretmochelys imbricata*], Kemp's ridley [*Lepidochelys kempii*], leatherback [*Dremochelys coriacea*], and loggerhead [*Caretta Caretta*]), and 2 plants (South Texas ambrosia [*Ambrosia cheiranthifolia*] and Texas ayenia [*Ayenia limitaris*]) (NOAA, 2012; USFWS, 2013a). The piping plover regularly occurs, and the aplomado falcon is known to occur in the study area. In addition, designated critical habitat for the piping plover is present along the eastern margin of the project area. Tidal flats are potential winter foraging habitat for the piping plover. The jaguarundi and ocelot are believed to occur and are rarely observed in the study area. Loggerhead and green sea turtles are known to feed on seagrasses in the Lower Laguna Madre, with the green sea turtle being the more abundant of the 2 species, and Kemp's ridley sea turtle nests on South Padre Island are increasing. For the remaining species, the likelihood of occurrence in the project area is low to very low, primarily due to the lack of suitable habitat in the project area or the project area being outside of the known present or historical range and distribution of these species. Candidate species for Federal listing are 3 bird species (red knot [*Caladris canutus*], red-crowned parrot [*Amazona viridigenalis*], and Sprague's pipit [*Anthus spragueii*]), the scalloped hammerhead shark, and 7 coral species (boulder star [*Montastrea annularis*] and star [*Montastrea franksi*], elliptical star [*Dichocoenia stokesii*], mountainous star [*Montastrea faveolata*], Lamarck's sheet [*Agaricia lamarcki*], pillar [*Dendrogyra cylindrus*], and rough cactus [*Mycetophyllia ferox*]). Species of Concern (SOC) consist of 5 fish species (dusky shark [*Carcharhinus obscurus*], opossum pipefish [*Microphis brachyurus lineatus*], sand tiger shark [*Odontaspis taurus*], speckled hind [*Epinephelus drummondhayi*], and warsaw grouper [*Epinephelus nigritus*]). None of the Candidate species or SOC is likely to occur in the project area.

2.3.6 Water and Air Quality

Testing indicates that State water and sediment quality standards are consistently met in the South Bay, Lower Laguna Madre and Jetty Channel portions of the study area (Texas Commission on Environmental Quality [TCEQ], 2011). In the Main Channel upstream of its confluence with the Lower Laguna Madre, low tidal exchange and low velocities at times result in low dissolved oxygen in some areas. The water quality standard for bacteria and recreational use is not supported due to periodically elevated levels of *Enterococcus* bacteria in inland areas of the Main Channel.

The USACE has collected and archived a significant amount of water and sediment chemistry data from the BIH channel that was performed in conjunction with maintenance dredging, and new chemical, physical, and bioaccumulation assessments were conducted in 2012 (SOL Engineering Services, LLC [SOL] and Atkins, 2012, 2013). Detailed information on the chemical, physical and bioaccumulation assessments that have been conducted is available upon request. Analysis of the historical and recent testing data indicates that there is nothing in the chemical or physical analyses that would indicate a concern with the placement of these sediments in upland or offshore PAs. Toxicity bioassay results have indicated no toxic effect from BIH sediments or their elutriates.

Cameron County is currently designated as in attainment or unclassifiable with National Ambient Air Quality Standards (TCEQ, 2013a). Air quality in the study area is generally very good because there are few fixed or point emission sources that emit regulated pollutants (TCEQ, 2013b). Blowing dust can be a problem because of the prevalence of fine surface sediments in the area.

2.3.7 Noise

Land use adjacent to the BIH Main Channel is dominated by industrial development and existing PAs. As it enters from the Gulf, the BIH passes through the jetties and enters basically an industrial canal that ends at the POB Turning Basin. No noise-sensitive receptors such as residential, religious, educational, recreational, and medical facilities are located near the channel. However, several parks and recreational areas exist within the study area, including portions of the LRGVNWR, the LANWR, the South Bay Coastal Preserve, and Isla Blanca County Park.

2.3.8 Hazardous, Toxic and Radioactive Waste Concerns

The assessment of existing Hazardous, Toxic and Radioactive Waste Concerns (HTRW) conditions was conducted in general accordance with procedures described in the USACE Engineer Regulation (ER) 1165-2-132 - Water Resource Policies and Authorities Hazardous, Toxic and Radioactive Waste Guidance for Civil Works Projects (USACE, 1992). The assessment aims to identify the existence of, and potential for, HTRW contaminations on lands in the project area, or external contamination, which could impact or be impacted by the project. Historical aerial photographs were reviewed to examine the historical usage of the project area and surrounding areas. A review of reasonably accessible regulatory database findings was conducted to evaluate areas of potential environmental concern to the project area. A site reconnaissance was conducted in this assessment to verify the status and location of sites referenced in the regulatory database search or to locate any additional unreported hazardous materials site, as identifiable from public right-of-way.

The potential environmental impacts from the dredging and/or placement of material to be dredged from the Entrance and Jetty Channels were examined. Chemical analyses of water, sediment, and elutriate samples; suspended particulate phase and solid phase bioassays; and bioaccumulation studies were conducted in August and September 2012 (SOL and Atkins, 2013). Draft results of the chemical analysis and bioassays indicated no concerns with the ocean placement of these sediments. Chemical analysis of water, sediment, and elutriate samples from the BIH Main Channel were conducted in August 2012 (SOL and Atkins, 2013). Sampling was conducted to determine whether adverse impacts would result from dredging and dredged material placement operations. The report concluded that there was nothing in the chemical analyses that would indicate a concern with placement of these sediments. Detailed information on the chemical, physical and bioaccumulation assessments that have been conducted is available upon request.

These following HTRW sites (Table 2-2) were evaluated to determine the potential for active or historical HTRW activities to impact the project area or be impacted by the project. None are located in areas to be directly affected by project construction or placement activities.

Table 2-2. Hazardous, Toxic and Radioactive Waste Sites of Interest

Site	Description
Duro Bag Manufacturing 3401 David Shor Drive Brownsville, TX 78521 (adjacent to Main Channel)	Last reported as a large-quantity generator of hazardous waste in 2009, as identified in the Resource Conservation & Recovery Act- Generator Facilities (RCRAGR06) database. This facility received four notices of violation (NOVs) between 2006 and 2009, and one informal verbal enforcement resulted in 2009. The NOVs received by this facility indicate noncompliance with Federal regulations regarding hazardous waste operations. Specific information about the NOVs was not obtained in this records review.
Brownsville Navigation District 1000 Foust Road Brownsville, TX (0.18 mile north of Main Channel)	Reported as an inactive site within the TCEQ industrial and hazardous waste (IHW) Corrective Action Program. An Affected Property Assessment Report identified contaminants on-site in 2002 as: benz-a-anthracene; benzenes, toluenes, ethylbenzenes, and xylenes; fluoranthene; fluorene; phenanthrene; pyrene; and trimethylenzene,1,2,4. No remedial actions were reported.
Allied Trading 2601 North Indiana Avenue Brownsville, TX 78526 (0.19 mile south of Main Channel)	Active Municipal Solid Waste Landfill Sites (MSWLF). Solid waste is treated and/or stored at this location.

Site	Description
Groendyke Transport Inc. SH 48 Brownsville, TX 78522 (0.27 mile northwest of Main Channel)	A specific address was not provided for this leaking petroleum storage tank site, however, GeoSearch mapped the location according to a description of the tank's former location on SH 48 and Farm-to-Market Road (FM) 511. Gronndwater was impacted by the release of an unknown substance from a 3,000-gallon underground storage tank that was installed in 1956 and removed from the ground in 1989. The final concurrence of closure of this event is pending the documentation of well plugging. The leaking underground storage tank case is not closed.
Remediation Systems of Texas-Brownsville 400 Captain Don Foust Road Brownsville, TX (0.34 mile northwest of Main Channel)	This MSWLF site was reported to be closed with an estimated closure date in 1920. GeoSearch reported the facility type as a liquid transfer station.
City of Brownsville Composting Facility (approximately 3 miles northeast of Brownsville, northeast of Interstate Highway 4 and FM 511) Brownsville, TX (0.41 mile southeast of Main Channel)	Active MSWLF. Solid waste (compost) is treated and/or stored at this location.
Petro Processors Inc. on SH 48 (approximately 2.2 miles east of FM 511) Brownsville, TX 78720 (0.65 mile northwest of Main Channel)	Reported as a conditionally exempt small-quantity generator in 1990, identified through the RCRAC – Corrective Action Facilities database, and reported as a nongenerator in 2002. This petroleum refinery received six NOVs between 1986 and 2002 resulting in four enforcement actions in 1987, 1988, 1993, and 2002. Hazardous wastes at this facility were reported as ignitable waste, dissolved air flotation float, slop oil emulsion solids, heat exchanger bundle cleaning sludge, and separator sludge. An active IHW Corrective Action is identified on the TCEQ Central Registry (ID 33648). This clean up was started in 2006 and is ongoing. Various solid waste management units remain active at the time of this reporting.

2.3.9 Cultural Resources

Cultural resource surveys have been performed for much of the surrounding study area and for all of the project area, inclusive of all potential terrestrial and marine construction impact areas (Espey, Houston & Associates, Inc., 1981; Bond et al., 1990; Enright et al., 2012; Hall and Grombacher, 1974; Hoyt and Gearhart, 1992; Hoyt et al., 1991; Prewitt, 1974; Sanders, 2003; Weinstein et al., 2005). Forty-four terrestrial prehistoric and historic sites have been documented in the greater study area by numerous previous surveys. The majority of the terrestrial sites are prehistoric campsites and shell middens that date to either the Archaic or the Late Prehistoric periods. The majority of the historic sites are associated with archeological remains of the Brazos Santiago Depot, a military facility on Brazos Island during the Mexican War and later Civil War, which is the only site listed in the National Register of Historic Places in the study area. Brazos

Santiago Pass and the Laguna Madre are both considered archeologically sensitive, as historical research has identified 139 potential shipwrecks in these areas. Five marine remote-sensing surveys have covered the BIH channel from the Port Isabel Channel through the end of proposed channel improvements in the Gulf of Mexico, and these surveys found no historic properties within the project area. The BIH channel from Port Isabel to the Brownsville Turning Basin was cut through land in the 1930s; no surveys are needed for the remainder of the Main Channel since it was not constructed until the 1930s and therefore has very low potential for the presence of historically significant shipwrecks. Despite the high number of cultural resources in the study area, the cultural resource sensitivity of the project area is low as no sites or shipwrecks have been reported in the proposed project footprint.

2.3.10 Energy and Mineral Resources

Oil and natural gas make up the bulk of the region's mineral wealth (Brown et al., 1980). Within Cameron County, eight private mineral mines function to produce clays, fluorine, manganese, barium, chromium, strontium, and titanium. The Brownsville Mill (fluorine, barium, clays) and the Brazos Island mine (titanium) are located within 0.5 mile of the project area (US-Mining, 2013). These resource areas are not adjacent to the project area. Cameron County boasts approximately six oil and gas fields located within the study area. Two of these fields are located under the Laguna Madre in the Port Isabel area, while the rest are inland on either side of the channel. The biggest field is located near the Turning Basin on both sides of the channel. A review of the Texas Railroad Commission (RRC) database indicates that only one pipeline crosses the channel and none appears to cross any of the PAs (RRC, 2011). The Nustar Logistics refined petroleum products 10-inch pipeline crosses the channel in the vicinity of Station 80+000 at an approximate depth of 75 feet (USACE, 2005). Another pipeline (Port Isabel Gathering Line) is a 4.5-inch natural gas pipeline, which runs parallel to the north side of the Main Channel near the Bahia Grande and the Channel to Port Isabel.

2.3.11 Socioeconomic Considerations

Cameron County has experienced robust population growth over the last two decades, increasing by 29 percent between 1990 and 2000, and 21 percent between 2000 and 2010 (U.S. Census Bureau, 2010). The population of Cameron County has almost doubled since the 1980 census. Population growth in the vicinity of the study area has contributed substantially to the county's increase—Brownsville's population has doubled in size between 1980 and 2005, South Padre Island's permanent resident population has more than tripled, and Port Isabel's population has increased by more than 40 percent. In addition to the permanent residents, South Padre Island's population increases exponentially (averaging over 100,000) during peak tourist season, a trend that also continues to increase. The population of these 3 communities in the study area accounts for approximately 45 percent of the population of Cameron County.

The population of the Brownsville-Harlingen Metropolitan Statistical Area, located entirely within Cameron County, is currently equal to approximately 1 percent of the Texas state population. The population is forecast to increase by nearly 62 percent by 2050, or an average annual increase of 1.3 percent (Texas State Data Center, 2013). The change in population is expected to be twice that of the State of Texas (0.6 percent). Cities/towns that are expected to have the greatest growth during the period of analysis are South Padre Island (79 percent increase), Brownsville (64.4 percent increase), and Port Isabel (25.5 percent increase) (TWDB, 2011).

In 2010, the median household incomes in Cameron County ($31,264), Brownsville ($30,134), and Port Isabel ($22,969) are approximately 40 to 50 percent lower than the median household income for Texas ($49,646). In contrast, South Padre Island has a substantially higher per capita median household income ($53,175) than other parts of the study area and compared to Texas. Because South Padre Island is a coastal resort community with a small permanent resident population, high property values, and a high cost of living, the median household income of the population is higher than that for other areas in Cameron County. The Brownsville and Port Isabel poverty rates of 35.8 percent and 37.3 percent, respectively, are much higher than the 16.8 percent rate for the State of Texas as a whole (U.S. Census Bureau, 2010).

The civilian labor force in Brownsville consisted of 69,154 persons in November 2011, with an 11.3 percent unemployment rate compared to 60,951 jobs and an unemployment rate of 12.2 percent in November 2010 (Texas Workforce Commission, 2012a). The labor force in Port Isabel numbered 2,152 in 2010, compared to 2,258 in 2009 with unemployment rates of 5.8 percent and 8.1 percent, respectively. In South Padre Island, 1,020 persons were employed in 2010, compared to 1,177 in 2009 (U.S. Census Bureau, 2010).

The major employment sectors in the study area are educational and health services (25 percent), followed by government (24 percent), and trade, transportation and utilities (18 percent) (Brownsville Economic Development Council, 2010). Within Brownsville, the largest single five employers are Brownsville Independent School District, followed by The University of Texas–Brownsville, Cameron County Government, Keppel-AmFELS, and the City of Brownsville. The educational and health services sector is also the top employer in Cameron County with employment in that sector increasing by an average of 8 percent between the first quarter of 2009 and first quarter of 2011 (Texas Workforce Commission, 2012b).

2.4 ECONOMIC CONDITIONS

BIH is a bulk commodity port in which the major commodities include petroleum products, crude materials, and primary manufactured goods. There are several shipbreakers located at BIH that bring ships into the channel, dismantle the ships, and then place the materials on barges to ship out. In addition, there is one rig fabricator, Keppel-AmFELS, which builds, repairs, and inspects offshore oil rigs that are drilling in offshore deepwater in the Gulf of Mexico. The POB estimates that the harbor dock capacity is 18.7 million tons.

The POB is the only deep-draft port available to industry along the U.S. – Mexico border. Brownsville is primarily a bulk commodity port covering both liquid and dry cargo handling. The increased traffic is a direct result of the North American Free Trade Agreement in that a majority of the increased commodity traffic is to meet industrial needs in Mexico. One-way traffic limitations do not appear to be an issue with the existing channel.

The main harbor, including the Turning Basin, its extension and approach, contains Cargo Docks 1 through 4, 7, 8, 10 through 13, and 15; Oil Docks 1, 2, 3, and 5; a bulk/grain cargo dock; a liquid cargo dock; and an express dock. Activities at the POB (Figure 2-1) include:

- Offshore rig fabrication operations;
- Ship repair and dismantling;
- Steel fabrication;
- Boat construction;
- Liquid Petroleum Gas storage/distribution;
- Bulk terminals for petroleum, chemical, and miscellaneous liquids;
- Steel products and ore minerals offloading; and
- Grain handling and storage.

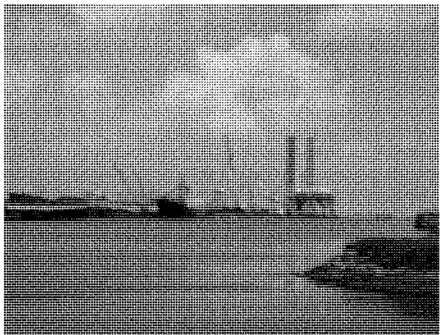

Figure 2-1. Port of Brownsville

Figure 2-2 shows the location of the facilities and docks along the channel. The POB is the owner of the property along the channel and leases the land to the facility operators. Detailed economic information is included in Appendix A – Economic Appendix.

Based on historical data, the major vessel categories are tank ships, bulk carriers, scrap vessels, and barges. The existing vessel size is limited because of current channel dimensions. The maximum ship dimensions permitted by the Brazos Santiago Pilots Association (Pilots) are a maximum length of 850 feet, maximum beam of 135 feet, and maximum draft of 39 feet. On average, there are 250 deep-draft vessel calls annually, while there are more than 600 barge movements annually. Under existing conditions, the deep-draft vessels do not come into the POB fully loaded. The current bulkers and tankers range from less than 20,000 dead weight tons (DWT) to approximately 70,000 DWT in size, with the majority of the calls in the smaller size range. The largest tanker that currently comes into the channel has a beam of 120 feet, while the largest bulker has a beam of 110 feet.

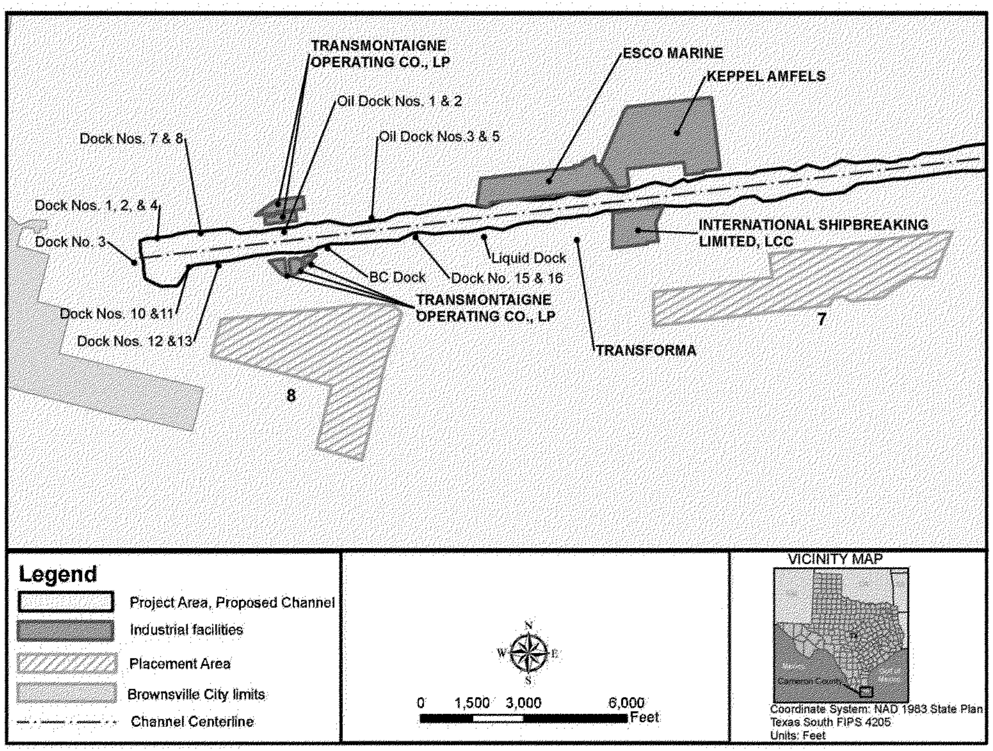

Figure 2-2. Locations of Port Facilities and Docks

Offshore oil rigs are routinely required to come into dock for inspections or they require maintenance and repair. The rigs are in dry dock for a minimum of 2 months, depending on the work required. The closest location for rigs operating in the Gulf of Mexico to have such inspections or repairs performed is the Keppel-AmFELS location at BIH. Keppel-AmFELS' work typically consists of jack-ups and semisubmersible oil rigs. However, over time, the semisubmersible rigs have been built wider and deeper, and they are reaching the limitations of the current BIH channel dimensions, which risks the operations being moved to Mexico without channel improvements.

Semi-submersible rigs use thrusters as part of their dynamic positioning while drilling offshore, but the thrusters add additional depth to the rig, constraining the rigs that can enter the channel. Some semi-submersible rigs are able to traverse the channel if the thrusters are removed at sea, which has been considered by rig owners for the work to be done at BIH. However, this costs millions of dollars and additional time, which is often a limitation for owners when deciding to bring a rig to BIH.

Analysis of the world offshore rig fleet and the current rig fleet for Brownsville indicates that only a small percentage of the world fleet could be serviced in Brownsville due to the width restrictions. Tables 2-3 and 2-4 show the world offshore rig fleet by width and the Brownsville rig fleet as compared to the world fleet, respectively.

Table 2-3. World Offshore Rig Fleet as of January 2009 (Includes New Construction)

Rig Width (feet)	Number	Percentage of World Fleet
150–165	6	2.8
189–197	3	1.4
200–236	16	7.5
246–249	4	1.9
250–277	25	11.8
280–298	24	11.3
302–325	29	13.7
327–349	29	13.7
350–399	67	31.6
400–410	7	3.3
531	1	0.5
820	1	0.5
Greater than 820	0	0.0
Total	212	100.0

Source: Fairplay/Lloyds' Register of Ships, January 2009.

Table 2-4 indicates that only 20 percent of the world fleet currently uses Brownsville while 80 percent have widths greater than 236 feet and would not be able to traverse the 250-foot channel. Additionally, Table 2-3 indicates almost 32 percent of the world fleet has widths between 350 and 399 feet and could possibly benefit from this additional width at Brownsville.

Table 2-4. Comparison of World and Brownsville Offshore Rig Fleet

Rig Width (feet)	Percentage of Brownsville Fleet				Percentage of World Fleet
	2006	2007	2008	2009	
Less than or equal to 175	63	50	33	67	12
200–236	37	50	67	33	8
Greater than 236	0	0	0	0	80
Total	100	100	100	100	100

3 FUTURE WITHOUT-PROJECT CONDITIONS

The USACE is required to consider the Future Without-Project (FWOP) alternative (called the "No Action" alternative) during the planning process and assessment of impacts to comply with USACE regulation and guidance for planning as well as NEPA. With the Future Without-Project (FWOP), it is assumed that no project would be implemented by the Federal Government or by local interests to achieve the planning objective. The FWOP forms the basis against which all other alternative plans are measured.

3.1 Economic Conditions

The non-Federal sponsor or other local interests have no plans to pursue channel improvements without Federal assistance. Therefore, the FWOP condition would retain the existing 42-foot-deep BIH by approximately 250 feet wide along the waterway. The channel would continue to be operated for one-way traffic only, as two-way traffic is not needed. The current dimensions would continue to limit the efficient movement of commodities by vessels traveling the waterway. As vessels increase in draft, the restrictive depth of the waterway would prevent vessels from entering with full loads or prevent larger vessels from even utilizing the waterway. The FWOP condition would lack social acceptance, considering the overall favorable public support of deepening and/or widening the current channel.

Population in the Cameron County study area is expected to increase by nearly 62 percent by 2050, and ethnicity is expected to remain primarily Hispanic/Latino. The study area economy would continue to be based on heavy and light manufacturing related to port activities, trade, commercial and recreational fishing, and tourism. The focus of these economic activities would continue to be the POB, the Port of Port Isabel, the Small Boat Fishing Harbor, recreation activities on the Gulf beaches and barrier island, and bird and wildlife watching in the numerous parks and preserves in the area. Publicly owned lands in the study area, such as Federal refuges, State of Texas wildlife management areas, and local parks would continue to be managed for the preservation of fish and wildlife and for public recreation. It is assumed that long-term refuge acquisition plans would continue to be implemented as funding is made available. Development along the Main Channel would continue to be constrained and controlled by POB ownership of most of the surrounding land.

Detailed economic analysis is presented in Appendix A – Economic Appendix. The current channel dimensions would also continue to limit the ability of the shipyards along the waterway to bring in the larger oil rigs that are currently operating in the Gulf of Mexico. The existing shipyard would not be able to accommodate drill ships, but would continue accommodating jack-up rigs and semi-submersible rigs. The semi-submersible rigs would need to continue to remove thrusters to enter the channel, although this has yet to be done at BIH for a variety of reasons. Based on recent economic evaluations, up to 5,000 jobs are attributed to these operations.

Without channel improvements, oil rig repair operations (and jobs) would possibly be relocated to Mexico, resulting in not only an economic impact in the South Texas region, but also the national economy.

Removing thrusters before entering the channel can be cost prohibitive because of the additional expense this adds to the vessel transportation to the channel. Among the elements included in the thruster removal costs are tractor tugs (to be transported from Corpus Christi Ship Channel), divers to remove the thrusters, a crane barge, crew, and miscellaneous support. On average it takes one day to remove or reattach one thruster and a semi-submersible rig typically has four to eight thrusters that need to be removed to enter the channel and then reattached after the work on the rig in the channel has been completed. The total cost to remove and then reattach the thrusters offshore can be upwards of $15 million.

However, while thrusters have not, to date, been removed offshore for a rig to enter the BSC, it is reasonable to assume that in the future, the without-project condition will experience rigs entering the channel with their thrusters removed for a variety of reasons. No matter where in the world a rig travels to, including BIH for modifications or inspections, if it will be dry docked, the thrusters will need to be removed. Thrusters protrude significantly and because of their height, scaffolding would likely have to be 20 feet high for work to be completed, which increases the difficulty and adds additional risk. Thus, thrusters will always be removed; it is just a matter of whether or not it will be done at the dock or in the case of BIH, outside the channel in the without-project condition. The with-project condition assumes thrusters will also be removed at BIH, but that would be done dockside in that condition.

The newest semi-submersible rigs have not reached the age in which they have required their decadal ABS inspection or modifications. As the fleet ages, though, drilling rig owners would rather have a rig operating in the Gulf of Mexico visit a local port for repair or inspection in order to reduce the transit time and cost. Even with the cost to remove and reattach the thrusters at sea before entering BIH, it is more time effective than moving the rig to a foreign country. With the assumption that it will take a week to remove the thrusters and another week to reattach the thrusters for a rig to visit BIH, this is only two weeks of downtime, but the downtime would be longer if a rig has to move to a foreign country for service.

Taking into consideration the competition to keep rigs near the Gulf of Mexico, the time and cost savings to remove the thrusters at BIH, and the upcoming need for inspections and modifications, it is reasonable to assume that thrusters will be removed at BIH in the near future, even without the channel modifications. Keppel-AmFELS has taken measures to be ready for such activities by securing a regulatory permit from USACE for a square mile of land six miles from the channel jetties where the thrusters will be able to be removed. Keppel-AmFELS has incurred the cost for this permit as commitment to remove thrusters in the without-project condition in attempt to remain competitive in the oil drilling rig fabrication market while oil production occurs in the Gulf of Mexico.

While the volume of commodities is expected to grow in the future, lack of channel modifications to BIH would continue operating inefficiencies. The number of vessel calls would increase, but there would be continued restrictions on the draft of vessels and larger vessels would be prevented from utilizing the channel. Therefore, there would continue to be additional costs and delays for vessels, which could discourage long-range industrial growth.

3.2 Dredged Material Base Plan Description

Maintenance dredging activities would continue to be performed as they have been in the past. Dredging of the Entrance and Jetty Channels would be performed by hopper dredge, with higher shoaling sections dredged as frequently as every 18 months, and other reaches dredged on the average of 4.5 years. In recent years, all material has been placed in the least-cost nearshore Feeder Berm or directly onto South Padre Island beaches under cost-sharing agreements with the Texas General Land Office (GLO) and the City of South Padre Island. The Maintenance ODMDS site has not been used in recent years because it was preferable to use the material beneficially, if possible. The Main Channel reaches would continue to be dredged every 4 to 7 years with a hydraulic pipeline cutterhead, with material being pumped to the existing PAs that line the channel's south bank. No new PAs would be needed to accommodate quantities expected over the 50-year period of analysis. PA dikes would continue to be raised incrementally as additional capacity is needed. On occasion in the past, the BIH channel maintenance has been postponed because of budget considerations, resulting in restricting vessel drafts to those shallower than the authorized depth. However, the channel is expected to be maintained at authorized depths in the future.

3.3 Environmental and Historic Resources

Potentially adverse environmental effects of a channel modification, primarily from channel widening, would be avoided in the FWOP. Environmental effects of the existing project would continue as they do today. The largest impact is the adverse effect of hopper maintenance dredging on threatened and endangered sea turtles; no other listed species are affected by maintenance dredging or placement activities. Hopper dredging would continue to comply with the reasonable and prudent measures (RPMs) and implementing Terms and Conditions described in the Gulf Regional Biological Opinion (GRBO) for Hopper Dredging, Gulf of Mexico (NMFS, 2003 with 2005 and 2007 updates). Although the existing PAs are located in or adjacent to sensitive environmental zones, potential impacts to nearby seagrass beds, black mangrove stands, wind-tidal mud and algal flats, the Bahia Grande, the Lower Laguna Madre, and Back Bay would be avoided by the consistent use of best management practices (BMPs), which would prevent the discharge of dredged material into these areas. Similarly, the use of BMPs would prevent impacts to all biological communities in the project vicinity, including thornscrub forest and brush, mesquite savannahs, clay lomas, coastal dunes, wetlands, and oyster reef. Minor and temporary effects to air quality and noise levels would occur during maintenance dredging episodes. The Main Channel is a dead-end channel with low tidal exchange, little freshwater inflow, and low velocities, all of which would be expected to continue to contribute to low dissolved oxygen in some areas at some times. Sediment quality would be monitored to identify contaminants in the dredged material, even though no concerns with contaminated sediments have been documented in the project area in over 30 years of monitoring.

While the study area is rich in archeological sites and numerous historic shipwrecks have been reported in the area, none are affected by on-going maintenance dredging activities. Archeological sites known to be present in the vicinity are located on clay lomas, which are avoided by construction activities, both for their cultural and habitat values. No historically significant shipwrecks have been identified along the existing channel margins or side slopes, or in the ODMDS.

3.4 Relative Sea Level Rise

The FWOP conditions must include consideration of potential changes in RSLR over the period of analysis. Rising regional sea level would result in small increases (no greater than 2.4 feet) in inundation and tidal circulation in the Laguna Madre, Bahia Grande complex, and Back Bay. Armoring may be needed to protect PAs near Brazos Santiago Pass, but overall, base land elevations along the channel are high enough that even the high range estimate would result in few changes to navigation features or industrial infrastructure.

4 PROBLEMS AND OPPORTUNITIES

4.1 PROBLEMS

The problems in the BIH study area are:

- Constraints of channel dimensions for the POB have resulted in inefficient navigational practices; and
- Limited ability for oil drilling rig fabrication, maintenance, and repair at the POB due to current channel dimensions.

4.2 OPPORTUNITIES

Opportunities in the BIH study area include the following:

- Increase navigational efficiency of vessel transportation for the channel; and
- Increase ability of the channel to accommodate offshore rigs for maintenance and repair as well as fabrication of new rigs.

Scoping, detailed in Section 9.0, identified operational constraints with the BSC as an existing problem. Other public concerns involved issues that were not within the study authority.

The POB has experienced strong overall growth from the early 1990s to present day. Total tonnage on BIH has more than tripled from 1,641,000 short tons in 1990 to 5,907,000 short tons in 2011. Foreign imports have been the primary driver for growth, including petroleum products, iron, and steel products.

In addition to traditional vessel traffic, there is a need for increased channel dimensions in order to serve offshore rigs presently operating in the U.S. Gulf Coast (USCG). Keppel-AmFELS is currently operating on the BIH for the fabrication, maintenance, and repair of rigs, and several oil companies have acquired Outer Continental Shelf blocks due to the proximity to BIH. The operational draft of the newer rigs ranges from 45 to 63 feet. Current dimensions of BIH limit the ability of shipyard repair operations to bring in larger oil rigs (Figure 4-1).

4.3 PLANNING OBJECTIVE

The following planning objective was used in formulation and evaluation of alternative plans:

- Increase navigational efficiency of cargo vessels and offshore rigs using the channel during the 50-year period of analysis.

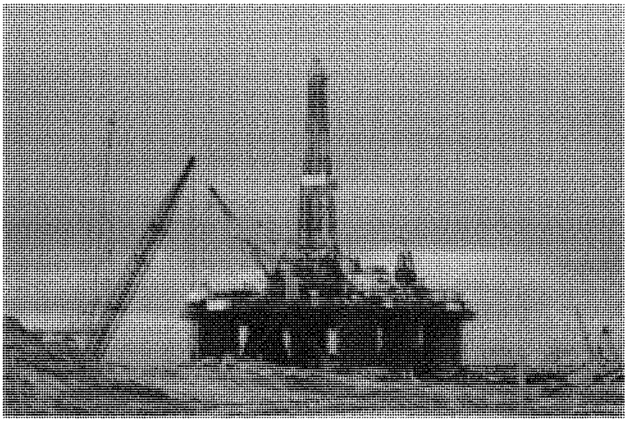

Figure 4-1. Offshore Rig Fabrication Operations

4.4 PLANNING CONSTRAINTS

The following constraints apply to this study:

- Minimize impacts to designated critical habitat for threatened and endangered species in the study area;
- Minimize impacts to threatened and endangered species in the study area;
- Minimize impacts to cultural resources listed on or eligible for the National Register of Historic Places (defined as historic properties);
- Develop alternatives within Coastal Barrier Resources Act (CBRA) guidelines, which prohibit new Federal expenditures or financial assistance within any CBRA unit with the exception of improvements to existing navigation channels, disposal areas, and related improvements; and
- Limit channel traffic to single lane/one way only.

4.5 RELATED ENVIRONMENTAL DOCUMENTS

The proposed action is included in sections of this FIFR-EA in order to satisfy the requirements of NEPA. Other NEPA documents prepared by the USACE related to the planned action include the *Environmental Statement, Brazos Island Harbor, Texas, Brownsville Channel* (1979); *Environmental Assessment, Brazos Island Harbor Underwater Feeder Berm Construction, USACE (1988); Final Environmental Impact Statement, Brazos Island Harbor Ocean Dredged Material Disposal Site Designation, EPA (1990); and Final Environmental Impact Statement, Brazos Island Harbor 42-Foot Project, Texas, Ocean Dredged Material Disposal Site Designation, EPA (1991).*

4.6 DECISIONS TO BE MADE

This FIFR-EA will provide recommendations for reducing vessel costs to improve navigation efficiencies and improving channel dimensions to accommodate current and future offshore rigs into the POB for fabrication, maintenance, and repair during the 50-year period of analysis in the BSC. Various alternatives were evaluated and specific measures were suggested to minimize, or avoid, adverse effects to local resources.

4.7 AGENCY GOAL OR OBJECTIVE

The planning objective of the feasibility study involves the use of available information and hydrodynamic modeling to evaluate navigation improvements in BIH over the 50-year period of analysis from 2021 to 2071. The specific planning objective for the feasibility phase of the BIH channel improvement study includes identification of a plan for BIH, which most efficiently and safely maximizes net benefits for the BSC existing and future ship and rig traffic.

5 FORMULATION AND EVALUATION OF ALTERNATIVE PLANS

5.1 PLAN FORMULATION RATIONALE

Plan formulation is the process of building alternative plans that meet the planning objective and developing alternatives within the planning constraints. Alternative plans are a set of one or more management measures functioning together to address the planning objective. A management measure is a feature that can be implemented at a specific geographic site to address the planning objective. A feature can be a structural element that requires construction or a nonstructural action.

Preliminary plans were formulated by combining management measures. Each plan was formulated in consideration of the following four criteria described in the Principles and Guidelines (P&G):

- Completeness: Extent to which the plan provides and accounts for all necessary investments or actions to ensure realization of the planning objective
- Effectiveness: Extent to which the plan contributes to achieving the planning objective
- Efficiency: Extent to which the plan is the most cost-effective means of addressing the specified problems and realizing the specified opportunities, consistent with protecting the nation's environment
- Acceptability: Workability and viability of the alternative plan with respect to acceptance by Federal and non-Federal entities and the public, and compatibility with existing laws, regulations, and public policies

Initial study efforts involved a determination of the magnitude and extent of the problems along BIH in order to develop and evaluate an array of alternative solutions that meet the existing and long-range future needs of the non-Federal sponsor and the public. At the initiation of the feasibility phase of the project, lines of communication were opened with Federal, State, and local agencies, private groups, and the affected public. A public scoping meeting was held in Brownsville, Texas, on January 31, 2007. As mentioned earlier, the attendees were overwhelmingly in favor of the project for the economic benefits it would likely generate for the South Texas area. The public was assured that their involvement would occur throughout the planning process.

5.2 MANAGEMENT MEASURES

The main problems with the existing channel are constraints in accommodating deeper draft vessels like the post-Panamax vessels and the inability to accommodate larger offshore rigs.

Nonstructural and structural measures were developed to address the planning objective, alone or in combination with other measures. These measures were later combined to form alternatives to be evaluated in this study process. New measures identified in later phases of the Plan Formulation process were also reviewed and considered in the alternative analysis. Measures were formulated to avoid or minimize the constraints, identified in Section 4.4.

5.2.1 Nonstructural Measures

Based on the economic forecasts discussed in Section 3.1, Economic Conditions, existing vessel management practices and scheduling is sufficient to maintain efficient channel operation in the future. Therefore, no nonstructural alternatives related to vessel management were included.

The nonstructural measures considered included:

- Utilize another port; and
- Alternative modes of commodity transport.

A multiport analysis was used to assess whether or not improvements at BIH would result in a diversion of cargo traffic that would either shift to or from competing ports to or from BIH. The analysis is included in the Economic Appendix (Appendix A) and did not find any reason to assume a shift in cargo to or from BIH. If it was determined that there is an impact, the forecasted cargo traffic at BIH would be adjusted by an amount derived from the cargo movements analysis and transportation costs at competing ports; however, in this case, there was no evidence that such a shift would occur.

Further, the multiport analysis was used to determine that the nonstructural measures developed to address at least one of the planning objectives are not reasonable. Utilizing another port would require additional transportation to the subject hinterland and the use of another port and alternative modes of commodity transport would add additional cost. Therefore, the additional cost compared to the transport to BIH leads to the nonstructural measures being removed from further consideration.

5.2.2 Structural Measures

Structural measures included:

- Deepen only;
- Widen only;
- Deepen and widen channel;
- Widen only up to location of existing offshore rig fabrication operations;
- Relocate turning basin to new location closer to the channel entrance; and

- Widen using shelves to facilitate rig movements on the outer Main Channel.

The purpose of the deepening and/or widening measures of the existing 42-foot channel would be to allow existing ships to more fully utilize the channel while also allowing larger offshore rigs to come into the port for fabrication, maintenance, and repair. The deepening and/or widening measures could also be considered at different scales (various channel depths and widths). Widening specific parts of the channel includes widening using shelves on either side of the deep-draft channel to accommodate rigs that need additional widths but not at the deeper channel depth. Widening the channel only up to the existing rig facilities located near the turning basin was also considered as part of the formulation to accommodate wider rigs. Widening considered in any alternative would be limited since the channel would continue to operate for one-way traffic only in the future.

Another measure considered was construction of a new turning basin closer to the channel entrance. This measure would allow for a shorter segment of channel to be improved, allowing the vessels to travel only as far as this new turning basin. For this measure, the remainder of the channel would continue to be maintained at existing conditions and would not be able to serve any future vessels and rigs that require channel improvements. With this new turning basin measure, considerable upland development would be required after completion of channel improvements, with no benefits from the improved channel being realized by existing tenants unless their operations are relocated to this new turning basin area.

The detailed Plan Formulation analysis, including development of the alternative and screening to the Final Array, is included in Appendix L.

5.3 SUMMARY OF ALTERNATIVES ANALYSES

Measures were evaluated and screened by the team through several arrays of alternatives. Consistent with new SMART Planning concepts, this effort included a qualitative analysis of an Initial Array, and quantitative analysis of an Evaluation and Final Array of alternatives.

In the evaluation of the Initial Array, a combination of deepening and widening alternatives was evaluated qualitatively based on several factors including potential to improve navigation efficiencies, scale of possible environmental and cultural impacts, potential for significant increases in costs, both operations and maintenance (O&M) and construction, as well as possibility for public concern with the different alternatives. The alternatives were scored based on the team's assessment and a reduced combination of widening and deepening alternatives was carried forward into the Evaluation Array.

The Evaluation Array included deepening alternatives at 45, 48, and 50 feet. In this analysis, the sponsor had limited the team to considering only depths up to 50 feet because of cost limitations and the belief at that time that no vessels would utilize depths greater than that. Widening alternatives evaluated were a full 200-foot widening and a 75-foot widening in limited areas (shelves). The 200-foot widening was driven by the possibility for large rig access in the channel. The team also evaluated creation of a new turning basin and associated facilities that would allow rigs to travel a shorter distance to their destination.

For the Evaluation Array, the team prepared qualitative assessments, again looking at the potential for improved navigation and environmental impact, as well as quantitative measures that detail costs and economic benefits. Based on the scores the team determined that all three deepening only alternatives as well as the three alternatives that combined deepening with 200-foot widening had the greatest potential for success.

From those results, the team developed a Final Array that would be evaluated quantitatively for selection of the Recommended Plan. In the quantitative results calculated for the Evaluation Array, the 50-foot deepening alternative had the greatest net excess benefits for the deepening only alternatives. Based on this result, the team added an alternative to the Final Array of deepening to 52 feet in an attempt to determine whether the 50-foot alternative was in the fact the NED Plan. Also, during the analysis performed for the Evaluation Array, changes to vessel fleet forecasts were realized that would impact the widening alternatives that would need to be evaluated. Changes were made to both expected tanker traffic and rig movements. Oil exploration is expected to switch away from rigs to drill ships, which do not require large widths but would benefit from deeper depths. Based on these considerations the 200-foot widening was dropped from consideration. However, 50- and 100-foot widening were added to ensure that sufficient analysis was conducted to determine if widening would be part of the Recommended Plan.

5.4 COMPARISON OF FINAL ARRAY OF ALTERNATIVE PLANS AND DECISION CRITERIA

Table 5-1 presents the Final Array of alternatives along with the corresponding dredged material quantities, average annual costs and benefits, net excess benefits, and benefit-to-cost ratios (BCRs) using the most current price level and interest rate at the time of calculations (October 2012 and 3.75 percent interest rate).

For the Final Array of alternatives, all of the channel depth alternatives are economically justified at either the current 250-foot or the 300-foot width alternative, but not at the 350-foot width alternative. The deepening alternatives with no widening have the greatest BCRs and net excess benefits compared to those with any widening.

In comparing the deepening only alternatives, the net excess benefits are increasing as the channel depths increase. Interpolation between these depths was used to optimize the plan and possibly identify the NED plan. Appendix A includes details of the benefit analysis and this

Table 5-1. Traditional NED Benefit Analysis for Final Array of Alternative Screening
(Cost in $1,000s, October 2012 price levels, 3.75% interest rate)

Alt. No.	Description	Dredging Quantities (cy)	First Cost	Average Annual O&M	Total Annual Costs[1]	Average Annual Benefits	BCR	Net Excess Benefits
F-1a	Deepen from 42 to 45 feet	3,736,000	89,200.0	856.3	4,932.0	9,717.2	1.97	4,785.2
F-1b	Deepen from 42 to 48 feet	8,274,000	121,340.0	1,084.2	6,670.5	14,204.6	2.13	7,534.1
F-1c	Deepen from42 to 50 feet	11,430,000	162,170.0	1,324.1	8,861.4	17,380.8	1.96	8,519.5
F-1d	Deepen from 42 to 52 feet	14,093,000	193,950.0	1,503.3	10,586.4	19,873.8	1.88	9,287.4
F-2a	Deepen from 42 to 45 feet/widen from 250 to 300 feet	7,703,000	126,090.0	2,240.2	8,067.3	10,843.1	1.34	2,775.9
F-2b	Deepen from 42 to 48 feet/widen from 250 to 300 feet	12,912,000	189,430.0	2,623.9	11,563.2	13,760.4	1.19	2,197.3
F-2c	Deepen from 42 to 50 feet/widen from 250 to 300 feet	16,503,000	230,730.0	2,853.2	13,867.0	17,939.3	1.29	4,072.2
F-2d	Deepen from 42 to 52 feet/widen from 250 to 300 feet	19,758,000	274,220.0	3,100.8	16,342.2	20,440.4	1.25	4,098.1
F-3a	Deepen from 42 to 45 feet/widen from 250 to 350 feet	14,007,000	204,970.0	4,354.3	14,063.9	8,958.2	0.64	–5,105.7
F-3b	Deepen from 42 to 48 feet/widen from 250 to 350 feet	19,315,000	271,090.0	4,889.2	17,979.5	14,140.2	0.79	–3,839.3
F-3c	Deepen from 42 to 50 feet/widen from 250 to 350 feet	22,569,000	310,880.0	5,272.9	20,342.4	16,687.0	0.82	–3,655.4
F-3d	Deepen from 42 to 52 feet/widen from 250 to 350 feet	26,728,000	365,860.0	5,606.1	23,616.5	19,896.1	0.84	–3,720.4

[1] Total Annual Costs is a sum of Average Annual Cost and Average Annual O&M. Average Annual Costs is a sum of First Cost of Construction and Interest during Construction.

interpolation for all of the final alternatives; whereas Table 5-2 presents just those interpolated depths for the no widening alternative.

Table 5-2. NED Benefit Analysis for Deepening Only Alternatives
(Cost in $1,000s, October 2012 price levels, 3.75% interest rate)

Alt. No.	Description	Average Annual Costs	Average Annual Benefits	BCR	Net Excess Benefits
	Deepen from 42 to 43 feet	3,366.6	3,239.1	1.0	−127.5
	Deepen from 42 to 44 feet	4,148.0	5,795.9	1.4	1,647.8
F-1a	Deepen from 42 to 45 feet	4,932.0	9,717.2	2.0	4,785.2
	Deepen from 42 to 46 feet	5,509.0	11,213.0	2.0	5,704.0
	Deepen from 42 to 47 feet	6,088.5	12,503.7	2.1	6,415.2
F-1b	Deepen from 42 to 48 feet	6,670.5	14,204.6	2.1	7,534.1
	Deepen from 42 to 49 feet	7,761.4	15,792.7	2.0	8,031.4
F-1c	Deepen from 42 to 50 feet	8,861.4	17,380.8	2.0	8,519.5
	Deepen from 42 to 51 feet	9,721.0	18,627.3	2.0	8,906.3
F-1d	Deepen from 42 to 52 feet	10,586.4	19,873.8	1.9	9,287.4

All alternatives in the Final Array were compared based on economic, engineering, environmental, and socioeconomic factors as presented in Table 5-3. PAs do not need to be expanded to accommodate new work material and the 50-year dredged material quantities, and no new PAs are planned. All PA containment dike lifts would be accomplished inside the footprint of the existing containment dikes, and BMPs would be utilized during construction to avoid impacts to water quality, which could affect SAVs or mangroves located near some PAs.

All structural alternatives would result in the use of hopper dredges in the Gulf of Mexico, and all therefore would have the potential to impact threatened and endangered sea turtles. RPMs, developed to avoid adverse impacts to these species, would be similar for all alternatives. None of the alternatives would result in impacts to terrestrial resources, wetlands, or tidal/algal flats. No oyster reef is located near the alternative impact areas.

The deepening only alternatives (F-1a through F-1d) would result in minor additional widening of the top of cut within the existing waterway. Benthic communities that may be present in the submerged sediment on the edge of the current channel would be destroyed, but they would rapidly recolonize. SAV beds are located near the Port Isabel Wye in the shallow waters of the Main Channel along the emergent shoreline. None of the deepening only alternatives would result in SAV impacts. Among the action alternatives, the deepening only alternatives result in the fewest environmental impacts, and there are no significant differences in impacts among them.

Table 5-3. Comparison of Final Array Alternatives

Alternative Number	No Action (F-4)	F-1a	F-1b	F-1c	F-1d (Recommended Plan)	F-2a	F-2b	F-2c	F-2d	F-3a	F-3b	F-3c	F-3d
Evaluation Criteria	**Future Without-Project (FWOP)**	**Deepen to 45 feet**	**Deepen to 48 feet**	**Deepen to 50 feet**	**Deepen to 52 feet**	**Deepen to 45 feet/ widen to 300 feet**	**Deepen to 48 feet/ widen to 300 feet**	**Deepen to 50 feet/ widen to 300 feet**	**Deepen to 52 feet/ widen to 300 feet**	**Deepen to 45 feet/widen to 350 feet**	**Deepen to 48 feet/widen to 350 feet**	**Deepen to 50 feet/ widen to 350 feet**	**Deepen to 52 feet/ widen to 350 feet**
Construction Dredging Volumes (MCY)	None	3.7	8.3	11.4	14.0	7.7	12.9	16.5	19.8	14.0	19.3	22.6	26.7
Shoaling Rates (cubic yards per year [cy/yr])	1,099,000	1,155,000	1,198,000	1,227,000	1,255,000	1,256,000	1,302,000	1,333,000	1,364,000	1,438,000	1,502,000	1,545,000	1,587,000
Channel Extension Lengths (feet)	None	2,000	3,000	3,400	4,000	2,000	3,000	3,400	4,000	2,000	3,000	3,400	4,000
Net Excess Benefits (October 2013 price level)	($127,500)	$4,785,200	$7,534,100	$8,519,500	$9,287,400	$2,775,900	$2,197,300	$4,072,200	$4,098,100	($5,105,700)	($3,839,300)	($3,655,400)	($3,720,400)
Construction Air Quality (Nitrogen oxide [NO_x] Emissions)	It is anticipated that air contaminants in the project area would increase due to continued operational constraints on the existing system and a possible increase in ship traffic resulting both from growth of existing business and from new business.	Lowest air quality impacts of all action plans, but greater than No Action; fewer impacts than Recommended Plan	Higher impacts than F-1a, but greater than No Action; fewer impacts than Recommended Plan	Slightly higher impacts than F-1b, but greater than No Action; fewer impacts than Recommended Plan	2,567 tons NO_x (total for all years of construction). Higher impacts than No Action, shallower depth alternatives, and Alternatives F-2a and F-2b; lower impacts than Alternatives F-2c and F-2d, and all F-3 Alternatives	Second lowest air quality impacts overall, but greater than No Action; fewer impacts than Recommended Plan	About the same impacts as Recommended Plan and greater than No Action; lower impacts than Alternatives F-2c and F-2d, F-3b, F-3c, and F-3d	Slightly higher impacts than the Recommended Plan and greater than No Action; lower impacts than Alternatives F-2d, F-3b, F-3c, and F-3d	Higher impacts than the Recommended Plan and greater than No Action; lower impacts than Alternatives F-3c, and F-3d	About the same impacts as Recommended Plan and greater than No Action; lower impacts than Alternatives F-2c and F-2d, F-3b, F-3c, and F-3d	Higher impacts than the Recommended Plan and greater than No Action; lower impacts than Alternatives F-2d, F-3c, and F-3d	Higher impacts than the Recommended Plan and greater than No Action; lower impacts than Alternative F-3d	Highest air quality impacts of all action plans, and greater than No Action; nearly double impacts of the Recommended Plan
Upland PAs	7 existing upland confined PAs	Same number and footprint of PAs as No Action; lower dike heights than Recommended Plan.	Same number and footprint of PAs as No Action; lower dike heights than Recommended Plan	Same number and footprint of PAs as No Action; lower dike heights than Recommended Plan	7 existing upland confined PAs; same footprint as No Action	Same number and footprint of PAs as No Action; lower dike heights than Recommended Plan	Same number and footprint of PAs as No Action; lower dike heights than Recommended Plan	Same number and footprint of PAs as No Action; higher dikes than Recommended Plan	Same number and footprint of PAs as No Action; higher dikes than Recommended Plan	Same number and footprint of PAs as No Action and same dike heights as Recommended Plan	Same number and footprint of PAs as No Action; higher dikes than Recommended Plan	Same number and footprint of PAs as No Action; higher dikes than Recommended Plan	Same number and footprint of PAs as No Action; higher dikes than Recommended Plan

Alternative Number	No Action (F-4)	F-1a	F-1b	F-1c	F-1d (Recommended Plan)	F-2a	F-2b	F-2c	F-2d	F-3a	F-3b	F-3c	F-3d
Evaluation Criteria	**Future Without-Project (FWOP)**	**Deepen to 45 feet**	**Deepen to 48 feet**	**Deepen to 50 feet**	**Deepen to 52 feet**	**Deepen to 45 feet/ widen to 300 feet**	**Deepen to 48 feet/ widen to 300 feet**	**Deepen to 50 feet/ widen to 300 feet**	**Deepen to 52 feet/ widen to 300 feet**	**Deepen to 45 feet/widen to 350 feet**	**Deepen to 48 feet/widen to 350 feet**	**Deepen to 50 feet/ widen to 350 feet**	**Deepen to 52 feet/ widen to 350 feet**
ODMDS	1 existing New Work ODMDS	Reopen existing new work ODMDS; lower mounding than Recommended Plan	Reopen existing new work ODMDS; lower mounding than Recommended Plan	Reopen existing new work ODMDS; lower mounding than Recommended Plan	Reopen existing ODMDS, dispersive with unlimited capacity; modeling indicates mounding of new work will not exceed 14.3 feet	Reopen existing new work ODMDS; lower mounding than Recommended Plan	Reopen existing new work ODMDS; lower mounding than Recommended Plan	Reopen existing new work ODMDS; slightly higher mounding than Recommended Plan	Might require resizing of existing ODMDS; mounding height would be higher than Recommended Plan	Reopen existing ODMDS, dispersive with unlimited capacity; same mounding height as Recommended Plan	Might require resizing of existing ODMDS; mounding height would be higher than Recommended Plan	Might require resizing of existing ODMDS; mounding height would be much higher than Recommended Plan	Might require resizing of existing ODMDS; mounding height would be much higher than Recommended Plan
Vegetation/SAV	Ongoing maintenance dredging would not result in impacts to vegetation or SAV	No terrestrial vegetation impacts and no impacts to SAV	No terrestrial vegetation impacts and no impacts to SAV	No terrestrial vegetation impacts and no impacts to SAV	Construction and maintenance dredging would not result in impacts to terrestrial vegetation or SAV	No terrestrial vegetation impacts and no impacts to SAV	No terrestrial vegetation impacts and no impacts to SAV	No terrestrial vegetation impacts and no impacts to SAV	No terrestrial vegetation impacts and no impacts to SAV	No terrestrial vegetation impacts and no impacts to SAV	No terrestrial vegetation impacts and no impacts to SAV	Construction would permanently impact approximately 1 acre of SAV along the edges of the Main Channel; no terrestrial vegetation impacts	Construction would permanently impact approximately 1 acre of SAV along the edges of the Main Channel; no terrestrial vegetation impacts
Terrestrial Wildlife Habitat	Ongoing maintenance dredging and placement would cause no impacts to terrestrial wildlife habitats	No impacts to wildlife habitats; all impacts avoided	No impacts to wildlife habitats; all impacts avoided	No impacts to wildlife habitats; all impacts avoided	All impacts would be avoided by restricting construction activities to the existing PA footprints and existing access roads	No impacts to wildlife habitats; all impacts avoided	No impacts to wildlife habitats; all impacts avoided	No impacts to wildlife habitats; all impacts avoided	No impacts to wildlife habitats; all impacts avoided	No impacts to wildlife habitats; all impacts avoided	No impacts to wildlife habitats; all impacts avoided	No impacts to wildlife habitats; all impacts avoided	No impacts to wildlife habitats; all impacts avoided
Wetlands	Ongoing maintenance dredging and placement would not result in new impacts to wetlands.	No impacts to wetlands; all impacts avoided	No impacts to wetlands; all impacts avoided	No impacts to wetlands; all impacts avoided	All impacts would be avoided by restricting construction activities to the existing PA footprints and existing access roads	No impacts to wetlands; all impacts avoided	No impacts to wetlands; all impacts avoided	No impacts to wetlands; all impacts avoided	No impacts to wetlands; all impacts avoided	No impacts to wetlands; all impacts avoided	No impacts to wetlands; all impacts avoided	No impacts to wetlands; all impacts avoided	No impacts to wetlands; all impacts avoided

Alternative Number	**No Action (F-4)**	**F-1a**	**F-1b**	**F-1c**	**F-1d (Recommended Plan)**	**F-2a**	**F-2b**	**F-2c**	**F-2d**	**F-3a**	**F-3b**	**F-3c**	**F-3d**
Evaluation Criteria	**Future Without-Project (FWOP)**	**Deepen to 45 feet**	**Deepen to 48 feet**	**Deepen to 50 feet**	**Deepen to 52 feet**	**Deepen to 45 feet/ widen to 300 feet**	**Deepen to 48 feet/ widen to 300 feet**	**Deepen to 50 feet/ widen to 300 feet**	**Deepen to 52 feet/ widen to 300 feet**	**Deepen to 45 feet/widen to 350 feet**	**Deepen to 48 feet/widen to 350 feet**	**Deepen to 50 feet/ widen to 350 feet**	**Deepen to 52 feet/ widen to 350 feet**
Aquatic Habitat	Temporary water column turbidity associated with maintenance dredging and placement would continue	Lowest aquatic habitat impacts of all action plans, impacts similar to No Action; fewer impacts than Recommended Plan	Higher impacts than F-1a, but greater than No Action; fewer impacts than Recommended Plan	Slightly higher impacts than F-1b, but greater than No Action; fewer impacts than Recommended Plan	Impacts greater than No Action; short-term, temporary impacts to benthic organisms and increased turbidity are expected, although no significant impacts would be anticipated	Impacts greater than No Action; water bottom impacts slightly greater than deepening only alternatives ; turbid conditions slightly less than all alternatives with exception of F-1a	Impacts greater than No Action; water bottom impacts slightly greater than deepening only alternatives ; turbid conditions about the same as Recommended Plan	Impacts greater than No Action; water bottom impacts slightly greater than deepening only alternatives ; turbid conditions about the same as Recommended Plan	Impacts greater than No Action; water bottom impacts slightly greater than deepening only alternatives ; turbid conditions greater than the Recommended Plan	Impacts greater than No Action; water bottom impacts and turbid conditions about the same as Recommended Plan but greater than other deepening only alternatives	Impacts greater than No Action; water bottom impacts and turbid conditions greater than deepening only and deepening plus widening to 300-foot alternatives	Impacts greater than No Action; water bottom impacts and turbid conditions greater than deepening only and deepening plus widening to 300-foot alternatives	Impacts greater than No Action; largest water bottom and turbidity impacts of all alternatives
Essential Fish Habitat (EFH)	Ongoing maintenance dredging and placement would not result in new impacts to EFH	Lowest EFH impacts of all action plans; impacts similar to No Action; fewer impacts than Recommended Plan	Higher impacts than F-1a, but greater than No Action; fewer impacts than Recommended Plan	Slightly higher impacts than F-1b, but greater than No Action; fewer impacts than Recommended Plan	Turbidity would be temporary; localized impact during dredging and placement; benthic organisms would be affected until natural recovery occurs; no significant impacts anticipated	Impacts greater than No Action; EFH impacts slightly greater than deepening only alternatives ; turbid conditions slightly less than all alternatives with exception of F-1a	Impacts greater than No Action; EFH impacts slightly greater than deepening only alternatives ; turbid conditions about the same as Recommended Plan	Impacts greater than No Action; EFH impacts slightly greater than deepening only alternatives ; turbid conditions about the same as Recommended Plan	Impacts greater than No Action; EFH impacts slightly greater than deepening only alternatives ; turbid conditions about the same as Recommended Plan	Impacts greater than No Action; EFH impacts and turbid conditions about the same as Recommended Plan but greater than other deepening only alternatives	Impacts greater than No Action; EFH impacts and turbid conditions greater than deepening only and deepening plus widening to 300-foot alternatives	Impacts greater than No Action; EFH impacts and turbid conditions greater than deepening only and deepening plus widening to 300-foot alternatives	Impacts greater than No Action; largest EFH and turbidity impacts of all alternatives
Threatened and Endangered Species	Ongoing maintenance dredging of the Entrance and Jetty Channels may adversely impact sea turtles	Lowest sea turtle impacts of all action plans, but greater than No Action; fewer impacts than Recommended Plan	Higher sea turtle impacts than F-1a, but greater than No Action; fewer impacts than Recommended Plan	Slightly higher impacts than F-1b, but greater than No Action; fewer impacts than Recommended Plan	Construction and maintenance dredging of the Entrance and Jetty Channels may adversely impact sea turtles; no other T&E species adversely affected	Second sea turtle impacts overall, but greater than No Action; fewer impacts than Recommended Plan	About the same impacts as Recommended Plan and greater than No Action; lower impacts than Alternatives F-2c and F-2d, F-3b, F-3c, and F-3d	Slightly higher impacts than the Recommended Plan and greater than No Action; lower impacts than Alternatives F-2d, F-3b, F-3c, and F-3d	Higher impacts than the Recommended Plan and greater than No Action; lower impacts than Alternatives F-3c, and F-3d	About the same impacts as Recommended Plan and greater than No Action; lower impacts than Alternatives F-2c and F-2d, F-3b, F-3c, and F-3d	Higher impacts than the Recommended Plan and greater than No Action; lower impacts than Alternatives F-2d, F-3c, and F-3d	Higher impacts than the Recommended Plan and greater than No Action; lower impacts than Alternative F-3d	Highest sea turtle impacts of all action plans, and greater than No Action

Alternative Number	No Action (F-4)	F-1a	F-1b	F-1c	F-1d (Recommended Plan)	F-2a	F-2b	F-2c	F-2d	F-3a	F-3b	F-3c	F-3d
Evaluatinn Criteria	**Future Without-Project (FWOP)**	**Deepen to 45 feet**	**Deepen to 48 feet**	**Deepen to 50 feet**	**Deepen to 52 feet**	**Deepen to 45 feet/ widen to 300 feet**	**Deepen to 48 feet/ widen to 300 feet**	**Deepen to 50 feet/ widen to 300 feet**	**Deepen to 52 feet/ widen to 300 feet**	**Deepen to 45 feet/widen to 350 feet**	**Deepen to 48 feet/widen to 350 feet**	**Deepen to 50 feet/ widen to 350 feet**	**Deepen to 52 feet/ widen to 350 feet**
Water and Sediment Quality	Maintenance dredging and placement activities would result in no new impacts. Testing indicates no contaminants of concern would be expected in channel sediments	Lowest temporary turbidity impacts of all action plans; no sediment contaminant concerns	Higher turbidity impacts than F-1a, but greater than No Action; no sediment contaminant concerns	Slightly higher turbidity impacts than F-1b, but greater than No Action; no sediment contaminant concerns	Construction dredging and placement activities would result in temporary increases in turbidity; testing indicates no contaminants of concern would be expected in channel sediments	Impacts greater than No Action; temporary turbidity slightly less than all alternatives with exception of F-1a; no sediment contaminant concerns	Impacts greater than No Action; turbidity conditions about the same as Recommended Plan; no sediment contaminant concerns	Impacts greater than No Action; turbidity conditions about the same as Recommended Plan; no sediment contaminant concerns	Impacts greater than No Action; turbidity conditions about the same as Recommended Plan; no sediment contaminant concerns	Impacts greater than No Action; turbidity about the same as Recommended Plan but greater than other deepening only alternatives; no sediment contaminant concerns	Impacts greater than No Action; turbidity greater than deepening only and deepening plus widening to 300-foot alternatives; no sediment contaminant concerns	Impacts greater than No Action; turbidity greater than deepening only and deepening plus widening to 300-foot alternatives; no sediment contaminant concerns	Impacts greater than No Action; largest turbidity impacts of all alternatives; no sediment contaminant concerns
Hazardous, Toxic, and Radioactive Waste (HTRW)	No change from past practices in land use and the occurrence of HTRW sites would be expected	No HTRW impacts identified	No HTRW impacts identified	No HTRW impacts identified	Construction and placement activities would not impact any known HTRW sites	No HTRW impacts identified	No HTRW impacts identified	No HTRW impacts identified	No HTRW impacts identified	No HTRW impacts identified	No HTRW impacts identified	No HTRW impacts identified	No HTRW impacts identified
Energy and Mineral Resources	Maintenance of the existing project would have no impact on pipelines and mineral resources	No pipeline or mineral resource impacts	No pipeline or mineral resource impacts	No pipeline or mineral resource impacts	Construction and maintenance of the Recommended Plan would have no impact on pipelines and mineral resources	No pipeline or mineral resource impacts	No pipeline or mineral resource impacts	No pipeline or mineral resource impacts	No pipeline or mineral resource impacts	No pipeline or mineral resource impacts	No pipeline or mineral resource impacts	No pipeline or mineral resource impacts	No pipeline or mineral resource impacts
Cultural Resources	Maintenance of the existing project would have no impact on cultural resources	No cultural resource impacts	No cultural resource impacts	No cultural resource impacts	Construction and maintenance of the Recommended Plan would have no impact on cultural resources	No cultural resource impacts	No cultural resource impacts	No cultural resource impacts	No cultural resource impacts	No cultural resource impacts	No cultural resource impacts	No cultural resource impacts	No cultural resource impacts

Alternative Number	**No Action (F-4)**	**F-1a**	**F-1b**	**F-1c**	**F-1d (Recommended Plan)**	**F-2a**	**F-2b**	**F-2c**	**F-2d**	**F-3a**	**F-3b**	**F-3c**	**F-3d**
Evaluation Criteria	**Future Without-Project (FWOP)**	**Deepen to 45 feet**	**Deepen to 48 feet**	**Deepen to 50 feet**	**Deepen to 52 feet**	**Deepen to 45 feet/ widen to 300 feet**	**Deepen to 48 feet/ widen to 300 feet**	**Deepen to 50 feet/ widen to 300 feet**	**Deepen to 52 feet/ widen to 300 feet**	**Deepen to 45 feet/widen to 350 feet**	**Deepen to 48 feet/widen to 350 feet**	**Deepen to 50 feet/ widen to 350 feet**	**Deepen to 52 feet/ widen to 350 feet**
Socioeconomics	Socioeconomic conditions resulting from existing port activities and commerce would be expected to continue	Lowest economic benefits of all action alternatives, but greater than No Action	Slightly more economic benefits than Alternative F-1a, but less than the Recommended Plan	Slightly more economic benefits than Alternative F-1b, but less than the Recommended Plan	Economic impacts on the region would increase as a result of the channel improvements, resulting in an increase in the number of jobs	Fewer economic benefits than the Recommended Plan but greater than the No Action	Fewer economic benefits than the Recommended Plan but greater than the No Action	Fewer economic benefits than the Recommended Plan but greater than the No Action	Fewer economic benefits than the Recommended Plan but greater than the No Action	Fewer economic benefits than the Recommended Plan but greater than the No Action	Fewer economic benefits than the Recommended Plan but greater than the No Action	Fewer economic benefits than the Recommended Plan but greater than the No Action	Fewer economic benefits than the Recommended Plan but greater than the No Action
Environmental Justice (EJ)	Maintenance of existing project would not impact minority or low-income populations	No impacts to EJ segments of the population	No impacts to EJ segments of the population	No impacts to EJ segments of the population	Construction and maintenance of the Recommended Plan would not impact minority or low-income populations	No impacts to EJ segments of the population	No impacts to EJ segments of the population	No impacts to EJ segments of the population	No impacts to EJ segments of the population	No impacts to EJ segments of the population	No impacts to EJ segments of the population	No impacts to EJ segments of the population	No impacts to EJ segments of the population
Environmental and Safety Risks to Children	Maintenance of existing project would not cause environmental or safety risks to children	No environmental or safety risks to children	No environmental or safety risks to children	No environmental or safety risks to children	Construction and maintenance of the Recommended Plan would not cause environmental or safety risks to children	No environmental or safety risks to children	No environmental or safety risks to children	No environmental or safety risks to children	No environmental or safety risks to children	No environmental or safety risks to children	No environmental or safety risks to children	No environmental or safety risks to children	No environmental or safety risks to children

The alternatives with widths of 300 and 350 feet would extend the top-of-cut for the deepening another 25 or 50 feet toward both shores, respectively. Based upon current survey information, aerial photographs, and field inspections, the 50-foot widening alternatives for all depths (F-2a through F-2d) and the 100-foot widening alternatives for the two shallower depths (F-3a and F-3b) would not impact SAV beds, but the 350-foot width for the 50- and 52-foot deep (F-3c and F-3d) alternatives could impact approximately 1 acre of SAV beds on the north side of the channel. Mitigation costs for the impacts of Alternatives F-3c and F-3d were not estimated, as they would be minimal in comparison to project construction costs.

Each plan was formulated in consideration of the four criteria in the P&G: completeness, effectiveness, efficiency, and acceptability as presented in Table 5-4. With the exception of Alternative F-4, the No Action Alternative, each alternative in the Final Array is considered acceptable. While all of the alternatives that improve the channel would improve navigation efficiency while avoiding and minimizing environmental impacts to the greatest extent possible during the 50-year period of analysis, the plan with the greatest net excess benefits is considered the most complete, efficient, and effective plan. Therefore, Alternative F1-d, the 52-foot deep channel with no additional widening, is the plan that best meets the four P&G criteria. It is also the environmentally preferable alternative because it is the most efficient alternative in terms of minimizing damages to the biological and physical environment while providing the maximum economic benefit for the general welfare of the Nation.

5.5 PLAN SELECTION

Alternative F1-d (deepening the channel to –52 feet MLLW) is the Recommended Plan. This alternative was evaluated and determined to be economically justified, environmentally acceptable, and complete. The costs including interest during construction (IDC), NED Average Annual Equivalent (AAEQ) benefits, and BCR for the Recommended Plan are presented in Table 5-5.

5.5.1 NED Benefits

NED Benefits were calculated in HarborSym and were based on reductions in transportation costs generated for more-efficient vessel transportation and less restrictions on transit of larger oil drilling rigs. The proposed channel improvements are in response to the need for deeper access by allowing the existing fleet to load more fully and for the introduction of larger vessels, including oil drilling rigs.

Table 5-4. Comparison of P&G Evaluation Criteria

Alternative Number	**No Action (F-4)**	**F-1a**	**F-1b**	**F-1c**	**F-1d (Recommended Plan)**	**F-2a**	**F-2b**	**F-2c**	**F-2d**	**F-3a**	**F-3b**	**F-3c**	**F-3d**
Criteria	**Future Without-Project (FWOP)**	**Deepen to 45 feet**	**Deepen to 48 feet**	**Deepen to 50 feet**	**Deepen to 52 feet**	**Deepen to 45 feet/ widen to 300 feet**	**Deepen to 48 feet/ widen to 300 feet**	**Deepen to 50 feet/ widen to 300 feet**	**Deepen to 52 feet/ widen to 300 feet**	**Deepen to 45 feet/widen to 350 feet**	**Deepen to 48 feet/widen to 350 feet**	**Deepen to 50 feet/ widen to 350 feet**	**Deepen to 52 feet/ widen to 350 feet**
Acceptability (meets all laws, regulations and guidance)	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
Completeness (provides and accounts for all necessary investments or other actions to ensure the realization of the planning objective)	No Action is an incomplete solution to all planning objective	Plan is an incomplete solution; it provides some improvement in navigation efficiency over No Action but does not maximize transportation benefits when compared to other alternatives	Plan is an incomplete solution; it provides some improvement in navigation efficiency over No Action but does not maximize transportation benefits when compared to other alternatives	Plan is an incomplete solution; it provides some improvement in navigation efficiency over No Action but does not maximize transportation benefits when compared to other alternatives	Plan is more complete than lesser plans and has the highest net excess benefits of alternatives evaluated; but may not maximize transportation benefits are still rising and deeper plans were not evaluated.	Plan is an incomplete solution; it provides some improvement in navigation efficiency over No Action but does not maximize transportation benefits when compared to other alternatives	Plan is an incomplete solution; it provides some improvement in navigation efficiency over No Action but does not maximize transportation benefits when compared to other alternatives	Plan is an incomplete solution; it provides some improvement in navigation efficiency over No Action but does not maximize transportation benefits when compared to other alternatives	Plan is an more complete solution; it provides some improvement in navigation efficiency over No Action but does not maximize transportation benefits when compared to other alternatives, including the Recommended Plan	Plan is an incomplete solution; it provides some improvement in navigation efficiency over No Action but does not maximize transportation benefits when compared to other alternatives	Plan is an incomplete solution; it provides some improvement in navigation efficiency over No Action but does not maximize transportation benefits when compared to other alternatives	Plan is an incomplete solution; it provides some improvement in navigation efficiency over No Action but does not maximize transportation benefits when compared to other alternatives	Plan is an incomplete solution; it provides some improvement in navigation efficiency over No Action but does not maximize transportation benefits when compared to other alternatives including the Recommended Plan
Efficiency (extent to which an alternative plan is the most cost effective means of achieving the objective)	No Action does not address the planning objective	Less costly than Recommended Plan but does not address objective as effectively; net excess benefits are not maximized and are less than the Recommended Plan	Less costly than Recommended Plan but does not address objective as effectively; net excess benefits are not maximized and are less than the Recommended Plan	Less costly than Recommended Plan but does not address objective as effectively; net excess benefits are not maximized and are less than the Recommended Plan	Cost-effective; achieves objective; net excess benefits may not be maximized but are greatest of alternatives evaluated; Sponsor indicated this plan is LPP	Less costly than Recommended Plan but does not address objective as effectively; net excess benefits are not maximized and are less than the Recommended Plan	More costly than Recommended Plan but does not address objective as effectively; net excess benefits are not maximized and are less than the Recommended Plan	More costly than Recommended Plan but does not address objective as effectively; net excess benefits are not maximized and are less than the Recommended Plan	More costly than Recommended Plan but does not address objective as effectively; net excess benefits are not maximized and are less than the Recommended Plan	More costly than Recommended Plan but does not address objective as effectively; net excess benefits are not maximized and are less than the Recommended Plan	More costly than Recommended Plan but does not address objective as effectively; net excess benefits are not maximized and are less than the Recommended Plan	More costly than Recommended Plan but does not address objective as effectively; net excess benefits are not maximized and are less than the Recommended Plan	More costly than Recommended Plan but does not address objective as effectively; net excess benefits are not maximized and are less than the Recommended Plan
Effectiveness (extent to which the alternative plans contribute to achieve the planning objective)	Ineffective for improving navigational efficiencies	Not as effective as Recommended Plan for improving navigation efficiency	Not as effective as Recommended Plan for improving navigation efficiency	Not as effective as Recommended Plan for improving navigation efficiency	Most effective plan for improving navigation efficiency when compared to alternatives evaluated; Sponsor has indicated this plan is the LPP	Not as effective as Recommended Plan for improving navigation efficiency	Not as effective as Recommended Plan for improving navigation efficiency	Not as effective as Recommended Plan for improving navigation efficiency	Effective for improving navigation efficiency	Not as effective as Recommended Plan for improving navigation efficiency	Not as effective as Recommended Plan for improving navigation efficiency	Not as effective as Recommended Plan for improving navigation efficiency	Effective for improving navigation efficiency

Table 5-5. Economic Summary for Plan Selection
(October 2012 price levels, 3.75% interest)

First Cost of Construction	$193,950.0
IDC	$9,824.0
Total Investment	$203,774.0
Total AAEQ Cost	$10,586.4
AAEQ Benefits	$19,873.8
Net Excess Benefits	$9,287.4
BCR	1.9

It is not known if Alternative F1-d is the NED plan that maximizes the net excess benefits because the net excess benefits were still increasing with deeper channel dimensions and a deeper alternative was not included in the Final Array of alternatives. However, Alternative F1-d was the most cost effective of the Final Array of alternatives considered and the deepest channel dimension that the non-Federal sponsor would support at this time. Therefore, Alternative F1-d, deepening the channel to 52 feet with no widening, is considered the Recommended Plan.

The Final Screening determined that Net Excess Benefits would be $9.3 million. The project would be economically justified with a BCR of 1.9.

5.5.2 Categorical Exemption

For a navigation project, if a plan with lesser benefits is preferred by the sponsor due to financial constraints, guidance allows for a categorical exemption to be granted and this lesser plan to be selected as the Recommended Plan. The USACE guidance requires that the NED plan be recommended unless there are believed to be overriding reasons favoring the selection of another alternative. Planning guidance (ER 1105-2-100) states that if the non-Federal sponsor identifies a financial constraint due to limited resources, and if net benefits are increasing as the constraint is reached, a categorical exemption may be granted and the constrained plan recommended. Categorical exemptions for plans that are lesser projects than the NED plan are cost shared on the same basis as the NED and become a federally supportable plan.

Prior to completion of the economic analysis for the study, and without model results and benefit comparisons, the non-Federal sponsor assumed 50 feet would be the optimum channel depth based on traffic and available non-Federal funding. Therefore, the depth of 50 feet was chosen by the sponsor believing it would satisfy the needs of their users and remain within their future proposed budgets. After total TSP alternative analysis was completed, the economic analysis revealed that the net excess benefits continued to increase at 52 feet with a cost significantly less than originally anticipated by the non-Federal sponsor. Rather than have a Locally Preferred Plan to remain at 50 Feet and result in fewer benefits, the non-Federal sponsor agreed that acceptance of this deeper 52 Feet channel improvement through categorical exemptions was in the best interest of the Port and National economic development.

In this study's selection of the Recommended Plan, the sponsor has indicated a preference of the 52-foot alternative due to cost restraints. This plan is a justified plan in an array of alternatives in which it is not known if the NED benefits have been maximized. Had alternatives deeper than 52 feet been evaluated and net excess benefits decreased, it would have indicated that the 52-foot alternative was the NED plan. However, because no evaluation deeper than 52 feet was performed, the 52-foot alternative was not identified as the NED plan. This alternative still meets the policies for the high-priority outputs and has greater benefits than the smaller scale plans (see Table 5-3). Since the 52-foot plan is the sponsor's preference due to financial constraints and fits all of the criteria regarding categorical exemptions for navigation projects, this plan has been identified as the Recommended Plan. The economic analysis indicates that the NED is 52 feet deep or deeper; therefore, cost sharing would be the same as if it was the identified NED plan.

5.5.3 Least Cost Disposal Alternative

Placement options were evaluated to determine the best disposal alternative for all material, both new work and O&M. These alternatives considered possible beneficial use of dredged material, as well as traditional PAs.

5.5.3.1 Beneficial Use Opportunities

Section 2037 of WRDA 2007 amended Section 204 of WRDA 92 dealing with regional sediment management. Section 204 states that a regional sediment management plan shall be developed by the Secretary of the Army for sediment obtained through the construction, operation, or maintenance of an authorized Federal water resources project. The purposes of using sediment for the construction, repair, modification, or rehabilitation of Federal water resource projects are to reduce storm damage to property; to protect, restore, and create aquatic and ecologically related habitats, including wetlands; and to transport and place suitable sediment.

During the Feasibility study, a conceptual sediment budget was developed (HDR, 2008) and the beneficial use of the dredged material was investigated. New work construction would yield primarily clay sediments, which are suitable for dike construction or marsh restoration. New work material from the Main Channel would be stockpiled within the existing PAs and used for future incremental dike raisings. No marshes in need of clay material for restoration were identified near the project area. New work material from the Entrance and Jetty Channels would be placed at the New Work ODMDS; sediments to be dredged would be overwhelmingly clay and would not be suitable for placement at the nearshore Feeder Berm, which was designed to receive sandy sediments.

The potential for beneficial use of maintenance material from the new project was also investigated. Shoaled sediments from the majority of the Main Channel (Stations 11+000 to 89+500) are expected to be primarily clay and silt. No marsh areas that would benefit from these sediment types have been identified near the project area. Maintenance dredging of the eastern end of the Main Channel (Stations 0+000 to 11+000) and the entire Jetty and Entrance Channels are expected to be primarily sand with some silt, suitable for use in the nearshore Feeder Berm. Sandy material deposited in this nearshore berm is redeposited by cross-shore and longshore currents on the shoreline of South Padre Island, decreasing shoreline erosion. Sandy materials could also be used to nourish eroding beaches fronting the City of South Padre Island; however, beach placement is not a least-cost plan. The incremental difference between the cost of normal placement into the Feeder Berm and the cost to pump material directly onto the beach must be provided by a non-Federal sponsor. In the past, the City of South Padre Island has participated in paying the incremental cost to place the material directly onto the beach at South Padre Island. This incremental cost has been about $2 to $3 million per dredging cycle.

5.5.3.2 Screening for Least Cost Plan

Based on the possible beneficial use options identified above, several alternative placement plans were considered for the material from Station –17+000 to 11+000. This reach includes the Entrance Channel Extension, Entrance Channel, Jetty Channel, and a portion of the Main Channel. This reach is primarily sandy material that would be suitable for placement in the Feeder Berm, the current least-cost disposal plan for maintenance material. Another option for this material would be placement into the Maintenance ODMDS, which is located directly adjacent to the channel extension. However, the Maintenance ODMDS has been designated for material only from the Entrance and Jetty Channels. This designation prevents material from Station 0+000 to 11+000 (part of the Main Channel) to be placed in the Maintenance ODMDS. Placement of the material from Station 0+000 to 11+000 is limited to the Feeder Berm because of the lack of capacity in the nearby upland PAs.

Additional advance maintenance (AM) was considered to allow channel dredging cycles to be combined in order to save mobilization and demobilization costs that occur with each dredging contract. Currently 2 feet of AM is included in the channel improvement design for this reach. AM greater than the 2 feet would result in stability issues for the channel, so this option was disregarded from further consideration.

Table 5-6 presents the quantifiable costs and dredging cycles for the two remaining placement options: Placement Plan 1 (Maintenance ODMDS and Feeder Berm) and Placement Plan 2 (Feeder Berm).

Use of Placement Plan 2 rather than Placement Plan 1 provides an economically and environmentally balanced, sustainable solution for life cycle sediment management for the BIH

Project. While life-cycle maintenance dredging costs for Placement Plan 1 are essentially equivalent to Placement Plan 2, environmental benefits of Placement Plan 2 make it the optimal sediment management solution.

Table 5-6. Alternative Placement Plans

Stationing	Placement Location	Dredging Cycle (years)	Average Annual Costs
Placement Plan 1			
Sta. −17+000 to 0+000	Maintenance ODMDS	1.5	$6,246,000
Sta. 0+000 to 11+000	Feeder Berm	4.5	
Placement Plan 2			
Sta. −17+000 to 0+000	Feeder Berm	1.5	$6,387,000
Sta. 0+000 to 11+000	Feeder Berm	4.5	

Environmental benefits are achieved by regularly placing material trapped by the channel extension back into the littoral system through the use of the Feeder Berm. The material is then available for cross-shore and longshore sediment transport to South Padre Island. This improves environmental stewardship, while improving relationships with area stakeholders on South Padre Island, where shoreline erosion has averaged 18 feet per year. Placing material into the Maintenance ODMDS removes the material from the littoral system and keeps it from nourishing the shoreline.

In addition, the Feeder Berm option (Placement Plan 2) has the potential to reduce life cycle costs because sediments from the Entrance and Jetty Channels are placed farther upcurrent from the channel than the Maintenance ODMDS option (Placement Plan 1). The current Entrance Channel terminates at the southwest corner of the Maintenance ODMDS, with the majority of this ODMDS offshore of the current channel limits. For the Recommended Plan, the Entrance Channel Extension would extend the channel along the Maintenance ODMDS's southern limit. The Maintenance ODMDS site is dispersive in nature; material is generally moved away from the site by the Gulf current within a few weeks to months. While the current flows from south to north most of the time, storms and seasonal reversals sometimes result in the current moving from north to south. If maintenance materials are present at the ODMDS site when the current reverses, they could move back into the channel. The historic dredging records used to establish this study's channel shoaling rates include the current practice of Feeder Berm use for placement of all of the material from the Jetty and Entrance Channels. The Maintenance ODMDS has not been used in more than a decade. Therefore, any increase in shoaling due to the periodic reverse in current flows from north to south has not been accounted for using the recent historic records. Use of the Maintenance ODMDS with the future channel alignment could potentially increase channel shoaling and maintenance costs.

Because of uncertainties described above and the fact that these average annual costs for the two placement plans are nearly identical, these plans' costs are considered equivalent. Therefore, Placement Plan 2, the Feeder Berm option, is the preferred solution because it is the least-cost, environmentally preferable plan.

6 RECOMMENDED PLAN

The Recommended Plan for navigation improvements for BIH has to be responsive to local needs and desires as well as the economic and environmental criteria established by Federal and State law. To do this, the plan must be able to handle current and forecasted vessel traffic safely with minimum impact on the environment. Subsequent paragraphs outline the plan design, construction, and O&M procedures.

The USACE decision making for the selection of a Recommended Plan begins at the District level and continues at the Division and Headquarters levels through subsequent reviews and approval. For congressionally authorized projects, the final agency decision maker is the Secretary of the Army through the Assistant Secretary of the Army for Civil Works.

The Recommended Plan is identified as Alternative F-1d, deepening of the channel to 52 feet without channel widening, which includes the least-cost disposal option. The least-cost dredging disposal plan includes the beneficial use of maintenance material from the Jetty and Entrance Channels and the first 11,000 feet of the Main Channel for placement into the offshore Feeder Berm (PA 1A). No environmental mitigation would be required for the Recommended Plan as it would result in only negligible environmental impacts. The Recommended Plan meets the objective of this study while avoiding all constraints previously presented in Section 4.

6.1 PLAN COMPONENTS

Table 6-1 presents the depths of the Recommended Plan by stationing. Figures 6-1 through 6-3 show the channel plan with PAs. No widening of the BIH Channel is proposed. The Entrance and Jetty Channels from Station –17+000 to 0+000 would be deepened to a depth of –54 feet MLLW. This additional 2 feet of depth is to allow for the effects of vessel pitch, roll, heave, and yaw occurring as a result of strong currents, waves, and wind. From Station 0+000 to 84+200, the channel would be deepened to a depth of 52 feet. From Station 84+200 to 86+000, the existing channel is 42 feet deep. In this reach, there are oil docks as well as the TransMontaigne Dock, which brings in petroleum products. There is no forecast change in the design drafts of vessels using the channel in the future so no deepening is proposed for this reach. There will be a transition from the 52-foot depth to the 42-foot depth in this reach. The channel would be maintained at a depth of –36 feet MLLW from Station 86+000 to the end of the Turning Basin including a transition from a depth of 42 to 36 feet, as ships would have been light-loaded or unloaded before entering the basin.

Table 6-1. Channel Depths of Recommended Plan

Stations		Recommended Plan Depth	Existing Channel Depth
From	**To**		
–17+000	–13+000	54	Beyond Existing Channel
–13+000	0+000	54	44
0+000	84+200	52	42
84+200	86+000	42	42
86+000	End of Turning Basin	36	36

6.1.1 New Work Construction

Under the first construction contract, a hopper dredge would be used to construct the Entrance and Jetty Channels, with a total length (after extension of the Entrance Channel) of 3.2 miles. Although the authorized depth of the offshore channels would be 54 feet, the potential dredging depth of the Entrance and Jetty Channels could actually be 58 feet, after accounting for 2 feet AM and 2 feet allowable overdepth (AO). One hopper dredge would be operated continuously for an estimated duration of 7 months to remove approximately 2.1 MCY of new work material from the Entrance and Jetty Channels. It is estimated that six subsequent contracts would be awarded for cutterhead suction dredging of the Main Channel through Station 84+200 for a total length of 15.9 miles. The remainder of the channel (the Turning Basin Extension and Turning Basin) would remain at existing depths. The authorized depth for the inland Main Channel would be –52 feet MLLW, but the potential dredging depth could actually be –55 feet MLLW, after accounting for 2 feet AM and 1 feet AO. Two or three cutterhead dredges would be working simultaneously to remove approximately 12.0 MCY of new work material over an estimated 29 months. This dredging would be performed concurrently with the hopper dredge contract for the Entrance and Jetty Channels, resulting in a total construction duration of 29 months.

6.1.2 Dredged Material Management Plan

A summary of dredged material placement is presented below with a more detailed DMMP for the Recommended Plan being included in Appendix M of this report.

6.1.2.1 New Work Placement

New work material from channel deepening would be distributed among the existing New Work ODMDS and upland confined PAs as shown in Table 6-2. All of the material from the Entrance and Jetty Channels (Station -17+000 to 0+000) would be placed at the existing New Work ODMDS (U.S. Environmental Protection Agency [EPA], 1991). This site is located in a dispersive offshore environment and has unlimited capacity. It is located approximately 4 miles from shore in 60 to 70 feet of water. The 350-acre site is large enough to contain all new work material that would be placed there during construction.

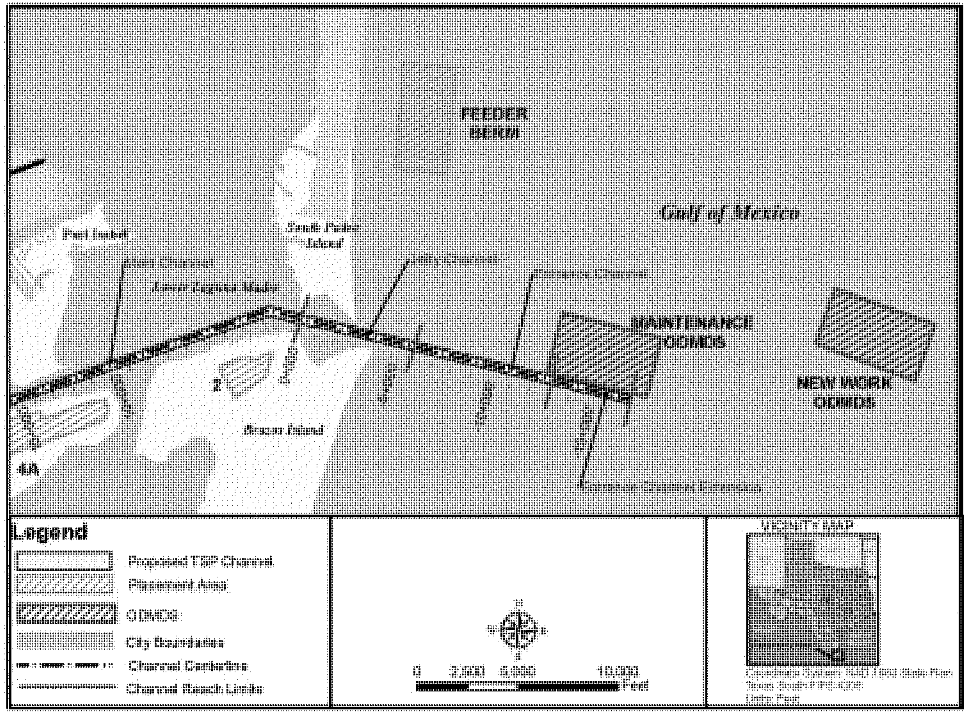

Figure 6-1. Recommended Plan - Entrance Channel Extension to Main Channel

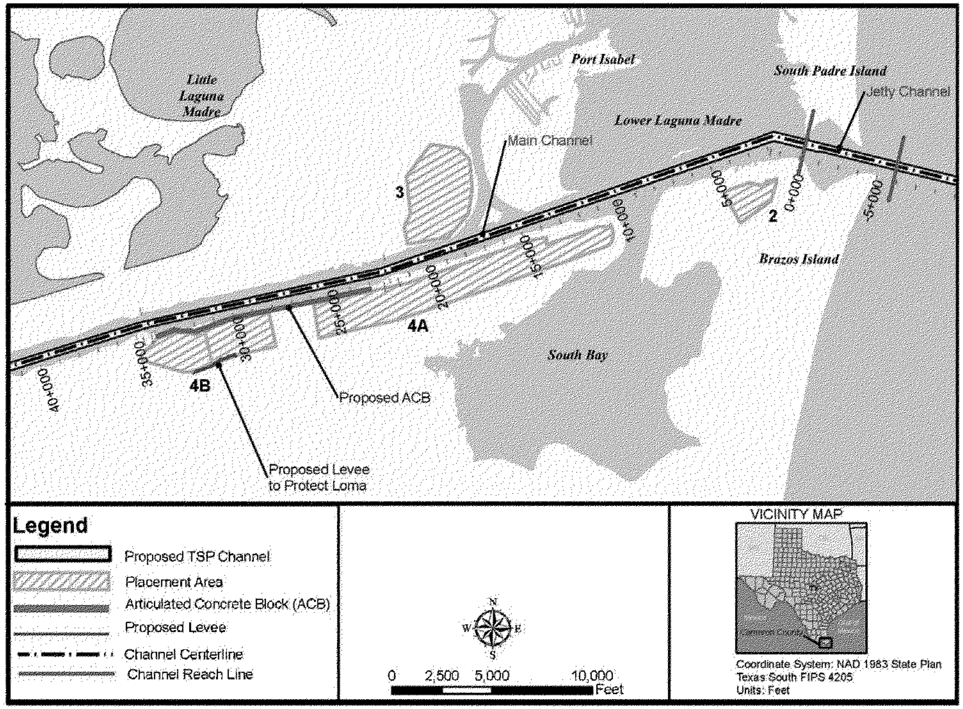

Figure 6-2. Recommended Plan - Jetty Channel to Main Channel

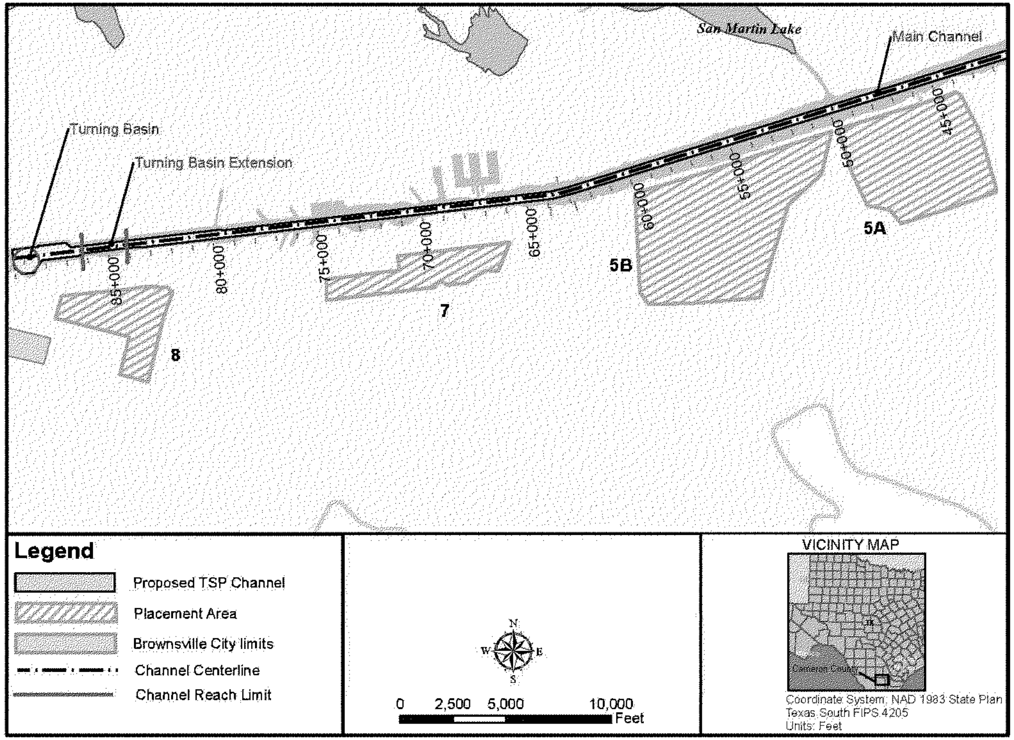

Figure 6-3. Recommended Plan – Main Channel to Turning Basin

Table 6-2. Recommended Plan –
New Work Quantities & Placement Area Dike Elevations

Channel Stations		PA Location	Current PA Size (acres)	Deepening Dredge Quantity (MCY)	Existing PA Dike Elevation in Feet (NAVD88*)	New Work Dike Elevation in Feet (NAVD88)
–17+000	0+000	New Work ODMDS	350	2.1		
0+00 0	7+000	2	71	0.9	27	36
7+000	25+000	4B	243	2.7	7	19
25+000	50+000	5A	704	3.6	6	12
50+000	70+000	5B	1,020	2.6	12	15
70+000	82+000	7	257	1.8	20	26
82+000	89+500	8	288	0.4	22	25
Total New Work Dredging Volume				14.1		

*NAVD = North American Vertical Datum

New work material from the Main Channel (Stations 0+000 through 84+200) would be pumped from the dredges through a combination of fully submerged and floating hydraulic pipelines into existing upland confined PAs owned and managed by the BND (PAs 2, 4B, 5A, 5B, 7, and 8). In addition, new work material may be placed in PA 3, a PA managed by the San Benito Navigation District and generally used for Port Isabel Channel material. The clay new work material would be stockpiled and used to raise the PA 3 dikes for later, unrelated maintenance dredging of the Port Isabel Channel. Specific quantities going to PA 3 are unknown at this time; should PA 3 be utilized, quantities going to PA 2 and/or 4B would be reduced. None of the existing PAs would need to be expanded, and no new PAs would be needed. Construction to raise the containment dikes to heights needed to accommodate new work quantities would be done within the footprints of the existing PAs. The resulting elevations of the PA dikes for the new work placement activities are also shown in Table 6-2. They would range from a total elevation of 12 feet NAVD88 around PA 5A to a total elevation of 36 feet around PA 2.

The POB is responsible for dredging their docks for the channel improvements. It is expected that material from the deepening of dock facilities would be placed in PA 5A and/or PA 8. This dredging of port facilities is expected to be completed during the deepening of the channel at the same time as the adjacent channel improvement and is relatively small compared to the dredging of the Main Channel.

Erosion along the toes of the containment dikes in PA 4A and 4B have been noted historically. This erosion is a result of wind driven waves and ship wakes in the channel. Because of this situation, erosion protection is required at the toe of the PA 4A and PA 4B containment dikes to protect the long term stability. A preliminary proposal is to place articulated concrete mattresses (ACM) with underlying geotextile along the toes of the containment dikes and between the PAs from about Station 22+000 to Station 34+000. The location of this proposed erosion protection plan is shown in Figure 6-2 and discussed in more detail in the Engineering Appendix.

Additionally, USFWS conservation recommendations require that all impacts to the lomas adjacent to PAs must be avoided, as they are potential habitat for endangered ocelots and jaguardundis. All lomas with the exception of the one in PA 4B are already isolated from adjacent PAs by existing dikes. The proposed dike around the loma at PA 4B would consist of a typical containment dike section continued along the edges of the loma in the PA. Figure 6-2 shows the location of the dike to protect the loma with the dike just skirts the edge of the loma resulting in 100 percent of the loma residing outside of PA 4B. During final design in PED, the dike location will comply with the USFWS' recommendation that the toe of the dike at its closest point will be no closer than 30 feet from the point at which land elevation begins to rise into the loma.

PA 4A is an existing PA that would not be used for new work material during construction; however, this site would be utilized for maintenance material during the 50-year period of analysis.

6.1.2.2 Maintenance Material Placement

Maintenance dredging would generally be conducted by hopper and cutterhead dredges, with material being distributed among a nearshore Feeder Berm or the existing Maintenance ODMDS, and upland confined PAs as shown in Table 6-3. Federal dredging quantities would increase approximately 14.0 percent over the existing project. Maintenance dredging would utilize the same PAs as those utilized for existing conditions, and the duration and frequency of dredging events would be within the range occurring under current conditions. Dredging of the Entrance and Jetty Channels and the first 11,000 feet of the Main Channel (–17+000 to 11+000) would generally be performed by a hopper dredge, and material would be placed in the nearshore Feeder Berm Site 1A, located between 1.5 and 2.5 miles from the North Jetty and from 0.4 to 0.9 mile from shore (USACE, 1988a). Sediment removed by maintenance dredging would therefore be regularly placed back into the littoral system, available for cross-shore and longshore sediment transport to South Padre Island. Monitoring of material placed at the Feeder Berm has demonstrated that it moves toward the beach and disperses, with the major movement being in the alongshore direction (McLellan et al., 1997; USACE, 1989). If for some reason the Feeder Berm cannot be used, maintenance material from the Entrance and Jetty Channels (Station –17+000 to 0+000) could be placed in the Maintenance ODMDS, which is located approximately 2.5 nautical miles from shore and north of the channel (USACE, 1975, 1999). The ODMDS and Feeder Berm are located in dispersive environments and have unlimited capacities.

Table 6-3. Recommended Plan – Operations & Maintenance Quantities and Placement Area Dike Elevations

Channel Stations		Shoaling Rate (cy/yr)	PA	Size (acres)	Dredge Cycle (years)	Number of Cycles in 50 years	Quantity per Cycle (cy/Cycle)	Total O&M Quantity in 50 years (MCY) (rounded)		Total Dike Elevation in 50 years (feet NAVD88)
–17+000	0+000	470,630	Nearshore Feeder Berm Site 1A	320	1.5	33	706,000	23.3		N/A
0+000	11+000	161,595			4.5	11	727,000	8.0		N/A
11+000	28+000	183,995	4A	469	4	12	736,000	8.8		35
28+000	34+000	43,047	4B	243	4	12	172,000	2.1		24
34+000	50+000	123,527	5A	704	4	12	494,000	5.9		17
50+000	65+000	143,577	5B	1,020	5	10	718,000	7.2		19
Non-Federal Permit Dredging					5	10	831,000		6.7	
65+000	79+000	98,637	7	257	6	8	586,000	4.7		38
Non-Federal Permit Dredging					6	8	415,000		3.3	
79+000	89+500	30,377	8	288	7	7	241,000	1.7		28
Non-Federal Permit Dredging					6	8	415,000		3.3	
				Total Federal Channel O&M Dredging Volume				61.7		
				Non-Federal Permit Dredging Volume					13.3	
				Total Dredging Volume				75.0		

With regards to maintenance dredging over the 50-year period of analysis, the Port is also responsible for the cost of maintaining their facilities. It is expected that these facilities will be dredged at the same time as the adjacent reach of channel, if needed. The Port would pay the incremental costs of the facilities dredging, and for construction of placement area capacity (dike raising) for placement of maintenance material. The landlocked reaches of the channel where the Port facilities are located do not have high rates of shoaling. Additionally, the banks of these facilities are basically hardened (sheet piling, etc.) and there is very little erosion and most likely even less shoaling is expected within the dock area. Overall, the quantity of material to be removed at the Port facilities is negligible when compared to the maintenance dredging of the main channel and can easily be included within the PAs without any additional dike raises being needed to accommodate the dock material. This maintenance dredging of port facilities is expected to be completed at the same time as maintenance of the adjacent channel reaches.

Maintenance material from the remainder of the Main Channel (Stations 11+000 through 89+500) would be placed in existing PAs 4A, 4B, 5A, 5B, 7, and 8. Upland PAs and containment dikes are sized to accommodate total quantities over the 50-year period of analysis. None of the existing PAs would need to be expanded, and no new PAs would be needed. Construction to raise the containment dikes to heights needed to accommodate the 50-year maintenance quantities would be done within the footprints of the existing PAs using material stockpiled during new work construction. Dikes would be raised incrementally as needed to contain material from each maintenance cycle. An additional 13.3 MCY of material is expected to be placed in the PAs over the 50-year period of analysis from non-Federal dredging to maintain the port facilities. The resulting elevations of the PA dikes for the 50-year Dredged Material Management Plan (DMMP), including the non-Federal dredging quantities, are also shown in Table 6-3. They range from a total elevation of 17 feet NAVD88 around PA 5A to a total elevation of 38 feet around PA 7.

6.1.3 Environmental Impacts

Environmental impacts of the Recommended Plan are fully described in Section 7.0. The Recommended Plan would result in no significant environmental impacts and therefore no mitigation is required. Project impacts would be associated with dredging and placement activities, but these impacts are primarily minor and temporary. Hopper dredging during construction of the Jetty and Entrance Channels could adversely affect threatened and endangered sea turtles; however, these effects would be minimized by the adoption of RPMs developed in consultation with NMFS. The special authority regarding Bahia Grande, contained in the FY 2003 Omnibus Appropriations Bill, states that the Chief of Engineers shall provide credit to the BND for work it performed to restore the wetlands of the Bahia Grande, Lower Laguna Madre, and Vadia Ancha, and apply that credit to wetland impacts from this proposed project. Since no wetland impacts are expected with construction of the Recommended Plan and no mitigation is required, the actions required by this authority are not needed.

6.2 DETAILED COST ESTIMATES (MCACES)

6.2.1 Cost Estimate

Based on planning level benefits and costs as presented in the Plan Selection section above, Alternative F-1d, deepening of the channel to 52 feet without channel widening, has been identified as the Recommended Plan. A detailed cost estimate for the Recommended Plan has been developed using the Micro Computer Aided Cost Engineering System (MCACES). These costs include associated non-Federal costs for berth and dock modifications that would be needed for use of the deeper channel and any lands, easements, rights-of-way, and relocations (LERRs).

The Berthing and Dock Modifications costs of $47,257,000 in Table 6.4 include dredging costs to deepen the dock areas, as well as the costs to improve the facilities (including site preparation, sheet piling and concrete work). The Port has provided a letter of commitment for the improvements of the berths and docks. The Port will pay the additional incremental cost to place this material removed from their facilities into the PAs, which includes the cost of dike raises. The non-Federal Sponsor provided these associated costs for the improvement project. The docks to be deepened include Oil Docks #3 and 5, Cargo Docks #15 and 16, and the Liquid Cargo Dock. The costs to improve these facilities are based on a recent cost of constructing a shallower dock along the BSC which was extrapolated to allow for the deeper facilities needed for the improved channel. Overall, the costs for disposing of non-Federal berthing area dredge material is insignificant compared to the project disposal costs, and the 50-year maintenance dredging will be minimal. Historical practice dictates that costs for disposing of non-Federal berthing area dredged (new work and operations and maintenance) materials are paid for by the POB as options during Invitation For Bids (for the Main Channel).

As detailed in Appendix B, the Alternative F-1d construction cost (including PED and aids to navigation [ATON]) would be $251,952,000 (Table 6-4). The fully funded costs of the project would be $279,817,000.

The MCACES estimate of first costs for construction of the Recommended Plan includes a narrative, a summary cost, and a detailed cost showing quantity, unit cost, and the amount for contingencies for each cost item. The costs of the non-construction features of the project are also included in the cost estimate. The costs have been prepared for an effective date of October 2013.

Table 6-4. MCACES Costs for Recommended Plan
($ in 1,000s rounded with October 2013 Price Level)

Cost Account	Item Description	First Cost ($)	Fully Funded Cost ($)
General Navigation Features (GNF)			
01	Lands and Damages	11	12
12	Navigation Ports and Harbors	169,820	186,296
30	Engineering and Design	21,719	25,133
31	Construction Management	13,032	15,869
GNF Total		**204,582**	**227,310**
non-Federal (LERRs/Associated) Costs			
01	Lands	5	5
12	Berthing and Dock Modifications	47,257	52,384
non-Federal Cost Total		**47,262**	**52,389**
Other Federal Cost			
12	ATON	108	118
Other Federal Cost Total		**108**	**118**
Total Navigation Costs		**251,952**	**279,817**

The USCG would be responsible for providing and maintaining navigation aids. Costs for modifications to ATON have been estimated by USACE and included in the project cost estimate, and coordination has been initiated with the USCG to obtain an estimate from that agency. Modifications are expected to be minor, and any difference in cost is not expected to significantly affect the BCR. A relatively small amount of cost is identified in the MCACES estimate to cover miscellaneous incidental costs for coordination with the USCG during and post construction.

6.2.2 Project Schedule and Interest During Construction

IDC accounts for the opportunity cost of expended funds before the benefits of the project are available and are included among the economic costs that comprise NED project costs. The amount of the pre-base-year cost equivalent adjustments depends on the interest rate; the construction schedule, which determines the point in time at which costs occur; and the magnitude of the costs to be adjusted. The current construction schedule assumes authorization of the project in a future WRDA. Assuming Congress provides funding subsequent to authorization of the project in that future WRDA, the proposed schedule of activities would follow, resulting in benefits starting in the base year 2021 for the proposed project. The IDC was computed with the October 2013 interest rate of 3.5 percent. Total construction duration is assumed to be 29 months. The following is the schedule for construction that was used in computing the IDC (Table 6-5).

Table 6-5. Construction Schedule

CONTRACT	PAs Used	DURATION (Months)	START DATE	END DATE
1	ODMDS	7	October 2017	April 2018
2	4B, 5A	15	October 2017	December 2018
3	7, 8	13	October 2017	October 2018
4	5A	16	February 2018	May 2019
5	2	6	February 2018	July 2018
6	4B	11	January 2019	November 2019
7	5B	12	March 2019	February 2020

6.3 DESIGN AND CONSTRUCTION CONSIDERATIONS

This project consists of noncomplex engineering measures such as channel dredging, earthen dike construction, and minor bank stabilization. Sufficient information is available from channel borings to adequately characterize the material to be encountered during dredging; new construction is expected to encounter clay and sand sediments. Geotechnical investigations, conducted over the majority of the project area, are sufficient for feasibility-phase planning and adequately characterize foundation conditions and soils that would be used for dike construction. Existing channel stationing would be maintained for the new project, with the addition of stationing for the 0.75-mile channel extension. The effects of RSLR on the channel and PAs have been taken in account in conformance with guidance. Little to no impact is expected over the 50-year period of analysis because elevations in uplands adjacent to the channel exceed the highest projected RSLR. The Engineering Appendix includes all design, geotechnical, and hydrologic modeling information, surveys, and plates in greater detail and is available upon request.

6.3.1 Value Engineering

A Value Engineering (VE) study was performed to identify potential savings of project costs and increase the BCR of the final plan. The VE study was performed after the ship simulation and rig geometric analysis so it was based on the preliminary results from those studies and limited to a plan for deepening the channel to 50 feet and widening to 350 feet. The recommendations for design changes from the VE study were applied to the other channel depths or widths that were evaluated in the Final Array.

The VE study resulted in three alternative suggestions:

- VE-1 – Only widen the channel to 300 feet from Station 28+000 to 79+415 in lieu of 350 feet;

- VE-2 – Only deepen the channel to 48 feet from Station 84+200 to the end of the Turning Basin in lieu of 50 feet; and
- VE-3 – Do not deepen the Turning Basin.

VE-2 and VE-3 suggestions have been incorporated into the design of the channel improvements presented in this report. VE-1 was rejected due to the need for the width based on design vessels evaluated at that time in the study process. Slight variations in the VE alternatives' stationing was made to ensure adequate deepening to port facilities that need the improved channel based on economic analysis.

6.3.2 With-Project Sea Level Rise

BIH is a very long channel with no additional sources of inflow, making it lack hydrodynamic complexity. This simplifies the sea rise level analysis, and modeling was therefore not required. Modeling was done to examine surge impacts from the project, which were minimal, and any additional impacts from RSLR on surge are again expected to be insignificant. The RSLR rates for the area, based on the tidal record analysis, are relatively low with rates for "low," "intermediate," and "high" being 0.6 foot, 1.1 feet, and 2.4 feet, respectively, over the 50-year period of analysis. The historic average rate for the project area is about 1.26 feet per 100 years according to NOAA Mean Sea Level trends using the Port Isabel, Texas, tide gage (NOAA, 2013a). Recommendations based on the results of the sea level rise analysis are:

1. RSLR of 2.0 to 2.5 feet needs to be considered in the shoaling analysis for future project considerations, or a safety factor needs to be included to account for any additional shoaling that may be contributed by additional rise in sea level. However, the effect of sea level rise on shoaling is expected to be minimal.
2. Any PAs that require protection should be armored an additional 2.0 to 2.5 feet in elevation.

6.3.3 Storm Surge

A storm surge impacts analysis was performed by the Engineer Research and Design Center's (ERDC) Coastal Hydraulics Laboratory to determine potential changes (increases and/or decreases) in storm surge considering with-project and future O&M conditions (USACE, 2013b). Storm surge simulations and analyses were used to quantify the impacts of BIH widening and/or deepening alternatives, as well as to estimate 50-year future conditions based on estimated PA dike elevations. A total of 14 synthetic storms and 1 historic storm (Hurricane Allen) were simulated to compute the difference in the peak water level between the existing and the 50-year project design conditions. Differences in storm surge found in the BIH region for the future condition compared to the existing condition range from 0.1 to 2.6 feet, with the majority of differences at the low end of this range. The largest increases in surge are generally on the southern side of the channel in unpopulated areas around PA margins. Changes in surge for the project conditions depended greatly on the intensity of the storm and the angle of approach. Overall, storm surge modeling has identified only minor potential impacts.

6.3.4 Mean Lower Low Water Conversion

Historically, USACE–Galveston used the MLT datum for its navigation channels. This datum was recently converted to MLLW for consistency with other USACE Districts. MLLW datum was used for all quantity calculations during plan formulation. For the BIH conversion, on average, the MLT/MLLW difference is +0.31 foot. Because this difference was so small and it would have little to no effect on dredging quantities, the study addresses MLT as equal to MLLW for conversion from historic dredging records and drawings. Therefore, –42 feet MLT is considered equal to –42 feet MLLW. More detailed information relating to this conversion is included in the Engineering Appendix.

6.4 REAL ESTATE CONSIDERATIONS

BND is required to furnish the LERRs for the proposed cost-shared project. The real estate requirements must support construction as well as O&M of the project after completion. Specific details of the real estate requirements can be found Appendix C of this document.

6.4.1 Lands, Easements, and Rights-of-Way

The offshore portion of the BIH Channel will be dredged to a depth of 54 feet. This dredging will occur from Station –17+000 to 0+000. From Station 0+000 to 84+200 dredging will be to a depth of 52 feet. New work dredged material and all maintenance material for the project would be placed in existing PAs. The seven existing PAs have been provided through a 50-year easement, issued in 1994, from the non-Federal sponsor to the Federal Government. Perpetual easements conveyed to the Federal Government are needed to assure all project PAs, which are built for the purpose of supporting the Federal navigation projects, are available to the Government as often and for as long as they are needed to support the project. The Real Estate Plan (Appendix C) further details the real estate requirement concerning perpetual easements. The existing 50-year easements must be converted to perpetual easements prior to the first contract being awarded. The only LERRs expense that may be creditable to the project costs is the administrative fee to convert/extend the existing easement estate from a 50-year easement to a perpetual easement. No LERRs credit would be provided for lands made available for the project since lands were previously credited as LERRs for the past project improvements with Federal funds participation. No new LERRs are required for the construction/implementation of the Recommended Plan.

All of the proposed work would be performed within the existing right-of-way of the BIH project. Access for construction would be by barge from the channel or over existing access corridors. All land that would be crossed is owned by the non-Federal sponsor and is available for this project. The channel itself, the two existing ODMDSs, and the Feeder Berm are within the navigable waters of the U.S. and are available to the Federal Government via navigation servitude.

6.4.2 Facility Removals/Deep-Draft Utility Relocations

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

Two pipelines located within or near the proposed project area were identified and investigated. The first pipeline is a 4-inch gas gathering pipeline that runs parallel to the channel. It does not cross the channel or any of the PAs being used for disposal; therefore, it would not be affected by the project. The second pipeline is a 10-inch refined products pipeline crossing under the channel near Station 80+000 at a depth of –75 feet MLLW. This pipeline is currently at such a depth that the channel deepening to –52 feet MLLW would allow adequate coverage per engineering guidance and would not require removal or relocation.

6.5 OPERATIONS AND MAINTENANCE CONSIDERATIONS

The required maintenance dredging of the 52-foot channel would increase to approximately 1,258,000 cy/yr from the current 1,103,000 cy/yr for the 42-foot channel for a net increase of 155,000 cy/yr, approximately a 14.0 percent increase. The increase in maintenance dredging quantities over the 50-year period of analysis is 7.8 MCY. Details are included in Section 6.1.2. The incremental increase in O&M dredging, Disposal Area Management Practice (DAMP) work, and dike raising costs for the Recommended Plan is estimated to be $2,971,000 annually.

6.6 ECONOMIC ANALYSIS FOR RECOMMENDED PLAN

6.6.1 Economic Optimization

Once the Recommended Plan was selected, additional efforts were made to optimize the plan. Detailed economic analysis is presented in Appendix A – Economic Appendix. The future vessel fleet composition was updated. Based on interviews with the Pilots and end-users, the speed in the reaches was increased and the loading and unloading rates were updated for some vessel types. Vessel operating costs for the oil drilling rigs in the without-project condition were also updated to be more consistent with the cost to remove a semisubmersible rig's thrusters before entering the channel. The thruster removal cost was modified to calculate only the change between removal of thrusters in channel and at sea, decreasing the cost reduction from $15 million to $8 million. Additionally, due to the timing of the project, the base year of the project was deferred to 2021 to represent a more realistic start date. Benefits were calculated in 10-year increments, rather than the beginning, midpoint, and end of the period of analysis that was used in the plan selection. HarborSym model inputs were updated based on new information and additional model runs were performed. The AAEQ benefits at 3.5 percent after this optimization are $20,539,000 with a BCR of 1.5 (Table 6-6). Details of the optimization are included in Appendix A. The details of the benefits that include Section 6009 are provided in the 6009 addendum, the BCR is 6.4. Per Section 6009 Implementation Guidance, Keppel-AmFELS provided a statement of their certification to the data related to such benefits.

Table 6-6. Economic Summary of Recommended Plan
(Costs in $1,000s, (October 2013 price levels, 3.5% interest)

	Traditional Benefits	Benefits with Section 6009
First Cost of Construction	251,952	251,952
IDC	10,563	10,563
Total Investment	262,515	262,515
Average Annual Cost	11,192	11,192
Incremental Average Annual O&M	2,971	2,971
Total Annual Cost	14,163	14,163
Average Annual Benefits	20,539	90,804
Net Excess Benefits	6,376	76,641
BCR	1.5	6.4

6.6.2 Economic Sensitivities

In order to examine areas of risk and uncertainty, sensitivity analyses were conducted to use as a comparison of the degree of reliability of the estimated benefits of the alternatives with details included in the Appendix A. The first sensitivity assumed no growth in the commodities during the period of analysis. A 1 percent growth rate was used to grow the tonnage from 2011 to 2021, which is a reasonable assumption that there would be minimal continued growth over the next decade. However, the tonnage remains constant throughout the period of analysis. The annualized benefits for the no-growth sensitivity at 3.5 percent interest rates are $17,472,000 with a BCR of 1.2.

In the second sensitivity, the current vessel fleet mix and the resultant tonnage percentage associated with the fleet sizes were carried throughout the period of analysis, while incorporating the tonnage growth. The resultant annualized benefits at 3.5 percent are $11,060,000 with a BCR of 0.8.

In addition, sensitivity analyses were performed to present the range of large semi-submersible rig arrivals. Table 6-7 presents the results of these sensitivity analyses.

Table 6-7. Economic Summary of Large Semi-Submersible Rig Sensitivity
(October 2013 Price Levels, 3.5% interest rate, $ in 1,000s)

	No Large Semi-Submersible Rigs	Fewer Large Semi-Submersible Rigs	Higher Large Semi-Submersible Rig Operating Costs
Average Annual Benefits	13,218	15,484	27,291
Total Annual Cost	14,163	14,163	14,163
Net Excess Benefits	(945)	1,321	13,128
B/C Ratio	0.9	1.1	1.9

6.7 SUMMARY OF ACCOUNTS

As stated in Section 5, the Federal process incorporates four accounts to facilitate evaluation and display of effects of alternative plans. The four accounts are NED, environmental quality (EQ), regional economic development (RED), and other social effects (OSE). They are established to facilitate evaluation and display of effects of alternative plans.

6.7.1 National Economic Development Benefits

The NED account is required. Other information that is required by law or that would have a material bearing on the decision-making process should be included in the other accounts, or in some other appropriate format used to organize information on effects. The Federal Objective is to determine the project alternative with maximum net benefits while protecting or minimizing impacts to the environment.

The economic analysis used NED to measure the benefits of the Recommended Plan; regional shifts in economics are not expected as a part of the Recommended Plan. Additional efforts were completed to optimize the Recommended Plan as described previously in Section 6.6.1.

The NED account displays changes in the economic value of the national output of goods and services. Under this account, the 52-foot-deep channel demonstrates the highest net benefits of $6,376,100 with a BCR of 1.5 as presented above in Table 6-6. With the Section 6009 benefits included, the BCR is 6.4.

6.7.2 Environmental Quality

Adverse EQ effects of the Recommended Plan are negligible and there is no required fish and wildlife or cultural resource mitigation. Incidental positive EQ effects would occur with the beneficial placement of maintenance material at the nearshore Feeder Berm. These effects were evaluated under the EQ account and are detailed in Section 7.

6.7.3 Regional Economic Development Benefits

The RED account identifies changes in the distribution of regional economic activity. Evaluations of regional effects are to be carried out using nationally consistent projections of income, employment, output, and population (ER 1105-2-100). With the value of the current 42-foot BIH channel to the region, it is expected that the Recommended Plan of deepening the channel would increase benefits to the region. During project construction, the study area would likely have an increase in construction employment and local purchases of construction materials, although this would be temporary. The primary economic bases of the study area include ship and rig repair operations, ship dismantling, marine cargo activity, and commercial fishing. As a result of the Recommended Plan, the positive economic effects to the study area would be moderate at the least and substantial at best.

6.7.4 Other Social Effects

OSE effects of the Recommended Plan would normally include effects to homeowners in the project area. However, this is not a concern for the BIH project since all lands adjacent to the channel are owned by the POB and already used for port-related activities. The types of activities that would occur at the POB in the future are not expected to change significantly.

6.8 RISK AND UNCERTAINTY

Risk and uncertainty is an important part of the USACE planning process and it is emphasized in Goal 2 of the USACE Campaign Plan, which is addressed in Appendix L. This goal expresses the USACE commitment to deliver enduring and essential water resource solutions, utilizing effective transformation strategies that develop and employ risk- and reliability-based approaches that evaluate the consequences of planning, design, construction, and management decisions.

Risk and uncertainty arise from measurement errors and the underlying variability of complex natural, social, and economic situations (Schultz et al., 2010; USACE, 2000). Risk is a potential adverse consequence that may or may not be realized in the future; it is often expressed as a probability of occurrence. Uncertainty reflects a lack of knowledge and is a measure of imprecision on economic, engineering, and environmental aspects of a plan or project. This study incorporated consideration of risk in the development and evaluation of alternatives by taking into account the likelihood and variability of physical performance, economic success, and residual risk.

6.8.1 Engineering Data and Models

Engineering analysis for BIH evaluated the array of alternative plans for impacts on hydrodynamics, storm surge, shoaling and sedimentation, shoreline erosion, navigation, and the potential to exacerbate the effects of RSLR. This section discusses risk and uncertainty in the engineering analyses conducted to determine feasibility of deepening and/or widening the BIH channel.

6.8.1.1 Relative Sea Level Rise

The project must consider possible trends that affect the area. One trend that would impact the area is RSLR. Estimates of potential sea level rise were performed as required by EC 1165-2-212 (Sea-Level Change Considerations for Civil Works Programs). RSLR estimates are based on historical data. The degree of uncertainty and values vary considerably amongst the worldwide scientific community, and this issue will likely be debated and estimating methods possibly improved over time. This study uses current USACE sea level rise guidance as required for USACE studies which incorporates many studies on projected sea level rise and predicts most likely scenarios. To account for the unknowns in sea level rise USACE requires considering "high", "medium", and 'low" scenarios of sea level rise projections. The estimated values range from 2.4 feet for the "high" scenario to 0.63 feet for "low" estimate for BIH.

In order to assess possible impacts of sea level rise for the project the "high" value (worst case scenario) was evaluated and it was determined the "high" sea level rise scenario will not produce negative impacts on the existing or proposed project. It is unlikely rising sea levels will rise above the top of jetty elevation which would impact the functionality of the project. Upland PAs would be armored to withstand the effects of rising sea levels and the cost of this armoring is included in the total project cost estimate. Minor impacts in the project vicinity would likely occur due to RSLR, but not as a consequence of the proposed project. RSLR guidance and corresponding estimates may change by the time the project goes to PED. It is recommended that these estimates be updated and reanalyzed during PED.

6.8.1.2 Shoaling

Shoaling rates estimated for the proposed project are based on historical dredged quantities. Since survey data were not analyzed, this analysis assumes that all material that shoaled was dredged. This was not the case, causing the estimated shoaling rate to be lower than actual. Causes of shoaling and pathways of shoaled material can be complex. Actual shoaling rates could be more than 10 percent greater than calculated; this could cause a linear increase in O&M costs.

This shoaling analysis method does not include possible impacts from sea level rise or changes in ship traffic through the proposed channel. It is noted that large storms that come through, such as hurricanes, could alter the amount of shoaling in any given year. Site conditions and characteristics of adjacent water bodies such as Bahia Grande and South Bay may change before PED begins and any such changes should be evaluated for impacts to shoaling. It is recommended that shoaling rates be reassessed during PED with any additional data that is available at that time. Additional dredging histories and survey data will be available and should be used to refine shoaling estimates for PED.

BIH is currently being studied by ERDC (including site monitoring and possible hydrodynamic/sedimentation modeling) under the Monitoring of Completed Navigation Projects (MCNP) program. Additional data and study results should increase understanding of shoaling and its causes in the BIH channel and project vicinity. This information could help determine ways to decrease shoaling and related costs. This data should be utilized to reevaluate shoaling estimates, reduce uncertainty of shoaling rates, and refine cost estimates during PED.

6.8.1.3 Hydrodynamics and Storm Surge

Typical Conditions. Hydrodynamics for the channel were modeled using an Adaptive Hydraulics two-dimensional model. Simulations were performed for several widening and deepening scenarios, and the results were used to evaluate project impacts. The model was not validated against field data; therefore, these model results should be applied qualitatively. The model does show that impacts from the selected alternative to discharges, water surface elevations, and velocities in the channel are negligible and should not require any additional modeling during the PED phase (USACE, 2012a).

Storm Conditions. USACE performed a sensitivity analysis to determine potential changes in storm surge with-project and future O&M conditions. Baseline storm surges used for the analysis were composed of the suite of storm surges produced from the Federal Emergency Management Agency (FEMA) Texas Joint Storm Surge Study (JSS). The FEMA Texas JSS used the Advanced Circulation model together with the ERDC Steady State Wave model to perform storm surge and wave simulations. A total of 14 synthetic storms and 1 historic storm was simulated on the existing conditions mesh and the with-project 50-year O&M mesh to compute peak differences between existing and with-project design conditions. Changes surrounding the with-project channel are generally small. An uncertainty and error analysis of the surge impact estimates was performed, which yielded a high degree of confidence for simulations and surge impact estimates. Comparing the USACE ERDC existing conditions data versus the FEMA JSSS existing conditions data determined a correlation co-efficient of 0.97 to 0.98. The calculated root-mean-square error was between 0.36 feet and 0.34 feet. These values provide a high degree of confidence for the ERDC project simulations. No additional surge modeling should be needed during the PED phase.

6.8.2 Economic Data and Models Analysis

Economic analysis was based on data from Waterborne Commerce Statistics Center from the USACE Navigation Data Center, the Pilots, the POB, and various end-users. Traffic forecasts were projected for the "most likely" scenario. Deepening and widening benefit calculations were made using the HarborSym Model, which has risk and uncertainty built into the program, as a result of the Monte Carlo system. Any other risk and uncertainty is related to the inputs and assumptions used in the HarborSym Model. Sensitivity analyses were conducted to determine the sensitivity of projected benefits to changes in key assumptions, such as commodity tonnage, fleet distribution, and other various growth rates. Sensitivity analyses regarding commodity forecasts, vessel fleet mix, and large semisubmersible rig arrivals were performed and are presented in Section 6.6.2 above, as well as in the Economic Appendix (Appendix A).

6.8.3 Project Cost and Schedule Risk Analysis

In compliance with ER 1110-2-1302 – Civil Works Cost Engineering, dated September 15, 2008, a formal risk analysis, Monte-Carlo-based study was conducted by the Project Delivery Team (PDT) on remaining costs. The purpose of this risk analysis study was to present the cost and schedule risks considered, and respective project contingencies at a recommend 80 percent confidence level of successful execution to project completion. The cost and schedule risk analysis report regarding the risk findings and recommended contingencies for the Recommended Plan is included in Appendix B.

6.8.4 Environmental Data and Analyses

The most current available data were used for environmental analyses of the study area, augmented by field studies where needed to comply with specific regulatory requirements. No significant environmental impacts were identified, and therefore no ecological modeling was required to quantify impacts or mitigation. No significant uncertainties have been identified in the environmental data used to evaluate Recommended Plan impacts, and no significant risks to environmental resources are expected with construction of the Recommended Plan.

6.9 CONSISTENCY WITH OTHER STATE AND FEDERAL LAWS

This EA has been prepared to satisfy the requirements of all applicable environmental laws and regulations and has been prepared using the Council on Environmental Quality (CEQ) NEPA regulations (40 CFR Part 1500–1508) and the USACE's regulation ER 200-2-2 - Environmental Quality: Policy and Procedures for Implementing NEPA, 33 CFR 230. In implementing the Recommended Plan, the USACE would follow provisions of all applicable laws, regulations, and policies related to the proposed actions. The following sections present brief summaries of Federal environmental laws, regulations, and coordination requirements applicable to this Environmental Assessment (EA).

6.9.1 Clean Air Act

Cameron County is currently designated as in attainment or unclassifiable with National Ambient Air Quality Standards, therefore a General Conformity Determination is not required. Impacts of the Recommended Plan on air quality and greenhouse gases (GHG) have been evaluated. It is expected that air contaminant emissions from construction and maintenance dredging activities would result in short-term impacts on air quality in the immediate vicinity of the dredging site. An inventory of GHG emissions was also prepared for the Recommended Plan. Measures to reduce emissions from dredging activities would be included in USACE contracts.

6.9.2 Clean Water Act

Sections 401 and 404 of the Clean Water Act (CWA) apply to the Recommended Plan and compliance would be achieved. Section 404 of the CWA regulates dredge-and/or-fill activities in waters of the U.S. In Texas, Section 401 of the CWA (State Water Quality Certification Program) is regulated by the TCEQ. Compliance will be achieved through coordination of this final report with TCEQ to obtain water quality certification for the project. Coordination includes an evaluation of the project based on the Section 404(b)(1) Guidelines as presented in Appendix G. New work and maintenance sediments are suitable for placement in the upland PAs, the New Work and Maintenance ODMDSs, and the Feeder Berm. The USACE has requested and TCEQ has issued a 401 State Water Quality Certification for the project.

6.9.3 Section 103 of the Marine Protection, Research, and Sanctuaries Act

This Act requires a determination that dredged material placement in the ocean would not reasonably degrade or endanger human health, welfare, and amenities, or the marine environment, ecological systems, or economic potential of shellfish beds, fisheries, or recreational areas. A Marine Protection, Research, and Sanctuaries Act (MPRSA) Section 102/103 evaluation report for the proposed placement of new work dredged material within the ODMDS is provided in Appendix F. Modeling indicates the existing New Work and Maintenance ODMDSs are large enough to accommodate material from the Recommended Plan, and that future new work and maintenance material is expected to have the same properties as dredged material placed previously at both ODMDSs. The New Work ODMDS was created for the placement of new work material for the existing 42-foot Project. EPA has concluded that new work material expected with construction of the 52-foot project is suitable for placement in the new work ODMDS. Shoaled sediments that would be placed in the offshore Feeder Berm have been determined to be of sufficient quality for beneficial use. USACE would continue to use the Maintenance ODMDS, pending EPA concurrence that management and monitoring meet EPA guidelines. Use of the ODMDSs would be in accordance with a Site Monitoring and Management Plan that is under development.

6.9.4 Section 7 of the Endangered Species Act

Interagency consultation under Section 7 of the Endangered Species Act (ESA) has been undertaken and completed. A draft Biological Assessment (BA) was prepared describing the study area, federally listed threatened and endangered species of potential occurrence in the study area as identified by the NMFS and USFWS, and potential impacts of the Recommended

Plan on these protected species (Appendix I). The Draft BA was submitted to NMFS and USFWS for review and was revised based on their input. USACE has determined and the agencies agree that the Recommended Plan may affect but is not likely to adversely affect the piping plover, northern aplomado falcon, Gulf Coast jaguarundi, ocelot, the West Indian manatee, and the leatherback sea turtle. USFWS has reviewed our assessment of impacts to species under their jurisdiction and provided conservation recommendations, which have been adopted by USACE. Interagency consultation under Section 7 of the ESA has been concluded with NMFS. USACE has determined and NMFS agrees that the Recommended Plan may adversely affect but is not likely to jeopardize the continued existence of 4 sea turtle species (green, Kemp's ridley, loggerhead, and hawksbill). Potential impacts of maintenance dredging for the Recommended Plan will be covered by existing Biological Opinion (BiOp) Consultation No. F/SER/2000/01287 (NMFS, 2003, as amended by Revisions No. 1 and 2 (USACE 2006)). The Final NMFS BiOp (F/SER/2013/11766) requires USACE to adopt specific RPMs to minimize sea turtle impacts and USACE has agreed to adopt all of these RPMs. Actions that will be taken to comply with the USFWS RPMs and NMFS conservation recommendations are presented in Section 7.4.3. NMFS has provided an Incidental Take Statement for construction of the project which consists of a total of 19 turtles (3 loggerhead, 14 green, and 2 Kemp's ridley).

6.9.5 Magnuson-Stevens Fishery Conservation and Management Act

The Magnuson-Stevens Fishery Conservation and Management Act (PL 94-265), as amended, establishes procedures for identifying EFH and requires interagency coordination to further the conservation of federally managed fisheries. EFH consists of those habitats necessary for spawning, breeding, feeding, or growth to maturity of species managed by Regional Fishery Management Councils in a series of Fishery Management Plans. Submittal of the Draft Integrated Feasibility Report and Environmental Assessment (DIFR-EA) to NMFS initiated EFH consultation. USACE anticipates minor and temporary impacts to benthic organisms and turbidity during construction, but no significant or long-term effects.

6.9.6 Section 106 of the National Historic Preservation Act

Compliance with the National Historic Preservation Act of 1966, as amended, requires identification of all historic properties in the project area and development of mitigation measures for those adversely affected in coordination with the State Historic Preservation Officer (SHPO) and the Advisory Council on Historic Preservation. It has been determined, in consultation with the Texas SHPO, that no historic properties would be affected by the proposed undertaking.

6.9.7 Coastal Zone Management Act

Under the Texas Coastal Management Program (TCMP), enacted under the Coastal Zone Management Act in 1972, the GLO reviews Federal activities to determine whether they are consistent with the policies of the TCMP. USACE has prepared a Consistency Determination that evaluates the Recommended Plan for consistency with the TCMP and has concluded that it is fully consistent to the maximum extent practicable with the enforceable policies of the Texas program (Appendix H). GLO has concurred that the Recommended Plan in consistent with the TCMP.

6.9.8 Fish and Wildlife Coordination Act

The Fish and Wildlife Coordination Act provides for consultation with the USFWS and, in Texas, with TPWD whenever the waters or channel of a body of water are modified by a department or agency of the U.S. A Coordination Act Report (CAR) was prepared by the USFWS and is included in Appendix J. Submittal of the DIFR-EA initiated coordination with TPWD. The CAR recognizes that the Recommended Plan avoids significant impacts to fish and wildlife resources, including federally listed, threatened and endangered species. USACE has adopted the CAR conservation recommendations that provide better protection for several listed species as described in Section 7.0.

6.9.9 Marine Mammal Protection Act of 1972

The Marine Mammal Protection Act was passed in 1972 and amended through 1997. It is intended to conserve and protect marine mammals and establish the Marine Mammal Commission, the International Dolphin Conservation Program, and a Marine Mammal Health and Stranding Response Program. The Recommended Plan is not expected to impact any marine mammals.

6.9.10 Federal Water Project Recreation Act

This 1995 Act requires consideration of opportunities for outdoor recreation and fish and wildlife enhancement in planning water-resource projects. The Recommended Plan is not expected to have any long-term effects on outdoor recreation opportunities in the area.

6.9.11 Coastal Barrier Improvement Act of 1990

This Act is intended to protect fish and wildlife resources and habitat, prevent loss of human life, and preclude the expenditure of Federal funds that may induce development on coastal barrier islands and adjacent nearshore areas (Coastal Barrier Resources System, 2010). Portions of two Coastal Barrier Resources System units (TX 12 and TX 12P) are located south of the Main Channel on Brazos Island and in the Boca Chica area. The boundaries encompass existing PA 2 and a small part of existing PA 4A. Exceptions to the Federal expenditure restrictions include maintenance of constructed improvement(s) to existing Federal navigation channels and related structures, including the disposal of dredged material related to maintenance and construction.

Thus, Recommended Plan use of the existing PAs is exempt from the prohibitions identified in this act.

6.9.12 Farmland Protection Policy Act of 1981 and the CEQ Memorandum Prime and Unique Farmlands

In 1980, the CEQ issued an Environmental Statement Memorandum "Prime and Unique Agricultural Lands" as a supplement to the NEPA procedures. Additionally, the Farmland Protection Policy Act was passed in 1981, requiring consideration of those soils that the U.S. Department of Agricultural defines as best suited for food, forage, fiber, and oilseed production, with the highest yield relative to the lowest expenditure of energy and economic resources. No new lands would be impacted by construction of the Recommended Plan, and therefore there is no potential for impacts to prime or unique farmlands.

6.9.13 Executive Order 11988, Floodplain Management

This Executive Order (EO) directs Federal agencies to evaluate the potential effects of proposed actions on floodplains. Such actions should not be undertaken that directly or indirectly induce growth in the floodplain unless there is no practicable alternative. The Main Channel and existing PAs are located in the floodplain of the Rio Grande. There is no practicable alternative to proposed improvements to the existing channel or to the use of existing PAs. Impacts to the floodplain have been minimized by restricting all impacts to the footprints of existing PAs.

6.9.14 Executive Order 11990, Protection of Wetlands

This EO directs Federal agencies to avoid undertaking or assisting in new construction located in wetlands, unless no practicable alternative is available. The Recommended Plan does not impact wetlands. Impacts to wetlands have been avoided by restricting all construction to the footprints of existing PAs.

6.9.15 Executive Order 12898, Environmental Justice

This EO directs Federal agencies to determine whether the Recommended Plan would have a disproportionately adverse impact on minority or low-income population groups within the project area. An evaluation of potential Environmental Justice (EJ) impacts has been conducted, and the Recommended Plan is not expected to significantly affect any low-income or minority populations.

6.9.16 Executive Order 13186, Responsibilities of Federal Agencies to Protect Migratory Birds and the Migratory Bird Treaty Act

The Migratory Birds and the Migratory Bird Treaty Act (MBTA) of 1918 (as amended) extends Federal protection to migratory bird species. Among other activities, nonregulated "take" of migratory birds is prohibited under this Act in a manner similar to the ESA prohibition of "take" of threatened and endangered species. Additionally, EO 13186 "Responsibilities of Federal Agencies to Protect Migratory Birds" requires Federal activities to assess and consider potential effects of their actions on migratory birds (including, but not limited to, cranes, ducks, geese, shorebirds, hawks, and songbirds). The effect of the Recommended Plan on migratory bird species has been assessed, and no impacts are expected to migratory birds or their habitat in the project area. Construction contracts would include instructions to avoid impacts to migratory birds and their nests from construction-related activities.

6.9.17 Executive Order 13045, Protection of Children from Environmental and Safety Risks

This EO requires Federal agencies to make it a high priority to identify and assess environmental health and safety risks that may disproportionately affect children and to ensure that policies, programs, activities, and standards address these risks. This report has evaluated the potential for the Recommended Plan to increase these risks to children, and it has been determined that children in the project area would not likely experience any adverse affects from the proposed project.

7 ENVIRONMENTAL CONSEQUENCES

Environmental consequences of the No Action and Recommended Plan alternatives are compared below. A detailed comparison of all factors compared in evaluating the Final Array of Alternatives, including environmental effects, is presented in Section 5.4 of this report.

7.1 Impacts to Protected/Managed Lands

Federal and State lands would not be affected by either the No Action Alternative (FWOP) or the Recommended Plan alternative. Under the FWOP, Federal and State lands in the study area would continue to be unaffected by maintenance activities. No direct impacts would occur because Federal and State lands do not exist within the Recommended Plan project footprint.

7.2 Impacts to Physical and Hydrological Characteristics

Under the No Action Alternative (FWOP condition), the existing BIH channel would continue in operation at its current depth and length. The existing PAs, Maintenance ODMDS and the Feeder Berm would continue in use. RSLR over the 50-year period of analysis would be expected to range between 0.6 foot and 2.4 feet, resulting in small increases in inundation and tidal circulation in the Laguna Madre, Bahia Grande complex, and Back Bay. Overall, base land elevations along the channel are high enough that even the high range estimate would result in few changes to navigation features or industrial infrastructure.

The Recommended Plan alternative would result in minor changes to the physical and hydrological characteristics of the study area. The Entrance Channel would be extended an additional 4,000 feet (0.76 mile) into the Gulf of Mexico and the navigation channels would be deepened an additional 10 feet from offshore to the beginning of the Turning Basin Extension at Station 84+200. Hydrodynamic modeling has determined that negligible differences in water surface elevations would occur with construction of the Recommended Plan (Tate and Ross, 2012). No effect on tidal range in the Laguna Madre was discernible. The deepening would result is a small change in phasing of flows and in the peak velocity magnitudes in the channel, but velocities are quite low and therefore the increased velocity would result in a negligible effect. Typically, concerns when deepening a navigation channel focus on salinity intrusion. Salinity intrusion is not an issue in the BIH study area because overall salinities are already high in this dead-end man-made channel and there is little vertical stratification. A MPRSA Section 102/103 evaluation report for the proposed placement of new work dredged material within the ODMDS is provided in Appendix F. Modeling indicates the existing ODMDSs are large enough to accommodate all material from the Recommended Plan, and that future new work and maintenance material is expected to have the same properties as dredged material placed previously at both ODMDSs.

Upland PAs and containment dikes would be sized to accommodate total quantities over the 50-year period of analysis. None of the existing PAs would need to be expanded and no new PAs would be needed. Construction to raise the containment dikes to heights needed to accommodate the new work material and 50-year maintenance quantities would be done within the footprints of the existing PAs. Dikes would be raised incrementally as needed to contain quantities resulting from construction and maintenance contracts. The resulting elevations of the PA dikes for the 50-year DMMP would range from a total elevation of 12 feet NAVD 88 around PA 5A to a total elevation of 36 feet around PA 2. Effects of the increased elevations of these features and the increased depth of the channel were modeled to determine if the Recommended Plan would exacerbate the effects of tidal surge in the study area (Ratcliff and Massey, 2013). Since PA containment dikes are higher than most surrounding topography, storm surges that overtop the channel flow around the PAs and flood surrounding low areas. It was projected that, depending upon the storm's intensity and angle of approach, surge could increase between 0.1 foot and 2.6 feet due to the Recommended Plan; however, in most cases, surge increases would be at the lower end of this range. The highest increases in surge are generally in undeveloped areas on the southern side of the channel, especially from PA 5B eastward. The smallest effects would occur at the developed end of the channel near the Turning Basin, and in many cases, surge is projected to be lower with the project in this area.

The longer and deeper channel would result in an approximately 14.1 percent overall increase in maintenance dredging quantities over the period of analysis. Maintenance material from the Entrance and Jetty Channels and the first 11,000 feet of the Main Channel would generally be placed in the nearshore Feeder Berm (USACE, 1988a). Sediment removed by maintenance dredging would therefore be regularly placed back into the littoral system, available for cross-shore and longshore sediment transport to South Padre Island. Monitoring of material placed at the Feeder Berm has demonstrated that it disperses and moves alongshore toward the beach (McLellan et al., 1997; USACE, 1989). If for some reason the Feeder Berm cannot be used, maintenance material from the Entrance and Jetty Channels (station –17+000 to 0+000) could be placed in the Maintenance ODMDS, which is located approximately 2.5 nautical miles from shore and north of the channel (USACE, 1975, 1999). The ODMDS and Feeder Berm are located in dispersive environments and have unlimited capacities.

7.3 Impacts to Biological Communities

Under the No Action Alternative (FWOP condition), no effects would occur to the sensitive biological communities found in the study area. Most of the land along the BIH Main Channel is owned by the BND or is managed by Federal, State, and local agencies. Therefore, development that might be expected under the FWOP condition would be limited.

Under the Recommended Plan, no effects would occur to the following biological communities:

Thornscrub Forest and Brush, Coastal Dunes, Wetlands and Oyster Reef – none of these habitats occur within construction or maintenance footprints.

Mesquite Savannahs – impacts to mesquite savannahs located south of existing PAs would be avoided by project construction and maintenance activities. Access for PA dike construction would be obtained from the Main Channel wherever possible, and construction equipment and local transportation would be restricted to existing dirt roads in the vicinity of the PAs.

Lomas – impacts to all clay lomas would be avoided by project construction and maintenance activities. A new dike would be constructed to protect a large loma on the south side of PA 4B from impacts associated with dredged material placement; all other lomas in the project area are already protected by similar dikes. As recommended by USFWS (2013), the new dike would be constructed a minimum of 30 feet from the toe of the existing loma.

Tidal and Algal Flats – although these are present in areas surrounding existing PAs, none occur within construction or maintenance footprints. USFWS (2013b) has observed that a significant storm surge could breach PA containment dikes and spread dredged material over the adjacent flats. As recommended by USFWS, elevations of these tidal flats immediately adjacent to PAs would be documented during dike design activities and USACE would consult with USFWS should these impacts occur.

Bays and Deepwater Habitats – temporary and minor effects would occur to bays and deepwater habitats. Construction of the Recommended Plan would result in temporary disruption of benthic habitats within the channel and offshore PAs, and impacts associated with maintenance dredging would continue. These impacts would include short-term increases in water column turbidity and benthic impacts, although no long-term effects would be expected.

With construction of the Recommended Plan, aquatic organisms would be impacted by the increased water column turbidity during project construction. Conditions during dredging of the new project would be similar to existing maintenance activities. Such effects are usually temporary and local and can be expected to return to near-ambient conditions within a few hours after dredging ceases or moves out of a given area (Newcombe and Jensen, 1996; Clarke and Wilber, 2000). Finfish and shellfish are mobile enough to avoid highly turbid areas and under most conditions are only exposed to localized suspended-sediment plumes for short durations (minutes to hours) (Clarke and Wilber, 2000; Wilber and Clarke, 2001; Newcombe and Jensen, 1996). Notwithstanding the potential harm to some individual organisms, no long-term impacts to finfish or shellfish populations are anticipated from dredging and placement activities associated with the Recommended Plan compared with the existing condition.

Dredging operations would alter benthic habitats through evacuation of bay bottom and dredged material placement; evacuation buries and removes benthic organisms and placement smothers or buries benthic communities (Montagna et al., 1998). The impact to benthic organisms is likely to be confined to the immediate vicinity of the area dredged (Newell et al., 1998) and recovery of benthic macroinvertebrates following burial (in the ODMDSs and Feeder Berm) is typically rapid (recovering within months rather than years) (VanDerWal et al., 2011; Wilber et al., 2006; Wilber and Clarke, 2001). No long-term impacts are expected in the area dredged or disposal areas.

Shoal, turtle, and manatee grasses are the primary SAV in the study area. During a field visit in January 2013, it was verified that seagrasses grow in patchy strips within approximately 75 to 250 feet of the construction footprint (mostly near the East and West Wye and the South Bay entrance) where water depths and clarity are sufficient to allow light penetration. Under the Recommended Plan, seagrasses could be affected by temporary and localized turbidity, but any potential effects are anticipated to be negligible and short term.

7.4 Impacts to Fish and Wildlife and Their Habitats

7.4.1 Fish and Wildlife Impacts

Potential impacts to fish and wildlife are similar for both the No Action Alternative (FWOP condition) and Recommended Plan. All sediments from deepening the BIH channels would be placed in upland, confined PAs or in the existing New Work ODMDS. Maintenance dredged material would be placed in the same areas as those used under existing conditions, i.e., in existing upland, confined PAs, the Feeder Berm, and if necessary, the existing Maintenance ODMDS. The frequency and duration of maintenance dredging would be within the range occurring under existing maintenance dredging. Direct impacts to fish or wildlife would be restricted to benthic organisms and these would be minor and temporary, occurring only during dredging periods. Potential impacts to sensitive habitats surrounding the terrestrial PAs would be avoided by restricting construction activities to the existing PA footprints and existing access roads.

The mild climate and diverse habitats of Cameron County also support a rich variety of migrant and nesting birds, and many of the bird species recorded for Cameron County sites are spring and/or fall migrants. Of particular importance to the activities of the BIH Project construction and maintenance activities are ground-nesting avian species that utilize the sparse or unvegetated substrates which might be found on the containment dikes and within the PAs. These include the snowy plover (*Charadrius nivosus*), Wilson's plover (*Charadrius wilsonia*), killdeer (*Charadrius vociferus*), and least tern (*Sterna antillarum*). If depressional ponds and some emergent wetland vegetation develops within a PA, other bird species could opportunistically nest within the project area such as the black-necked stilt (*Himantopus mexicanus*), and American avocet (*Recurvirostra americana*). The greater the time period between dredging cycles, the more likely a given PA may stabilize with vegetation and other features that could support nesting birds.

In fulfillment of requirements of the MBTA, USACE would implement the following USFWS (2013b) recommendations. Activities requiring vegetation removal or disturbance would avoid the peak nesting period of March 1 through August 31 to avoid destruction of individuals, nests or eggs. If project activities must be conducted during this time, surveys for nests would be conducted prior to commencing work. If a nest is found, and if possible, a buffer of vegetation (≥165 feet for songbirds, >330 feet for wading birds, and >590 feet for terns, skimmers and birds of prey) would be allowed to remain around the nest until young have fledged or the nest is abandoned.

7.4.2 Essential Fish Habitat Impacts

Under the No Action Alternative (FWOP condition), the impacts associated with maintenance dredging would continue. Impacts from current maintenance dredging include temporary increases in water column turbidity during and for a short time after dredging and burial of benthic organisms at the maintenance ODMDS and nearshore Feeder Berm (Newcombe and Jensen, 1996; Clarke and Wilber, 2000). Recovery of benthic macroinvertebrates following burial is typically rapid (recovering within months rather than years) (VanDerWal et al., 2011; Wilber et al., 2006; Wilber and Clarke, 2001) and, consequently, no long-term effects are expected.

This DIFR-EA initiated EFH consultation for the Recommended Plan under the Magnuson-Stevens Fishery Conservation and Management Act. EFH would not be significantly affected by construction of the Recommended Plan. However, the Recommended Plan could temporarily reduce the quality of EFH (submerged soft bottom habitats) in the vicinity of the study area and some individual species may be displaced. The displacement of finfish and shrimp species (including estuarine dependent organisms that serve as prey for federally managed species) during project construction and maintenance dredging would likely be temporary and individuals should move back into these specific areas once the project is completed. Benthos, as a food source, would be lost at the ODMDS and Feeder Berm until recovery occurs; however, recovery of benthic macroinvertebrates following burial is typically rapid (recovering within months rather than years) (VanDerWal et al., 2011; Wilber et al., 2006; Wilber and Clarke, 2001) and, consequently, no long-term effects are expected.

The potential harm of some individual finfish and shellfish from turbidity-related impacts would be minimal and would not reduce any populations of federally managed species or their prey. No mitigation would be required for these temporary disruptions to federally managed species as these species are motile and avoid areas during dredging and placement activities and would be able to return to the area after these activities are completed (Clarke and Wilber, 2000).

7.4.3 Threatened and Endangered Species Impacts

Potential impacts to federally listed species are similar for both the No Action Alternative (FWOP condition) and Recommended Plan. Both the FWOP and the Recommended Plan would have no effect on the following listed animal and plant species: blue whale, finback whale, humpback whale, sei whale, sperm whale, nesting sea turtles (green, Kemp's ridley, loggerhead, hawksbill and leatherback), South Texas ambrosia, and Texas ayenia (USACE, 2013c; USFWS, 2013a). No placement of dredged material or other construction activities would occur on Gulf beaches in the study area, thereby precluding impacts to nesting sea turtles. Furthermore, it has been determined that the Recommended Plan would have no effect on designated piping plover critical habitat. The BIH Recommended Plan would also have no effect on the following Candidate species and SOC: red knot, red-crowned parrot, Sprague's pipit, scalloped hammerhead shark, boulder star coral and star coral, elliptical star coral, Lamarck's sheet coral, mountainous star coral, pillar coral, rough cactus coral, dusky shark, sand tiger shark, opossum pipefish, warsaw grouper and speckled hind (USACE, 2013c; USFWS, 2013a). The FWOP may affect swimming sea turtles. Potential impacts of FWOP maintenance dredging for the existing project are covered by existing GRBO (NMFS, 2003 and 2007).

7.4.3.1 Determinations of "May Affect But Not Likely to Adversely Affect"

The Recommended Plan may affect but is not likely to adversely affect the piping plover, Northern aplomado falcon, Gulf Coast jaguarundi, ocelot, the West Indian manatee and the swimming leatherback sea turtle. To provide better protection for these species, USACE has agreed to specific USFWS (2013) conservation recommendations provided in the Fish and Wildlife Coordination Act Report (CAR, 2013;Appendix J). As recommended by the USFWS CAR, if construction of the Recommended Plan does not commence within the next three years, USACE would coordinate with the USFWS prior to initiation of construction to determine if changes need to be made to the project plan to avoid impacts to threatened or endangered species and to determine if formal Section 7 consultation is needed. USFWS recommended and USACE has agreed to implement the following.

Piping plover. Located within the area designated as critical habitat unit TX-01, PAs 2, 4A, and most of 4B may contain unvegetated sand flats that may be utilized by piping plovers for foraging or roosting. Prior to the placement of dredged material into these PAs, USACE would survey unvegetated sand flats in the PAs for the presence of roosting piping plovers if two of the following weather conditions occur in combination: cold temperatures (below 40 °F), high winds (above 15 to 20 miles per hour), and precipitation. When these conditions apply in combination, piping plovers are likely to roost to conserve energy and body reserves, and disturbing birds under these conditions would cause harm by stressing the birds. If roosting birds are identified in the area, placement activities in the area would be delayed until weather conditions ameliorate and two of these three weather conditions are no longer occurring in combination.

Northern aplomado falcon. While acknowledging that impacts would be avoided, USFWS (2013b) notes that endangered aplomado falcons may use mesquite savannahs and grasslands south of the PAs for foraging and nesting, though no nests are known in the area at this time. Nest structures that could be utilized by the aplomado falcon have been documented approximately 0.5 mile south of PAs 7 and 5A. All construction activities would occur within the footprint of existing PA dikes, avoiding direct impacts to potential grassland and savannah habitat near the PAs. However, construction activities on the PA dikes or use of access roads south of the PAs may disturb birds in nests within 100 yards of these activities. Prior to commencing dike maintenance activities for new work and future maintenance during the months of March through June, areas within 100 yards of the PA dikes and access roads would be examined for use by nesting aplomado falcons. If they are found, further surveys and coordination with USFWS would be conducted. With implementation of this conservation recommendation, it has been determined that the Recommended Plan may affect but is not likely to adversely affect the northern aplomado falcon.

Gulf Coast jaguarundi and ocelot. These cats are known to occur around the project area and may use a variety of habitats for moving between preferred habitat sites. All construction activities would occur within the footprint of existing PA dikes, avoiding direct impacts to lomas and brush habitat adjacent to PAs 4A and 4B. A new dike would be constructed at least 30 feet from the outer edge of the loma on the south side of PA 4B to protect brush habitat on that landform. To prevent possible harm to a jaguarundi or ocelot moving through the area during construction, USACE would require that construction activities for dike rehabilitation or construction be conducted only during daylight hours. With implementation of this conservation recommendation, it has been determined that the Recommended Plan may affect but is not likely to adversely affect the jaguarundi and ocelot.

West Indian manatee. Although sightings of manatees are rare along the Texas coast, they do occur. To avoid potential impacts to the West Indian manatee, USACE would advise all contractors and staff that manatees may be found in the Entrance Channel, Jetty Channel, and Main Channel, and in adjacent areas of the Lower Laguna Madre. USACE would also incorporate specified education measures into construction and maintenance contracts for the Recommended Plan (USFWS, 2013b).

Leatherback sea turtles. It is unlikely that leatherback sea turtles would be found in the study area but since they could potentially occur, it has been determined that the Recommended Plan may affect, but is not likely to adversely affect the leatherback sea turtle (USACE, 2013c). RPMs would be implemented to minimize impacts to listed sea turtle species that may be adversely affected by the project as described below. These measures would also serve to minimize impacts to leatherbacks, in the unlikely event that they are encountered in the project area.

7.4.3.2 Determinations of "May Adversely Affect"

USACE has determined that sea turtles from four species (green, Kemp's ridley, loggerhead, and hawksbill) may be adversely affected by construction of the Recommended Plan during hopper dredging to deepen the BIH Entrance and Jetty Channels. It has been well documented that hopper dredging activities occasionally result in sea turtle entrainment and death, even with seasonal dredging windows. Between 1995 and 2012, a total of 31 sea turtles were taken as a result of hopper dredging of the BIH Entrance and Jetty Channels. To construct the Recommended Plan, one hopper dredge would be operated continuously for an estimated duration of 7 months to remove approximately 2.1 mcy of new work material from the Entrance and Jetty Channels. Because hopper dredging during construction may affect listed sea turtles under NMFS jurisdiction, USACE requested formal Section 7 consultation with NMFS to address potential adverse impacts (USACE, 2013c).

Section 7 consultation has been completed and NMFS has issued a Final BiOp for the BIH Recommended Plan (NMFS F/SER/2013/11766, 2014). The BiOp is presented in Appendix I. NMFS concluded that the project is not likely to jeopardize the continued existence or recovery of the affected turtle species. USACE has agreed to adopt NMFS' RPMs in the Recommended Plan and to fully implement the BiOp Terms and Conditions. The Incidental Take Statement for construction of the proposed project was set at a total of 19 sea turtles (3 loggerheads, 14 greens, and 2 Kemp's ridley).

7.4.3.3 Reasonable and Prudent Measures to Minimize Sea Turtle Impacts

The Final BiOp established the following Terms and Conditions to implement the RPMs needed to minimize impacts of the incidental take of sea turtles during construction of the proposed project (NMFS, 2014). Compliance with the RPMs' implementing Terms and Conditions is mandatory in order for incidental takes not to be considered prohibited takings under the ESA. Hopper dredging contracts for the Recommended Plan would comply with the following:

1. Hopper Dredging (RPM 1): Hopper dredging activities shall be completed, whenever possible, between December 1 and March 31, when sea turtle abundance is lowest throughout Gulf coastal waters.

2. Non-hopper Type Dredging (RPM 1): Pipeline or hydraulic dredges, because they are not known to take turtles, must be used whenever possible between April 1 and November 30.

3. Operational Procedures (RPM 1): During periods in which hopper dredges are operating and NMFS-approved protected species observers are *not* required, (December 1 through March 31, if water temperatures are under 11°C), the USACE must:

a. Advise inspectors, operators, and vessel captains about the prohibitions on taking, harming, or harassing sea turtles.

b. Instruct the captain of the hopper dredge to avoid any turtles and whales encountered while traveling between the dredge site and offshore disposal area, and to immediately contact the USACE if sea turtles or whales are seen in the vicinity.

c. Notify NMFS immediately by e-mail (takereport.nmfsser@noaa.gov with reference to this biological opinion - F/SER/2013/11766) if a sea turtle or other threatened or endangered species is taken by the dredge, and reference this biological opinion.

4. Dredging Pumps (RPM 1): Standard operating procedure shall be that dredging pumps shall be disengaged by the operator when the dragheads are not firmly on the bottom, to prevent impingement or entrainment of sea turtles within the water column. This precaution is especially important during the cleanup phase of dredging operations when the draghead frequently comes off the bottom and can suck in turtles resting in the shallow depressions between the high spots the draghead is trimming off.

5. Dredge Lighting (RPM 1): From May 1 through October 31, sea turtle nesting and emergence season, all lighting aboard hopper dredges and hopper dredge pumpout barges operating within 3 nautical miles of sea turtle nesting beaches shall be limited to the minimal lighting necessary to comply with U.S. Coast Guard and/or Occupational Safety and Health Administration requirements. All non-essential lighting on the dredge and pumpout barge shall be minimized through reduction, shielding, lowering, and appropriate placement of lights to minimize illumination of the water to reduce potential disorientation effects on female sea turtles approaching the nesting beaches and sea turtle hatchlings making their way seaward from their natal beaches.

6. Sea Turtle Deflecting Draghead (RPM 1): A state-of-the-art solid, plow-type rigid deflector dragheads must be used on all hopper dredges at all times. The use of alternative, experimental dragheads is not authorized without prior written approval from NMFS, in consultation with USACE ERDC. Slotted draghead deflectors or chain-type deflectors are currently not authorized.

7. Training – Personnel on Hopper Dredges (RPM 1): The USACE must ensure that all contracted personnel involved in operating hopper dredges (whether privately-funded or federally-funded projects) receive thorough training on measures of dredge operation that

will minimize takes of sea turtles. It shall be the goal of the hopper dredging operation to establish operating procedures that are consistent with those that have been used successfully during hopper dredging in other regions of the coastal United States, and which have proven effective in reducing turtle/dredge interactions. Therefore, USACE Engineering Research and Development Center experts or other persons with expertise in this matter shall be involved both in dredge operation training, and installation, adjustment, and monitoring of the rigid deflector draghead assembly.

8. Observers (RPM 2): The USACE shall arrange for NMFS-approved protected species observers to be aboard the hopper dredges to monitor the hopper bin, screening, and dragheads for sea turtles and their remains. Observer coverage sufficient for 100 percent monitoring (i.e., two observers) of hopper dredging operations is required aboard the hopper dredges between April 1 and November 30, or whenever surface water temperatures are 11°C or greater.

9. Screening (RPM 2): When sea turtle observers are required on hopper dredges, 100 percent inflow screening of dredged material is required and 100 percent overflow screening is recommended. If conditions prevent 100 percent inflow screening, inflow screening may be reduced gradually, as further detailed in the following, but 100 percent overflow screening is then required.

    a. Screen Size: The hopper's inflow screens should have 4-inch by 4-inch screening. If the USACE, in consultation with observers and the draghead operator, determines that the draghead is clogging and reducing production substantially, other than in sand borrow areas the screens may be modified sequentially. Mesh size may be increased to 8-inch by 8-inch; if that fails to solve the clogging problem, then 16-inch by 16-inch openings may be used. Clogging should be greatly reduced or eliminated with these options; however, further clogging may compel removal of the screening altogether, in which case effective 100 percent overflow monitoring and screening is mandatory. The USACE shall notify NMFS beforehand if inflow screening is going to be reduced or eliminated, what attempts were made to reduce the clogging problem, and provide details of how effective overflow screening will be achieved.

    b. Need or Flexible, Graduated Screens: NMFS believes that this flexible, graduated-screen option is necessary, since the need to constantly clear the inflow screens will increase the time it takes to complete the project and therefore increase the exposure of sea turtles to the risk of impingement or entrainment. Additionally, there are increased risks to sea turtles in the water column when the inflow is halted to clear screens, since this results in clogged intake pipes, which may have to be lifted from the bottom to discharge the clay by applying suction.

10. Dredge Take Reporting and Final Report (RPM 2): Observer reports of incidental take by hopper dredges must be emailed to the Southeast Regional Office (takereport.nmfsser@noaa.gov with reference to this biological opinion - F/SER/2013/11766) by onboard NMFS-approved protected species observers, the dredging company, or the USACE within 24 hours of any sea turtle or other listed species take observed.

    A final report summarizing the results of the hopper dredging and any documented sea turtle or other listed species takes must be submitted to NMFS (takereport.nmfsser@noaa.gov with reference to this biological opinion - F/SER/2013/11766) within 60 working days of completion of the dredging project. The reports shall contain information on project location (specific channel/area dredged), start-up and completion dates, cubic yards of material dredged, problems encountered, incidental takes and sightings of protected species, mitigative actions taken (if relocation trawling, the number and species of turtles relocated), screening type (inflow, overflow) utilized, daily water temperatures, name of dredge, names of endangered species observers, percent observer coverage, and any other information the USACE deems relevant.

11. Sea Turtle Strandings (RPM 2): The USACE Project Manager or designated representative shall notify the STSSN state representative (contact information available at: http://www.sefsc.noaa.gov/seaturtleSTSSN.jsp) of the start-up and completion of hopper dredging operations and bed-leveler dredging operations and ask to be notified of any sea turtle strandings in the project area that, in the estimation of STSSN personnel, bear signs of potential draghead impingement or entrainment, or interaction with a bed-leveling type dredge.

    a. Information on any such strandings shall be reported in writing within 30 days of project end to NMFS' Southeast Regional Office (takereport.nmfsser@noaa.gov with reference to this biological opinion - F/SER/2013/11766) with a report detailing incidents, with photographs when available, of stranded sea turtles that bear indications of draghead impingement or entrainment. Because the deaths of these turtles, if hopper dredge related, have already been accounted for in NMFS' jeopardy analysis, these strandings will not be counted against the USACE's take limit if they do not exceed the take limits set forth in this consultation.

12. Conditions Requiring Relocation Trawling (RPM 1): The USACE shall require trawling to start as soon as possible within 72 hours of either:

    a. Two or more turtles are taken by hopper dredges in a 24-hour period, or

    b. Total dredge takes in the project approach 75 percent (rounded-down) of any of the incidental take limits; i.e., 2 loggerheads, 10 greens, or 1 Kemp's ridley taken.

13. Relocation Trawling (RPM 1): Any relocation trawling conducted or contracted by the USACE to temporarily reduce abundance of these listed species during hopper dredging in order to reduce the possibility of lethal hopper dredge interactions, is subject to the following conditions:

    a. Trawl Time: Trawl tow-time duration shall not exceed 42 minutes (measured from the time the trawl doors enter the water until the time the trawl doors are out of the water) and trawl speeds shall not exceed 3.5 knots.

    b. Protected Species Handling During Trawling: Handling of sea turtles captured during relocation trawling in association with the dredging project shall be conducted by NMFS-approved protected species observers. Sea turtles captured pursuant to relocation trawling shall be handled in a manner designed to ensure their safety and viability, and shall be released over the side of the vessel, away from the propeller, and only after ensuring that the vessel's propeller is in the neutral, or disengaged, position (i.e., not rotating). Resuscitation guidelines are provided in Appendix B of the Biological Opinion.

    c. Captured Sea Turtle Holding Conditions: Sea turtles may be held briefly for the collection of important biological information, prior to their release. Captured sea turtles shall be kept moist, and shaded whenever possible, until they are released, according to the requirements of Term and Condition No. 13-e, below.

    d. Biological Data Collection: When safely possible, all turtles shall be measured (standard carapace measurements including body depth), tagged, weighed, and a tissue sample taken prior to release. Any external tags shall be noted and data recorded into the observers' log. Only NMFS-approved protected species observers or observer candidates in training under the direct supervision of a NMFS-approved protected species observer shall conduct the tagging/measuring/weighing/tissues sampling operations.

e. Take and Release Time During Trawling – Turtles: Turtles shall be kept no longer than 12 hours prior to release and shall be released not less than 3 nautical miles from the dredge site. Turtles to which satellite tags will be affixed may be held up to 24 hours before release. If two or more released turtles are later recaptured, subsequent turtle captures shall be released not less than 5 nautical miles away. If it can be done safely, turtles may be transferred onto another vessel for transport to the release area to enable the relocation trawler to keep sweeping the dredge site without interruption.

f. Injuries: Injured sea turtles shall be immediately transported to the nearest sea turtle rehabilitation facility. Minor skin abrasions resulting from trawl capture are considered non-injurious. The USACE shall ensure that logistical arrangements and support to accomplish this are pre-planned and ready. The USACE shall bear the financial cost of all sea turtle transport, treatment, rehabilitation, and release.

g. Flipper Tagging: All sea turtles captured by relocation trawling shall be flipper-tagged prior to release with external tags which shall be obtained prior to the project from the University of Florida's Archie Carr Center for Sea Turtle Research. This Opinion serves as the permitting authority for any NMFS-approved protected species observer aboard these relocation trawlers to flipper-tag with external tags (e.g., Inconel tags) captured sea turtles. Columbus crabs or other organisms living on external sea turtle surfaces may also be sampled and removed under this Opinion's authority.

h. PIT-Tag: This opinion serves as the permitting authority for any NMFS-approved protected species observer aboard a relocation trawler to PIT-tag captured sea turtles. Tagging of sea turtles is not required to be done if the NMFS-approved protected species observer does not have prior training or experience in said activity; however, if the observer has received prior training in PIT tagging procedures, then the observer shall tag the animal prior to release (in addition to the standard external tagging):

   (1) Sea turtle PIT tagging must then be performed in accordance with the protocol detailed at NMFS' Southeast Fisheries Science Center's Web page: http://www.sefsc.noaa.gov/seaturtlefisheriesobservers.jsp. (See Appendix C on SEFSC's "Fisheries Observers" Web page);

   (2) PIT tags used must be sterile, individually-wrapped tags to prevent disease transmission. PIT tags should be 125-kHz, glass-encapsulated tags–the smallest ones made. Note: If scanning reveals a PIT tag and it was not

difficult to find, then do not insert another PIT tag; simply record the tag number and location, and frequency, if known. If for some reason the tag is difficult to detect (e.g., tag is embedded deep in muscle, or is a 400-kHz tag), then insert one in the other shoulder.

i. PIT-Tag Scanning and Data Submission Requirements: All sea turtles captured by relocation trawling or dredges shall be thoroughly scanned for the presence of PIT tags prior to release using a multi-frequency scanner powerful enough to read multiple frequencies (including 125-, 128-, 134-, and 400-kHz tags) and read tags deeply embedded in muscle tissue (e.g., manufactured by Trovan, Biomark, or Avid). Turtles whose scans show they have been previously PIT tagged shall nevertheless be externally flipper tagged. Sea turtle data collected (PIT tag scan data and external tagging data) shall be submitted to NOAA, National Marine Fisheries Service, Southeast Fisheries Science Center, Attn: Lisa Belskis, 75 Virginia Beach Drive, Miami, Florida 33149. All sea turtle data collected shall be submitted in electronic format within 60 days of project completion to Lisa.Belskis@noaa.gov. Sea turtle external flipper tag and PIT tag data generated and collected by relocation trawlers shall also be submitted to the Cooperative Marine Turtle Tagging Program (CMTTP), on the appropriate CMTTP form, at the University of Florida's Archie Carr Center for Sea Turtle Research.

j. Handling Fibropapillomatose Turtles: NMFS-approved protected species observers are not required to handle viral fibropapilloma tumors if they believe there is a health hazard to themselves and choose not to. When handling sea turtles infected with fibropapilloma tumors, observers must maintain a separate set of sampling equipment for handling animals displaying fibropapilloma tumors or lesions.

k. Additional Data Collection Allowed During the Handling of Sea Turtles and Other Incidentally-caught ESA-listed species: The USACE shall allow NMFS-approved protected species observers to conduct additional investigations that may include more invasive procedures (e.g., blood-letting, laparoscopies, external tumor removals, anal and gastric lavages, mounting satellite or radio transmitters, etc.) and partake in or assist in research projects but only if 1) the additional work does not interfere with any project operations (dredging activities, relocation trawling, etc), 2) the observer holds a valid federal research permit (and any required state permits) authorizing the activities, either as the permit holder, or as designated agent of the permit holder, 3) the additional work does not incur any additional expenses to the USACE or the USACE approves of the expense, and 4) the observer has first coordinated with USACE Galveston District and notified

NMFS's Southeast Regional Office, Protected Resources Division (takereport.nmfsser@noaa.gov with reference to this biological opinion - F/SER/2013/11766).

14. Relocation Trawling Report (RPM 2): The USACE shall provide NMFS' Southeast Regional Office (takereport.nmfsser@noaa.gov with reference to this biological opinion - F/SER/2013/11766) with an end-of-project report within 30 days of completion of any relocation trawling. This report may be incorporated into the final report summarizing the results of the hopper dredging project.

15. Requirement and Authority to Conduct Tissue Sampling for Genetic Analyses (RPM 2): This opinion serves as the permitting authority for any NMFS-approved protected species observer aboard a relocation trawler or hopper dredge to tissue-sample live- or dead-captured sea turtles without the need for an ESA Section 10 permit. All live or dead sea turtles captured by relocation trawling and hopper dredging shall be tissue-sampled by a NMFS approved protected species observer prior to release.

    Sea turtle tissue samples shall be taken in accordance with NMFS SEFSC's procedures for sea turtle genetic analyses (Appendix II of this opinion). The USACE shall ensure that tissue samples taken during the dredging project are collected, stored properly, and mailed no later than 60 days of completion of the dredging project to: NOAA, National Marine Fisheries Service, Southeast Fisheries Science Center, Attn: Lisa Belskis, 75 Virginia Beach Drive, Miami, Florida 33149.

Other conditions may also apply. A detailed outline of the conditions of the USACE's activities to minimize impacts of sea turtle takes during maintenance dredging project is included in the NMFS Biological Opinion for dredging of Gulf navigation channels and sand mining areas using hopper dredges (NMFS, 2003, as amended by Revisions Number 1 and 2 (USACE, 2006).

7.5 Water and Sediment Quality Impacts

In the No Action Alternative (FWOP condition) condition, water and sediment quality are not expected to substantially change in the BIH channel, its surrounding waters, and the near-shore Gulf of Mexico. The Gulf of Mexico would continue to dominate water quality in the study area. TCEQ water quality standards should continue to be met in South Bay, the Lower Laguna Madre, and the near-shore Gulf of Mexico. Episodes of low dissolved oxygen and occasional elevated levels of *Enterococcus* bacteria in the BSC, believed to result from nonpoint source pollution, would probably continue to occur (TCEQ, 2011). Three decades of water and chemistry data from the BIH have documented no concerns with contaminated sediments in the project area. Information describing the results of water, sediment, and elutriate water testing under current conditions are available upon request.

With the Recommended Plan, increases in turbidity would occur at dredging locations during construction and maintenance dredging. Temporary increases in turbidity would also occur in the vicinity of the ODMDSs when dredge material is placed at those locations. Temporary changes in turbidity have not been modeled; however, they are not expected to significantly impact water quality. The Main Channel is a dead-end channel with low tidal exchange, little fresh water inflow, and low velocities, all of which contribute to low dissolved oxygen in some areas at some times. This would be expected to continue. Analyses of water, sediment, and elutriate samples, combined with toxicity and bioaccumulation tests on sediments and suspended sediments, indicate no unacceptable negative impacts can be expected to water quality or sensitive marine organisms during dredging or dredged material placement (SOL and Atkins, 2013).

Deepening the Entrance and Jetty Channels at Brazos Santiago Pass would only minimally increase water exchange between the Gulf of Mexico, South Bay, and the Lower Laguna Madre (Tate and Ross, 2012). Recent data show southern portions of the formerly hypersaline Lower Laguna Madre now have salinities approximating those of the Gulf of Mexico (Basin and Bay Expert Science Team, 2012). Hydrodynamic modeling has determined that no effect on tidal range in the Laguna Madre was discernible. However, the minor increase in circulation in those southern portions of the Lower Laguna Madre may slightly extend periods when salinities are similar to those of the Gulf of Mexico.

7.6 Air Quality Impacts

Cameron County is currently designated as in attainment or unclassifiable with National Ambient Air Quality Standards (TCEQ, 2013a). No new construction or dredging air contaminant emission sources are associated with the No Action Alternative (FWOP condition). However, it is anticipated that air contaminants in the project area would increase due to continued operational constraints on the existing system that would result in a possible increase in ship traffic due to growth of existing business and from new business.

Air contaminant emissions that may result from ongoing maintenance dredging activities would include exhaust emissions from fuel combustion in engines that power the marine vessels (dredge and support) and on-shore construction equipment for dredged material placement. Emissions associated with maintenance dredging are not expected to change from current conditions.

7.6.1 Recommended Plan Impacts of Construction Dredging Equipment

Dredge and support equipment would primarily include marine vessels (dredges, tug boats, survey boats, trawlers, spill barges, and crew boats) and on-shore construction equipment used for working dredged material PAs. The rate of air contaminant emissions from this equipment is directly related to the horsepower rating of each engine, load factor, duration of use, and the amount of material to be dredged. The combustion of diesel fuel in equipment engines would result in emissions of carbon monoxide (CO), nitrogen oxide (NOx), particulate matter (PM), sulfur dioxide (SO2), volatile organic compounds (VOC), and GHG (carbon dioxide [CO2], methane (CH4], and nitrous oxide [N_2O]).

Project emissions were estimated for new work construction. Estimated emissions were based on projected equipment use and scheduling for offshore and onshore construction activities. The construction emissions inventory included emissions associated with dredging vessels and equipment, nonroad construction equipment, and on-road mobile sources, such as dredging vessels, equipment and support marine vessels; nonroad construction equipment such as amphibious trackhoes, dozers, draglines, excavators and rolligon; and on-road mobile sources such as employee commuter vehicles. A summary of estimated emissions resulting from the new work construction is shown in Table 7-1.

Table 7-1. Annual New Work Emissions Summary
(tons per year)

	Yr 1	Yr 2	Yr 3	Yr 4
NOx	196	1,216	1,068	88
VOC	9	35	31	2
CO	62	310	274	22
PM_{10}	8	38	34	3
$PM_{2.5}$	8	37	33	3
SO_2	19	159	139	12
CO_2e	20,033	80,055	62,662	5,071

It is expected that air contaminant emissions from construction dredging activities would result in short-term impacts on air quality in the immediate vicinity of the dredging site. Each dredging operation would be relatively independent of the other, although, there may be some overlap. In addition, construction dredging activities would not continue past the date of completion and thus would be considered one-time activities. Due to the phased, one-time construction dredging, it is expected there would be no long-term impacts to air quality in the area. Furthermore, over the long-term, the Recommended Plan is expected to result in fewer vessel trips than the without project condition. As a result, total future emissions should be slightly lower if the Recommended Plan is constructed.

7.6.2 Recommended Plan Impacts of Maintenance Dredging

Routine dredging would be required to maintain the channel due to shoaling. The additional maintenance emissions due to the channel improvement project were conservatively estimated based on the ratio of the total volume of new work dredging by the total volume of dredged material displaced from maintenance dredging activities inclusive of the channel improvements. It is estimated that periodic maintenance dredging and dike raisings would result in the following emissions (Table 7-2).

Table 7-2. Annual Maintenance Dredging Emissions Summary
(tons per dredging cycle)

NOx	VOC	CO	PM10	PM2.5	SO_2	CO_2	N_2O	CH_4
187.42	5.55	48.34	5.99	5.81	24.13	13925	0.39	1.72

It is expected that air contaminant emissions from maintenance dredging activities would result in short-term impacts on air quality in the immediate vicinity of the dredging site. Each dredging operation would be relatively independent of the other, although there may be some overlap. Emissions from the maintenance dredging would not be expected to differ significantly from present maintenance dredging activities, and thus, should not result in a significant increase in the regional air quality.

Measures that may be used to reduce emissions from dredging activities should consider the equipment used over the expected life of the project and the feasibility and practicality of such measures. Measures would include the following:

- Encouraging construction contractors to apply for Texas Emission Reduction Plan grants or similar programs offering the opportunity to apply for resources for upgrading or replacing older equipment to reduce NO_x emissions;
- Encouraging contractors to use cleaner, newer equipment with lower NO_x emissions;
- Directing contractors and operators that would use nonroad diesel equipment to use clean, low-sulfur fuels;
- Directing contractors and operators that would use tugboats during construction to use clean, low-sulfur fuels;
- Directing operators of the assist tugboats used in maneuvering dredge vessels to use clean, low-sulfur fuels; and
- Directing operators of the dredging vessels to use clean, low-sulfur fuels.

7.6.3 Greenhouse Gas Emissions and Climate Change

An inventory of GHG emissions was also prepared for the Recommended Plan in terms of carbon dioxide equivalents (CO_2e). CO_2e measures the global warming potential of certain emissions. Those which result from the combustion of fuel (CO_2, CH_4, and N_2O) are the most relevant for this project and are reported here. It is estimated that total annual GHG emissions would be 20,033 tons in Year 1, 89,344 tons in Year 2, 79,133 in Year 3 and 6,339 tons in Year 4 of project construction. GHG emissions during each maintenance dredging cycle are estimated to be 14,083 tons.

Measures that may be used to reduce GHG emissions from the proposed dredging and placement activities should consider the equipment used over the expected life of the project and the feasibility and practicality of such measures. Alternatives considered for their ability to reduce or mitigate GHG emissions are those that may provide for enhanced energy efficiency, lower GHG-emitting technology, renewable energy, as appropriate for the dredging and construction equipment to be used and could include the following:

Dredging Mitigation Options – designing the dredging operation and schedule so as to reduce overall fuel use, if possible; repowering/refitting with cleaner diesel engines, if possible; selection of newer dredges with more efficient engines, if possible.

Land-side Construction Mitigation Options – use of biodiesel fuels if possible and available in sufficient quantities; repowering/refitting with cleaner diesel engines, if possible.

The proposed project would increase GHG emissions; however, it would be unlikely that GHGs emitted would cause an individually discernible impact on global climate change. GHG emissions accumulate in the atmosphere because of their relatively long lifespan. Consequently, their impact on climate change is independent of the point of emission. Because GHGs accumulate in the atmosphere and affect climate change on a global scale, it is not reasonable to predict the impact on climate change based on a project level evaluation. This analysis is more reasonably done on a regional or global scale.

7.7 Noise Impacts

Potential noise impacts would be similar for both the No Action Alternative (FWOP condition) and Recommended Plan. Noise sensitive receptors would be limited to recreational users of nearby parks such as Isla Blanca County Park. No permanent noise sources would be installed as part of this project. The Recommended Plan would create short-term noise level increases similar to increases during maintenance dredging for the existing project. Therefore, the Recommended Plan would have no significant noise impacts.

7.8 Hazardous, Toxic and Radioactive Waste Impacts

Potential HTRW impacts would be similar for both the No Action and Recommended Plan. Based on current sediment and water quality analysis, no sites in the study area are causing regulatory threshold exceedances in channel sediments at this time. No sites on the National Priorities List were identified along the Main Channel, and recent chemical analyses of sediments in the channel indicate no cause for concern for the Main, Jetty, or Entrance Channels. No change to this status quo is anticipated in the FWOP condition.

The Recommended Plan is not expected to induce changes in land use or industrial practices that would increase the occurrence or impact of HTRW sites in the project area. Future releases from known sites in the study area (see Section 2.3.8) may impact the channel, regardless of channel deepening activities. However, no evidence exists that demonstrates a known contaminant migration pathway from these sites to the channel. Therefore, no impacts are expected due to the presence of HTRW sites in the study area.

7.9 Cultural Resources Impacts

Potential effects to cultural resources would be similar for both the No Action Alternative and Recommended Plan. The activities associated with the proposed undertaking are limited to the dredging (deepening) of the BIH channel and the placement of dredged material within existing PAs. Information from previously conducted marine and terrestrial cultural resource investigations as well as a recent marine cultural resources investigation of the BSC (Enright et al., 2012) have been compiled and evaluated to determine potential impacts to historic properties. All areas to be impacted by deepening of the channel and upland PAs have been covered by these surveys. The New Work ODMDS (EPA, 1991), Maintenance ODMDS (EPA, 1990), and the Feeder Berm (USACE, 1988b) were evaluated for cultural resources as part of NEPA compliance by the EPA and the USACE. It was determined that the three offshore PAs are located in tracts with a low probability for shipwrecks and would have no effect upon historic properties; the SHPO concurred with these determinations. These investigations have identified a total of 44 previously recorded archeological sites and 139 potential shipwrecks within the study area. None of these previously recorded cultural resources is located within the footprint of the Recommended Plan. The marine survey conducted as part of the feasibility study (Enright et al., 2012) identified an element of one historic property, 41CF4 (Brazos Santiago Depot), adjacent to the project area. This element consists of the partial remains of a railroad line constructed in 1864. This site element lies more than 165 feet south of the toe of the existing BSC and since the Recommended Plan does not include widening of the channel there would be no effect upon this resource. Based on the disturbed nature of the terrestrial portions of the project area and the absence of cultural resources within the project area, it was determined, in consultation with the SHPO, that no historic properties would be affected by the proposed undertaking. SHPO coordination regarding this determination is provided in Appendix K.

7.10 Energy and Mineral Resources Impacts

Potential effects to energy and mineral resources would be similar for both the No Action Alternative and Recommended Plan. In the FWOP and Recommended Plan, there would be no change in the accessibility of barge transport of bulk materials generated by the mining industry out of the port. The Recommended Plan would have no impact on the two pipelines in the project area. The Nustar Logistics 10-inch pipeline crosses the channel at an approximate depth of 75 feet, well below any deepening impacts. The other pipeline in the area, the Port Isabel Natural Gas Gathering Line, runs parallel to the north side of the Main Channel near the Bahia Grande and the Channel to Port Isabel. It would not be affected by channel improvements.

7.11 Socioeconomic Impacts

Under the No Action Alternative (FWOP condition), no project would be implemented by the Federal Government or local interests. The existing 42-foot-deep by 250-foot-wide navigation channel would continue to be operate with existing draft constraints, limiting the loads of vessels entering the channel, and preventing larger vessels from utilizing the waterway. Shipyards along the waterway would continue to have limited ability to receive the larger oil rigs that are currently operating in the Gulf of Mexico, potentially causing oil rig repair operations and jobs to relocate to Mexico. Up to 5,000 jobs are attributed to these operations, and this would result in a negative economic impact to the South Texas region and to the national economy (Siegesmund et al., 2008).

No channel modifications to the BIH would also discourage long-range industrial growth and eventually reduce the volume of imports and exports at the POB. This would likely result in a gradual loss of economic operating efficiency for the port, and regional economic growth would slow. Based on the strong public support that has been demonstrated for improving the existing navigation channel, it may be concluded that the FWOP alternative (No Action Alternative) lacks social and institutional acceptance.

The Recommended Plan includes the least cost disposal option. The least cost dredging disposal alternative includes the beneficial use of the material for placement in the nearshore Feeder Berm off of South Padre Island. The Recommended Plan would have an overall favorable impact on social well-being of affected interests because of the economic benefits it would generate.

Activities associated with the proposed project have the potential to create additional waterborne commerce and temporary construction jobs and jobs in related industries. Benefits associated with job creation would be manifested in increased economic output and would increase revenues and local, State, and Federal tax collections.

7.11.1 Environmental Justice

The analysis of potential impacts is based on the location of the project relative to minority and low-income populations in the study area. The three census tracts nearest the project area are 123.04, 127, and 142. Census tract 123.04 is a geographically small census tract located on the north side of the channel near Port Isabel and contains one PA. Census Tract 127 encompasses most of the project and all of the remaining upland PAs. Census Tract 142 lies north and west of the channel and contains no PAs. No new PAs are planned as part of this project, and the existing PAs are not located near any existing neighborhoods. Land use near the project area is industrial and would likely remain industrial. No changes in the types of industries in the project area would be anticipated and no increases in pollution would be expected under the with-project condition. No contamination issues are associated with the water or the dredged sediments in the project area and no contamination issues would result from construction of the project. Air quality in the study area is in attainment and construction of the project would not have adverse impacts on air quality. This study area, particularly Census Tracts 123.04, 127, and 142, with minority populations of 76.6 percent, 93.4 percent, and 94.3 percent, respectively, and populations below the poverty level of 37.7 percent, 27.4 percent, and 33.6 percent, respectively, consists of minority and low-income populations, as do all census tracts in this region of Texas (U.S. Census Bureau, 2010). However, the neighborhoods where they live are not located near the project and PAs. Therefore, project construction would not disproportionately impact the minority and low-income populations in the economically stressed census tracts identified in the EJ analysis.

Positive impacts of the project would include increased spending in all 13 of the census tracts of the study area generated by construction and related activities that would temporarily boost the local economy, resulting in temporary job creation or preservation of jobs in the construction and service sectors. Newly created jobs would potentially be distributed among all groups equally. It is expected that the proposed project would positively impact EJ populations and other residents by increasing local employment opportunities and incomes.

7.11.2 Protection of Children From Environmental and Safety Risks

Potential environmental and safety effects to children would be similar for both the No Action Alternative and the Recommended Plan. EO 13045 of 1997 entitled, "Protection of Children from Environmental and Safety Risks" requires Federal agencies to make it a high priority to identify and assess environmental health and safety risks that may disproportionately affect children and to ensure that policies, programs, activities, and standards address these risks. Land use near the project area is primarily industrial and would likely remain industrial. There are no schools, day care centers, or residences located immediately adjacent to the channel. Children currently use recreational areas on South Padre and Brazos Islands in the project area and this would be expected to continue under both the FWOP and Recommended Plan. No contamination issues are associated with the water or the dredged sediments in the project area, and no contamination issues are expected from construction of the project. Analyses of water, sediment, and elutriate samples from the navigation channel indicate there would be no unacceptable negative impacts from the Recommended Plan to water quality that would adversely affect children (SOL and Atkins, 2013). No changes to the types of commodities currently carried through the channel are expected with the Recommended Plan. In addition, since vessels can be loaded more fully with the Recommended Plan, the number of vessel trips in the channel is projected to stay the same or slightly decrease over the 50-year period of analysis. Children in the project area would not likely experience any adverse affects from the proposed project.

7.12 Cumulative Impacts

Cumulative impacts are defined in 40 CFR 1508.7 as . . . " the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time." Cumulative impacts for the Recommended Plan were assessed in accordance with guidance provided by the President's CEQ.

7.12.1 Individual Project Impact Evaluations

Past, present, and reasonably foreseeable projects/activities within the study area were compared to the Recommended Plan, to determine whether the Recommended Plan, when combined with the impacts of other actions, could have cumulatively significant impacts on the environment.

7.12.1.1 Past or Present Actions

The first Federal involvement in navigation improvements for the BIH occurred in 1880 and 1881 (USACE, 1988a, 1990). The RHAs of 1880 and 1881 provided for deepening of the natural channel through the Brazos Santiago Pass to 10 feet, widening the channel through the pass to 70 feet, and the construction of two parallel jetties at the pass. Construction of the south jetty was started in 1882 and continued until 1884, when operations were suspended due to a lack of funds.

In 1930, Congress authorized the construction of navigation channels to Brownsville and Port Isabel and new jetty construction at the pass. The jetties were completed in 1935 in conjunction with construction of a 25-foot by 100-foot channel to Port Isabel. Dredging of the new 25-foot channel from the pass to the Brownsville Turning Basin was completed in 1936, at widths varying from 100 to 300 feet. The new BSC was not constructed in a natural waterway; it was dug through the Rio Grande deltaic plain in order to provide a navigation channel and port for the City of Brownsville. Several subsequent authorizations provided for progressive deepening and widening of the BSC, and other modifications, with the last project authorization in 1986 bringing it to the current authorized 42-foot-deep by 300-foot-wide project (USACE, 1988a, 1990).

Bahia Grande Restoration Project. Historically, Bahia Grande (located between Brownsville and Port Isabel, north of the BSC) served as an important nursery for a wide variety of fish and shellfish and was important habitat for wildlife and wintering waterfowl. The natural tidal flow between Bahia Grande and the Laguna Madre was negatively affected by construction projects in the 1930s and 1950s. For nearly 70 years, the degraded wetland was a source of blowing dust, a site of massive fish kills, and was a complicated natural resource problem. These problems are being addressed by the Bahia Grande Restoration Project, the largest wetlands restoration project in North America. The Bahia Grande restoration objectives include reestablishment of nursery habitat for fish and shell fish, wetland habitat for resident and migratory wildlife and waterfowl, opportunities for public recreation, and tidal exchange, eliminating dry basins and total evaporation of Bahia Grande (Ocean Trust, 2009). These objectives have been only partially fulfilled to date. In particular, restoration efforts to reestablish tidal exchange are still underway, and establishment of higher tidal flows are needed to complete reestablishment of fish and wildlife habitat.

The USFWS's LANWR acquired the 21,700-acre Bahia Grande Unit in 2000. In 2005, a pilot channel was constructed that connected the Main Channel to the Bahia Grande and the waters began flowing into the main basin and refilling the wetland. In 2007, two interior channels were cut that reconnected the larger basin to two smaller interior basins. These efforts attempted to reestablish natural tidal flow and exchange throughout the whole system; however, only weak tidal circulation has resulted. Currently, average salinities are still too high to support most wetland vegetation, and hypersaline conditions develop each summer that result in a massive die-off of all organisms in the system. Planning for additional hydrologic restoration efforts is continuing (Ocean Trust, 2009).

Port of Brownsville. The POB proposed amending its existing permit to deepen an existing lay berth at the International Shipbreaking facility on the Main Channel and install a bulkhead around the entire berth. The depth of the berth would be increased from –33 feet MLT to –38 feet MLT. Approximately 600,000 cy of clay material would be dredged by hydraulic or mechanical means and placed into an existing disposal area onsite, and/or into PAs 5 A/B, 7, and 8. The POB anticipates the need to dredge approximately 15,000 cy of maintenance material at approximate 10-year intervals. Construction of the bulkhead would be done in two phases with 977 linear feet constructed during the first phase and 2,149 feet constructed in the second phase (USACE, 2011a).

Brownsville Navigation District. In June 2012, the BND proposed amending their existing permit, which authorizes the deepening of the existing loading area and construction of bulkheads along the waterfront of the Keppel-AmFELS facility on the Main Channel. They requested authorization to increase the depth in several areas to –70 feet MLT. Approximately 1.2 MCY of dredged material would be hydraulically excavated from a 41-acre area and disposed of in PA 5A, 5B, and/or 7 (USACE, 2012b).

Bay Bridge Texas, LLC. Bay Bridge Texas, LLC proposed amending its permit to include PA 8 in addition to PA 7 in its maintenance dredging plan for a commercial ship-breaking facility on the southern bank of the Main Channel. Dredging would be by both mechanical and hydraulic methods, which would allow flexibility in the selection of dredging equipment for the project (USACE, 2011b).

Cameron County Regional Mobility Authority. The Cameron County Regional Mobility Authority proposes to amend its mitigation project and place articulated concrete mats along the eastern shoreline strip of the site instead of the edges of the three circulation channels adjoining the Port Isabel Channel and the Main Channel. The project site is located adjacent to the Main Channel on the southern end of Long Island, south of Port Isabel. They anticipate that this would increase shoreline protection from erosive wave action, thus protect plantings more effectively. They further propose to replace the previously approved wave barrier fencing with staked hay bales moved closer to the shoreline. It is anticipated that this would be safer for marine mammals and would be more effective than the original fencing in protecting mitigation plantings from wave action. In addition, they propose to use black mangrove as the vegetation species for planting the 5.16-acre area previously approved for planting with smooth cordgrass; higher survival rates are anticipated (USACE, 2012c).

7.12.1.2 Reasonably Foreseeable Future Actions

BIH Channel Improvement Project. The Recommended Plan for the BIH Channel Improvement Project is a reasonably foreseeable future action for the project area. Refer to Section 6.1 of this report for a detailed description of the Recommended Plan and Section 7.0 for impacts.

Port of Brownsville. The POB is planning to expand its previously permitted lay berths at the International Ship Breakers, Ltd. facility. The project is located on the south side of the Main Channel. Regulated activities would include the following: hydraulic dredging and/or mechanical excavation to widen and lengthen lay berth at USACE Station 75+000; increase the dredge depth of the current lay berth to –28 feet MLT; and install approximately 1,500 feet of Combi-Wall retaining wall along the east side of the lay berth slip and along the south side of the Main Channel. The lay berth would be expanded to 155 feet wide by 1,147 feet long (west side) and 1,300 feet long (east side). Hydraulically dredged material would be placed in PA 7. The project is estimated to produce approximately 211,700 cy of material (USACE, 2013d).

Space Exploration Technologies (SpaceX). SpaceX plans to construct facilities, structures, and utility connections in order to support the launch of the Falcon 9 and Falcon Heavy launch vehicles into space. A vertical launch area and control center would be located along FM Route 4, well south of the Main Channel and near the Gulf shoreline. The launch site is located in tidal wetlands along the Gulf of Mexico. The Federal Aviation Administration (FAA) Office of Commercial Space Transportation is preparing an Environmental Impact Statement (EIS) to evaluate the potential environmental impacts that may result from the FAA proposal to issue launch licenses and/or experimental permits to SpaceX. A draft EIS (FAA, 2013) was completed in April 2013. Compensatory mitigation would be required for all wetland impacts.

Long Island Village Owners Association. The association proposes to conduct maintenance dredging within the existing canal development to –5 feet mean sea level. The project site is located within the Long Island Village subdivision, which abuts the Port Isabel Channel, on Long Island in Port Isabel, Cameron County, Texas. Department of the Army Permit 12266, and subsequent amendments, authorized the dredging of canals to a –6.5-foot MLT. The proposed project would remove 38,860 cy of sand and silt from the canals and place it within the proposed upland PA (USACE, 2013e).

7.12.2 Resource Impact Evaluation

In assessing cumulative impacts, only those resources expected to be directly or indirectly impacted by the Recommended Plan, as well as by other actions within the geographic scope and time frame were chosen for cumulative impact analysis. Based on these criteria, the following resources were identified as relevant resources for the cumulative impacts analysis:

- bays and deepwater habitats;
- EFH;
- threatened and endangered species;
- air quality;
- water quality;
- commercial fisheries; and
- recreational fisheries.

7.12.2.1 Bays and Deepwater Habitats

The primary effects to bays and deepwater habitats in the project area would be to benthos. Organisms present on water bottoms are affected by dredging and placement of dredged materials. Past or present projects (the existing BIH navigation project, Port of Brownsville, Brownsville Navigation District, and Bay Bridge Texas, LLP) and potential projects (Port of Brownsville and Long Island Village Owners Association) in the study area have resulted in benthic community impacts that are similar to those that would be caused by the Recommended Plan. Previously dredged areas were deepened or maintained, resulting in minor and temporary direct impacts to benthic organisms that had recolonized those areas after prior dredging. Recommended Plan impacts would not result in the addition of permanent new benthic impacts and would not significantly increase the area of water bottom that is affected by dredging.

Dredged material placement at ODMDSs and nearshore Feeder Berm buries and temporarily smothers benthic organisms within those areas. With the exception of the existing BIH navigation project, none of the other past or present projects evaluated here utilize the ODMDSs or Feeder Berm. Recommended Plan impacts associated with use of the New Work and Maintenance ODMDS would not change the existing impact areas or frequency. The impact would be limited and of a relative short duration. The area is dispersive and material would be carried off by currents within 6 months. The use of the Maintenance ODMDS would be necessary only if the nearshore Feeder Berm cannot be used. The nearshore Feeder Berm, which is dispersive, would likely be subjected to reuse every 1.5 to 3 years. Placement of dredged material in the nearshore zone would impact benthos in a limited area, and the material would be rapidly dispersed from the area due to wave action and longshore currents. The Recommended Plan would not be expected to contribute to long-term benthic organism impacts. No cumulative benthic impacts are expected related to the Recommended Plan and other projects.

7.12.2.2 Essential Fish Habitat

EFH would not be significantly affected by construction of the Recommended Plan. The Recommended Plan would temporarily reduce the quality of submerged soft bottom habitats in the vicinity of the dredging and some individual fishes of managed species may be temporarily displaced. Past or present projects (the existing BIH navigation project, Port of Brownsville, Brownsville Navigation District, Bay Bridge Texas, LLP, and Cameron County Regional Mobility Authority) and potential projects (Port of Brownsville and Long Island Village Owners Association) in the study area have resulted in minor EFH impacts to the study area that are similar to those that would be caused by the Recommended Plan. Inasmuch as all of these impacts are minor and temporary, the Recommended Plan would not permanently add to cumulative EFH impacts. The Recommended Plan would not exacerbate temporary EFH effects because the foreseeable projects would not overlap with the Recommended Plan in time or space.

7.12.2.3 Threatened and Endangered Species

Four sea turtle species (green, Kemp's ridley, loggerhead, and hawksbill) could be adversely impacted by hopper dredging activities for the proposed Recommended Plan (USACE, 2013c). As described in Section 7.4.3.2 and Appendix I, hopper dredging activities occasionally result in sea turtle entrainment and death, even with seasonal dredging windows. Entrainment involves the direct uptake of sea turtles by the suction field generated at the hopper draghead. However, these impacts are not likely to jeopardize the continued existence or recovery of these species. RPMs have been developed to minimize adverse impacts to sea turtles from hopper dredging during construction of the Recommended Plan. Section 7 consultation with NMFS has been completed and the final BiOp is presented in Appendix I. NMFS has determined that the estimated incidental take for the project would not jeopardize the existence or recovery of the affected species. Therefore, the overall potential cumulative impacts are not expected to adversely impact sustainable populations. None of the other projects compared here have utilized or propose to use hopper dredges, and therefore do not have the potential to contribute to cumulative impacts on sea turtles.

7.12.2.4 Air Quality

The GHG emissions that would result from the Recommended Plan would be negligible relative to the total national emissions inventory, and would not have a significant effect on global warming. Furthermore, increased air contaminant emissions are not expected with Recommended Plan channel improvements. The more efficient use of the deep draft tanker fleet is projected to result in a small decrease in vessel trips, which would result in a small decrease in air contaminant emissions. No increase in the number of oil rigs being repaired or fabricated is projected by the economic analysis, and therefore no increase in air contaminant emissions associated with these activities is anticipated. Should a small unanticipated increase occur, it would likely be offset by the forecasted reduction in tanker emissions.

7.12.2.5 Water Quality

The historical and most recent testing data for the study area indicates an absence of contamination. Dredging and placement at open-water and upland PAs may increase suspended solids, bound nutrients, and deplete oxygen. However, this impact is temporary, localized, and except for turbidity, insignificant. If temporary degradation occurs, the area should rapidly return to ambient conditions upon completion of dredging. The impacts of the other dredging projects included in this analysis would be similar. With implementation of BMPs and other permitting requirements, no cumulative surface water quality impacts are expected related to the Recommended Plan and other projects.

7.12.2.6 Commercial and Recreational Fisheries

Fish would likely leave dredging areas and PAs for more-favorable, less-turbid locations; however, once construction and placement are complete, water and foraging conditions would improve, and fish would return to the area. No long-term cumulative impacts are expected from the Recommended Plan combined with area projects.

7.12.3 Conclusions

Cumulative impacts due to past, existing, and reasonably foreseeable future projects, along with the proposed Recommended Plan, are not expected to have significant adverse effects in the study area. Many of the projects occurring in the vicinity of BIH, including the Recommended Plan impacts, are part of the continuing port and shipping industry development. Impacts associated with Recommended Plan would be temporary and minor, requiring no compensatory mitigation. With compliance to environmental regulations, use of BMPs during construction, and compliance with NMFS RPMs to minimize impacts to listed sea turtles, these projects are not expected to have long-term detrimental effects on environmental resources in the area.

8 IMPLEMENTATION REQUIREMENTS

8.1 Division of Plan Responsibilities and Cost-Sharing Requirements

As is shown in Table 9-1, ER 1105-2-100 specifies cost shares for GNFs that vary according to the channel depth: 20 feet or less, greater than 20 feet but not more than 45 feet, and greater than 45 feet. The percentage applies as well to mitigation and other work cost shared the same as GNFs. The cost share is paid during construction. Section 101 also requires the project sponsor to pay an additional amount equal to 10 percent of the total construction cost for GNFs. This may be paid over a period not to exceed thirty years, and LERRs may be credited against it.

Table 8-1. General Cost Allocation

Feature	Federal Cost[1]	non-Federal Cost[1]
GNF	• 90% from 0 to 20 feet • 75% from 20 to 45 feet • 50% from 46 feet and deeper	• 10% from 0 to 20 feet • 25% from 20 to 45 feet • 50% from 46 feet and deeper
GNF costs for this project include mobilization, all dredging costs, and all disposal area construction costs.		
Navigation Aids	• 100%	• 0%
Operation and Maintenance		
GNF	• 100% except cost share 50% cost for maintenance greater than 50 feet	• 0% except cost share 50% cost for maintenance greater than 50 feet
Mitigation	• 75%	• 25%

1. The non-Federal sponsor shall pay an additional 10% of the costs of GNF over a period of 30 years, at an interest rate determined pursuant to Section 106 of WRDA 1986. The value of LERRs shall be credited toward the additional 10% payment.

8.2 Cost for the Recommended Plan

The project cost for the Recommended Plan is $251,952,000, as previously shown in Table 6-4. Costs include implementation costs and associated costs. Implementation costs include post authorization planning and design costs, construction costs, construction contingency costs, and O&M costs. Construction costs include costs for dredging and PA construction required for initial channel deepening. There are no costs for fish and wildlife mitigation expected for this project. No cultural resource mitigation costs are expected at this time. ATON would be provided by the USCG, and are a Federal cost included in the economic justification, but are not subject to project cost sharing. Costs for modifications to ATON have been estimated by USACE and included in the project cost estimate, and coordination has been initiated with the USCG to obtain an estimate from that agency. Modifications are expected to be minor and any difference in cost is not expected to significantly affect the BCR. A relatively small amount of cost is identified in the estimate to cover miscellaneous incidental costs for coordination with the USCG during and post construction. Construction General funding would fund Federal share of all project construction.

Project costs and price escalation (calculated by estimating the midpoint of the proposed contracts) are combined to create the Fully Funded Cost.

8.3 Cost-Sharing Apportionment

The project cost for determining the cost-sharing requirements is based on the Total Project Cost.

The Total Project Cost for all project components is separated into expected non-Federal and Federal cost shares and detailed in Table 8-2. These costs differ from those in Table 6-4 due to the inclusion of PED and Construction Management costs across the different channel segments. The costs are separated into expected Federal and non-Federal shares and detailed in Table 8-3.

Table 8-2. Cost Apportionment
($ in 1,000s, rounded with October 2013 Price Level and 3.5% interest rate)

Cost Apportionment Navigation*	First Cost ($)	Fully Funded Cost ($)
Federal Navigation:		
BIH Channel	116,000	128,811
Lands & Damages	8	9
Total Federal GNF	**116,008**	**128,820**
non-Federal Navigation:		
BIH Channel	88,571	98,487
Land & Damages	3	3
Total non-Federal GNF	**88,574**	**98,490**
Total GNF	**204,582**	**227,310**
Other Federal Costs		
Federal: ATON	108	118
Total Other Federal Costs	**108**	**118**
Other non-Federal Costs		
Lands	5	5
Associated Costs: Berths and Docks	47,257	52,384
Total non-Federal Costs	**47,262**	**52,389**
Total Project Costs	**251,952**	**279,817**

* Costs include PED and Construction Management totals

The USCG is responsible for ATON, and the cost is allocated as a Federal expense because the installation of new navigation aids on the Channel Extension is related to deepening.

Non-Federal costs include non-Federal sponsor and berthing/dock owner costs to include construction of capacity for maintenance dredged material. The non-Federal sponsor is responsible for 100 percent of LERRs. All project construction is on lands that are currently owned by the non-Federal sponsor. Pipeline relocations are defined as "deep-draft utility

Table 8-3. Recommended Plan First Cost Allocation
(October 2013 price levels, $ in 1,000s)

General Navigation Features	Costs Allocated for Depth Increment from 42 to 45 feet: Total ($)	Costs Allocated for Depth Increment from 42 to 45 feet: Federal Share ($) (75% of 45-Ft Costs)	Costs Allocated for Depth Increment from 42 to 45 feet: Non-Federal Share ($) (25% of 45-Ft Costs)	Costs Allocated to Depth Increment From 45 to 52 feet: Total ($)	Costs Allocated to Depth Increment From 45 to 52 feet: Federal Share ($) (50% of Cost - Depth Increment Greater than 45 Feet)	Costs Allocated to Depth Increment From 45 to 52 feet: Non-Federal Share ($) (50% of Cost - Depth Increment Greater than 45 Feet)	Total Federal Share ($)	Total Non-Federal Share ($)	Total First Cost ($)
Construction Dredging and Placement Areas	50,946	38,210	12,737	118,874	59,437	59,437	97,647	72,174	169,820
Engineering and Design	-	-	-	21,719	10,860	10,860	10,860	10,860	21,719
Construction Management	3,910	2,932	977	9,122	4,561	4,561	7,493	5,538	13,032
Lands	11	8	3				8	3	11
Subtotal	54,867	41,150	13,717	149,715	74,858	74,858	116,008	88,574	204,582
Lands, Easements, ROW, and Relocations (LERRs)	100% Non-Federal			100% Non-Federal					
Lands	5	-	5	-	-	-	-	5	5
Subtotal	5	-	5	-	-	-	-	5	5
Total First Costs	54,872	41,150	13,722	149,715	74,858	74,858	116,008	88,579	204,587
Other Federal Costs	100% Federal			100% Federal					
Aids to Navigation - USCG Channel Markers	-	-	-	108	108	-	108	-	108
Subtotal	-	-	-	108	108	-	108	-	108
Associated Non-Federal Costs	100% Non-Federal			100% Non-Federal					
Berthing Areas & Dock Modifications		-	-	47,257	-	47,257	-	47,257	47,257
Subtotal	-	-	-	47,257	-	47,257	-	47,257	47,257
Total Project Costs	54,872	41,150	13,722	197,080	74,966	122,115	116,116	135,836	251,952

Note: Figures may not add to totals due to rounding relocations" pursuant to Planning Guidance Letter (PGL) 44. No pipeline relocations are anticipated. Owners of berth and dock facilities that require modification in conjunction with the project would be responsible for 100 percent of those associated costs. Berth deepening and structural modifications would be incurred and are included in the project cost.

The maintenance of project features, including dredging, dike raisings, and DAMP work costs, would be funded through annual appropriations of the O&M program. The actual amounts would vary on a year-to-year basis because of variability in the volume of material removed during each dredging cycle and the variability of the cycles. Costs for maintenance of the BIH would be in accordance with Section 101(b) of WRDA 1986, as modified by Section 2102(b) of the Water Resources Reform and Development Act (WRRDA) of 2014, which allocates the increment of costs for maintenance of channel depths to 50 feet as 100 percent Federal and the increment of costs for channel depths below 50 feet as 50 percent non-Federal and 50 percent Federal. Costs for dike raising for dredging of berthing areas and development of other local service facilities is 100 percent a non-Federal sponsor responsibility. Additional PA capacity for the Recommended Plan would be constructed regularly over the 50-year period of analysis in conjunction with maintenance dredging cycles.

The increase in O&M dredging, DAMP work, and dike raising costs has been calculated to be an additional $2,971,000 annually. The cost allocation for this O&M is an increase in approximately $2,674,000 in Federal cost and $297,000 in non-Federal cost annually.

8.4 Additional non-Federal Sponsor Cash Contribution

Section 101 of Public Law 99-662 requires for all navigation channel depths that the non-Federal sponsor must provide an additional cash contribution equal to 10 percent of fully funded GNF costs (minus costs for LERRs). This total is detailed in Table 8-4 below. These costs may be paid over a period not to exceed 30 years.

Table 8-4. Total General Navigation Features Costs and Credits

(October 2012 Price Level)

Cost-Shared GNF	$204,582,000
10% of GNF	$20,458,000
Creditable Land Costs	$5,000
Cash Contribution	$20,453,000

8.5 Views of non-Federal Sponsor and Others

The non-Federal sponsor for the existing project, BND, has actively participated in the entire planning process. Their primary concern has been to provide the community with a channel design, preferably 52 feet deep in the Main Channel, to increase navigation efficiency and safety. BND is supportive of the Recommended Plan and has indicated a strong interest in beginning construction as soon as possible.

8.6 Recommended Plan and Recent USACE Initiatives

As discussed in the Appendix L (Plan Formulation), the USACE has implemented the USACE Campaign Plan over the past few years. These initiatives were developed to ensure USACE success in the future by improving the current practices and decision-making processes of the USACE organization. The application of those principles as they relate to the Recommended Plan for BIH is described below.

8.6.1 USACE Actions for Change as Reflected in the Campaign Plan

Goal 2: Transform Civil Works - Deliver enduring and essential water resource solutions, utilizing effective transformation strategies.

- BIH study analyzed potential effects over the study area.
- Direct and indirect effects of the project on the environment were avoided by changes in project design.
- All environmental impacts of the proposed project have been addressed and no compensatory mitigation is required.
- Dredged material placement plans were analyzed to beneficially use the material to the benefit of the entire system (inshore and offshore) to the greatest extent possible. Dredged material placed at the Feeder Berm would be beneficial in slowing shoreline erosion and resupplying sediment to the longshore drift.
- Close coordination among the USACE, non-Federal sponsor, resource agencies, and interested parties occurred throughout the study process. Interactions were professional and respectful, and opinions and expertise of others were obtained and utilized where appropriate. Coordination with the resource agencies and interested parties ensured that the spectrum of environmental habitats of the study and project area was adequately understood and that potential impacts accurately identified.
- Developed plans over long-term, 50-year period of analysis.
- Utilized latest development in engineering, economic, and environmental modeling.
- Risk analyses conducted throughout the study are summarized in Section 6.8.
- Review and inspection of work would be conducted during design and construction.
- Project risks will be communicated during the public review of the study findings.
- Unlike flood risk management and hurricane protection projects, navigation projects involve minimal risk to the public.

- Independent review of the project documents and analyses was performed internally to the USACE and externally by professionals from academia and expert consultants. Comments from those reviews have been incorporated into the study documents, as appropriate.

8.6.2 Environmental Operating Principles

Throughout the study process, USACE Environmental Operating Principles (EOP) were considered during alternatives and plan development. The re-energized EOP principles are considered at the same level as economic issues. The seven EOP principles are:

- Foster a culture of sustainability throughout the organization;
- Proactively consider environmental consequences of all USACE activities and act accordingly;
- Create mutually supporting economic and environmental solutions;
- Continue to meet our corporate responsibility and accountability under the law for activities undertaken by the USACE which may impact human and natural environments;
- Consider the environment in employing a risk management and systems approach throughout life cycles of projects and programs;
- Leverage scientific, economic, and social knowledge to understand the environmental context and effects of USACE actions in a collaborative manner; and
- Employ an open, transparent process that respects views of individuals and groups interested in USACE activities.

The application of EOP principles resulted in a Recommended Plan which minimizes the extent of channel widening and deepening impacts, restricts terrestrial impacts of the DMMP to existing PA footprints, adopts measures recommended by USFWS to avoid impacts to threatened and endangered species which may occur in the project area, adopts RPMs recommended by NMFS to minimize impacts to threatened and endangered sea turtles which may be adversely affected by hopper dredging during channel construction, protects important adjacent habitat with the installation of a protective dike, and promotes the beneficial use of maintenance material by placing sediment back into the littoral system in a nearshore Feeder Berm. An open and transparent process was employed to scope environmental and social issues of concern to resource agencies, local governments and the general public, and the DIFR-EA was circulated for public review and comment.

9 PUBLIC INVOLVEMENT

Public input was solicited through a public scoping meeting held at the Mary Yturria Education Center in Brownsville, Texas on January 31, 2007. Public input was received concerning the following topics:

1) Economic development opportunities;
2) Operational constraints associated with the BIH channel;
3) Current dredged material placement practices;
4) Opportunities for environmental restoration; and
5) The proposed channel improvement project.

The public was provided an opportunity to express comments in person or in writing. The following is an overview of the comments and concerns expressed by interested parties throughout the study process. These comments were received from the general public, State, and Federal resource agencies, and others. Detailed information including the transcript from the 2007 scoping meeting and comments received throughout the public involvement process is included in Appendix D.

At the scoping meeting, strong expressions of support were provided by members of the U.S. Congress, Texas Senate, Cameron County, the City of South Padre Island, local chambers of commerce, local business, and private citizens. Concerns were expressed about the inability of the current channel to support larger and deeper draft vessels needed for future economic growth, shoaling issues and maintenance dredging of the existing channel, blowing dust from potentially new or larger PAs, and beach erosion on South Padre Island. Officials from the Town (now City) of South Padre Island requested that sand from channel dredging be beneficially used for beach nourishment at South Padre Island. The GLO has partnered with USACE to place sandy maintenance material on the Gulf beach north of the jetties at Brazos Santiago Pass in the past and the City would like to continue this practice in the future.

Public and agencies were given an opportunity to review the draft report and responses to these comments were summarized in Appendix D of the final report. No public comments were received on the draft report. The notice of the availability of the draft report was sent to 225 individuals, agencies, businesses, local governments, and wildlife refuges. Digital copies of the draft report were also provided and the draft document was posted on the Galveston District website.

Comments were received from the EPA regarding the sufficiency of a draft Contaminant Sampling report and potential ODMDS mounding heights. USACE worked to resolve issues with the draft report and has completed a final report. The original report conclusions regarding suitability of material for disposal and mounding heights were sustained.

10 RECOMMENDATIONS

10.1 Overview

It is recommended that the existing projects for BIH, Texas, authorized by the resolution of the Committee on Public Works, U.S. House of Representatives dated May 5, 1966, be modified generally as described in this report as the Recommended Plan, with such modifications as in the discretion of the Chief of Engineers may be advisable, and subject to cost-sharing and financing arrangements satisfactory to the President and the Congress, to provide deep-draft channel improvements to the BIH Channel from the enlargement and continued maintenance of a portion of the BIH Channel.

For the purpose of calculating the Section 902 limit, the total estimated first cost of the GNF is \$204,587,000, including an estimated Federal share of \$116,008,000 and an estimated non-Federal share of \$88,579,000. The Total Project Cost of all project components, minus inflation and IDC, totals \$251,952,000. Total average annual costs for the project are \$14,163,000, which includes \$11,192,000 in average annual costs for construction and \$2,971,000 incremental annual O&M costs. The Federal government would be responsible for \$2,674,000 of the incremental O&M costs and the non-Federal sponsor would be responsible for the remaining \$297,000. Fully Funded Cost of the project, which includes Project Costs and expected escalation totals, is \$279,817,000.

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

BND shall:

a. Provide 10 percent of the total cost of construction of the GNFs attributable to dredging to a depth not in excess of 20 feet; plus 25 percent of the total cost of construction of the GNFs attributable to dredging to a depth in excess of 20 feet but not in excess of 45 feet; plus 50 percent of the total cost of construction of the GNFs attributable to dredging to a depth in excess of 45 feet as further specified below:

    1) Provide 50 percent of design costs allocated by the Government to commercial navigation in accordance with the terms of a design agreement entered into prior to commencement of design work for the project;

    2) Provide, during construction, any additional funds necessary to make its total contribution for commercial navigation equal to 10 percent of the total cost of construction of the GNFs attributable to dredging to a depth not in excess of

20 feet; plus 25 percent of the total cost of construction of the GNFs attributable to dredging to a depth in excess of 20 feet but not in excess of 45 feet; plus 50 percent of the total cost of construction of the GNFs attributable to dredging to a depth in excess of 45 feet;

b. Provide all LERRs, including those necessary for the borrowing of material and placement of dredged or excavated material, and perform or assure the performance of all relocations, including utility relocations, all as determined by the Government to be necessary for the construction or operation and maintenance of the GNFs;

c. Pay with interest, over a period not to exceed 30 years following completion of the period of construction of the GNFs, an additional amount equal to 10 percent of the total cost of construction of GNFs less the amount of credit afforded by the Government for the value of the LERRs, including utility relocations, provided by the non-Federal sponsor for the GNFs. If the amount of credit afforded by the Government for the value of LERRs, including utility relocations, provided by the sponsor equals or exceeds 10 percent of the total cost of construction of the GNF, the sponsor shall not be required to make any contribution under this paragraph, nor shall it be entitled to any refund for the value of LERRs, including utility relocations, in excess of 10 percent of the total costs of construction of the GNFs.

d. Provide, operate, and maintain, at no cost to the Government, the local service facilities in a manner compatible with the project's authorized purposes and in accordance with applicable Federal and State laws and regulations and any specific directions prescribed by the Federal Government;

e. Provide 50 percent of the excess cost of O&M of the project over that cost, which the Federal Government determines would be incurred for O&M if the project had a depth of 50 feet;

f. Give the Federal Government a right to enter, at reasonable times and in a reasonable manner, upon property that the non-Federal sponsor owns or controls for access to the project for the purpose of completing, inspecting, operating and maintaining the GNFs;

g. Hold and save the U.S. free from all damages arising from the construction or O&M of the project, any betterments, and the local service facilities, except for damages due to the fault or negligence of the U.S. or its contractors;

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

i. Perform, or ensure performance of, any investigations for hazardous substances as are determined necessary to identify the existence and extent of any hazardous substances regulated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 USC 9601–9675, that may exist in, on, or under LERRs that the Government determines to be necessary for the construction or O&M of the GNFs. However, for LERRs that the Government determines to be subject to the navigation servitude, only the Government shall perform such investigation unless the Federal Government provides the non-Federal sponsor with prior specific written direction, in which case the non-Federal sponsor shall perform such investigations in accordance with such written direction;

j. Assume complete financial responsibility, as between the Federal Government and the sponsor, for all necessary cleanup and response costs of any hazardous substances regulated under CERCLA that are located in, on, or under LERRs that the Federal Government determines to be necessary for the construction or operation and maintenance of the project;

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

l. Comply with Section 221 of PL 91-611, Flood Control Act of 1970, as amended (42 USC 1962d-5b), and Section 101(e) of the WRDA 86, Public Law 99-662, as amended (33 USC 2211(e)), which provides that the Secretary of the Army shall not commence the construction of any water resources project or separable element thereof, until the non-Federal sponsor has entered into a written agreement to furnish its required cooperation for the project or separable element;

m. Comply with the applicable provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, PL 91-646, as amended (42 USC 4601-4655), and the Uniform Regulations contained in 49 CFR 24, in acquiring lands, easements, and rights-of-way, necessary for construction, operation and maintenance of the project including those necessary for relocations, the borrowing of material, or the disposal of dredged or excavated material; and inform all affected persons of applicable benefits, policies, and procedures in connection with said act;

n. Comply with all applicable Federal and State laws and regulations, including, but not limited to, Section 601 of the Civil Rights Act of 1964, PL 88-352 (42 USC 2000d), and Department of Defense Directive 5500.11 issued pursuant thereto, as well as Army

Regulation 600-7, entitled "Nondiscrimination on the Basis of Handicap in Programs and Activities Assisted or Conducted by the Department of the Army"; and all applicable Federal labor standards requirements including, but not limited to, 40 USC 3141-3148 and 40 USC 3701-3708 (revising, codifying and enacting without substantive changes the provision of the Davis-Bacon Act (formerly 40 USC 276a et seq.), the Contract Work Hours and Safety Standards Act (formerly 40 USC 327 et seq.), and the Copeland Anti-Kickback Act (formerly 40 USC 276c);

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

p. Not use funds from other Federal programs throughout, including any non-Federal contribution required as a matching share, therefore, to meet any of the sponsor's obligations for the project costs unless the Federal agency providing the Federal portion of such funds verifies in writing that such funds are authorized to be used to carry out the project.

Construction of the recommended channel improvements is estimated to take 2.4 years to complete. During this period, the Government and the non-Federal sponsor shall diligently maintain the projects at their previously authorized dimensions according to the previous cooperation agreement. Maintenance materials will be removed from the channel prior to the beginning of construction and dredging profiles then will be taken. Maintenance materials that have accumulated in the channels after the time that "before dredging" profiles are taken for construction payment shall be considered as new work material and cost-shared according to the new cooperation agreement. Any dredging in a construction contract reach after the improvements have been completed and the construction contract closed will be considered to be maintenance material and cost-shared according to the new agreement.

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

10.2 Categorical Exemption

A categorical exemption for navigation projects exists to deviate from selection of the NED plan in accordance with ER 1105-2-100, E-3.b (5) that states:

> "Categorical Exemption for Flood Control and Navigation Projects. If the non-Federal sponsor identifies a constraint to maximum physical project size or a financial constraint due to limited resources, and if net benefits are increasing as the constraint is reached, the requirement to formulate larger scale plans in an effort to identify the NED plan is suspended. The constrained plan may be recommended. ..."

The proposed project meets the requirements for a categorical exemption due to the sponsor's financial constraint and is recommended as the Recommended Plan. Additional deepening beyond 52 feet was not evaluated in this study so the NED plan could not be identified. This constrained Recommended Plan consists of deepening of the channel to 52 feet as described in Section 6.0 of this report.

10.3 Recommendation

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

3 JUL 14
Date

Richard P. Pannell
Colonel, Corps of Engineers
District Engineer

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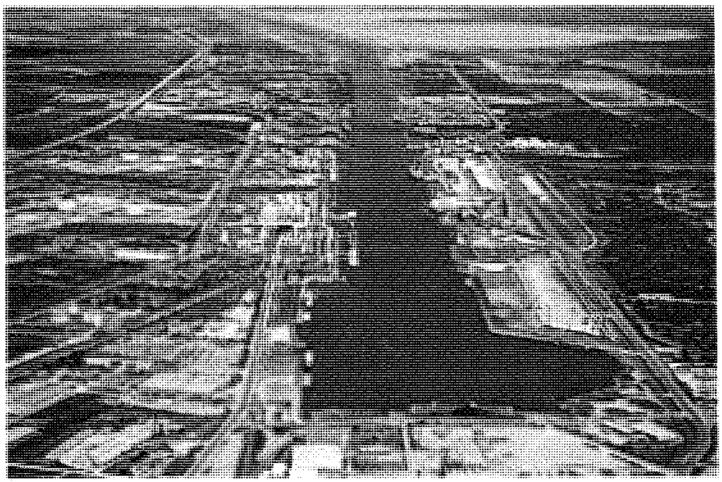
U.S. Army Corps of Engineers

Galveston District
Southwestern Division

Brazos Island Harbor, Texas Channel Improvement Project

Appendices



July 2014

Brazos Island Harbor, Texas
Channel Improvement Project

APPENDICES

A	Economic Appendix
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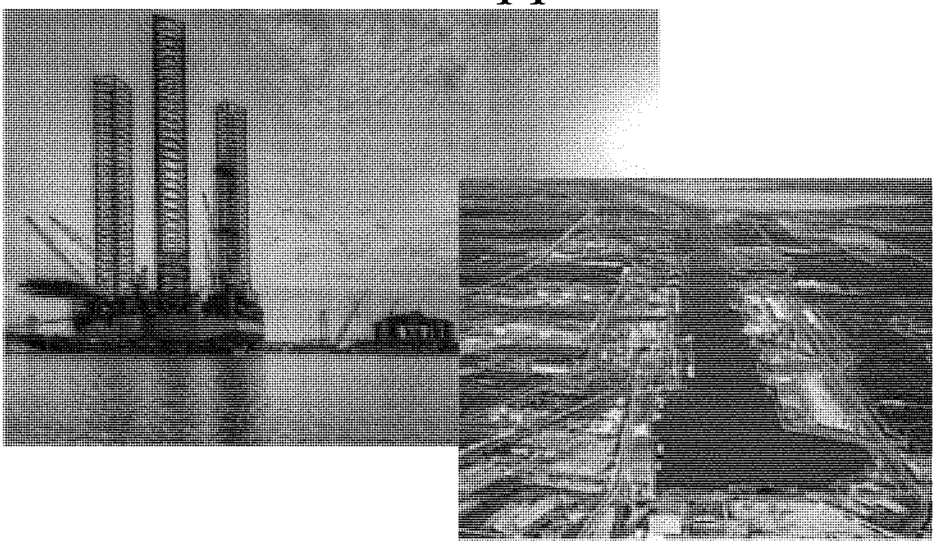
Brazos Island Harbor, Texas
Channel Improvement Project

Appendix A
Economic Appendix

May 2014

Brazos Island Harbor Channel Improvement Project

Economic Appendix



U.S. Army Corps of Engineers
Southwestern Division
Galveston District

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EXECUTIVE SUMMARY

This appendix presents the economic analysis for the Brazos Island Harbor (BIH) Feasibility Study. BIH is the southernmost port in Texas, and receives commodities that include petroleum products, crude materials, and primary manufactured goods. These commodities move on barges, bulk carriers, tankers, and general cargo vessels. In addition, BIH has several shipbreakers that receive vessels to scrap. There is also a major oil drilling rig fabricator that builds, repairs, modifies, and inspects oil drilling rigs that are drilling in offshore deepwater in the Gulf of Mexico.

BIH is situated to serve southern Texas, as well as northern Mexico for trade. As experienced in the past, BIH is expected to continue receiving increases in tonnage. However, there are current channel constraints, leading to vessel inefficiency. Therefore, the project benefits were calculated based on reductions in transportation costs generated for more efficient vessel transportation and less restrictions on transit of larger oil drilling rigs. The proposed channel improvements are in response to the need for deeper access by allowing the existing fleet to load more fully and for the introduction of larger vessels, to include oil drilling rigs. The existing Federal project has an authorized depth of 42 feet and a width of 250 feet. Among the alternatives analyzed included 45-, 48-, 50-, and 52-foot depths in addition to 300- and 350-foot widths, as well as the without-project condition.

The benefits were calculated for a 2021 to 2071 period of analysis using the fiscal year (FY) 2014 Federal discount rate of 3.5 percent and the deep-draft vessel operating costs contained in the Economic Guidance Memorandum (EGM 11-05). The Recommended Plan is deepening of the channel to 52 feet without any channel widening. The average annual benefits for this project are $20,539,400 with average annual costs of $14,163,300, leading to a benefit-to-cost ratio of 1.5. The benefits were also calculated using Section 6009 of the Emergency Supplemental Appropriations Act for Defense, the Global War on Terror, and Tsunami Relief, 2005 (Public Law 109-13) – Offshore Oil and Gas Fabrication Ports, which led to a benefit-to-cost ratio of 6.4.

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ACRONYMS AND ABBREVIATIONS

AAE	Average Annual Equivalent
ABS	American Bureau of Shipping
AEO	Annual Energy Outlook
BCR	Benefit Cost Ratio
BEA	Bureau of Economic Analysis
BIH	Brazos Island Harbor
BLS	Bureau of Labor Statistics
BND	Brownsville Navigation District
BRG	Brownsville & Rio Grande International Railroad
BSC	Brownsville Ship Channel
DDNPCX	Deep-Draft Navigation Planning Center of Expertise
DWT	Deadweight Tonnage
EGM	Economic Guidance Memorandum
EIA	Energy Information Administration
ERDC	Engineering Research and Development Center
FTZ	Foreign Trade Zone
FWOP	Future Without Project
FY	Fiscal Year
GDP	Gross Domestic Product
GIWW	Gulf Intracoastal Waterway
GRT	Gross Register Tonnage
I&S	Iron & Steel
IDC	Interest During Construction
IWR	Institute of Water Resources
LOA	Length Overall
LPG	Liquefied Petroleum Gas
MSA	Metropolitan Statistical Area
NDC	Navigation Data Center
NED	National Economic Development
NRT	Net Register Tonnage
O&M	Operations and Maintenance
Pilots	Brazos Santiago Pilots Association
Port	Port of Brownsville
Sponsor	non-Federal Sponsor
TPI	Tons Per Inch

U.S.	United States
USACE	United States Army Corps of Engineers
VLCC	Very Large Crude Carrier
WCSC	Waterborne Commerce Statistics Center
WOP	Without Project
WP	With Project

1.0 FEDERAL NAVIGATION PROJECT DESCRIPTION

1.1 LOCATION

Brazos Island Harbor (BIH), Texas, serves the Port of Brownsville and Port Isabel. The Port of Brownsville (Port) is the southernmost navigation channel in the state of Texas (Figure 1-1) and meets the Gulf of Mexico at the Brazos Santiago Pass. The harbor contains one deep-draft vessel entrance-exit approximately 1 mile offshore and one shallow-draft vessel entrance-exit at the western terminus of the Gulf Intracoastal Waterway (GIWW) near Port Isabel. The GIWW is a shallow-draft navigation channel that traverses the entire length of the Laguna Madre (Figure 1-2). The harbor also includes two shallow-draft harbors for fishing fleets, one at Port Isabel adjacent to Laguna Madre, and another adjacent to the Brownsville Ship Channel (BSC) several miles inland.

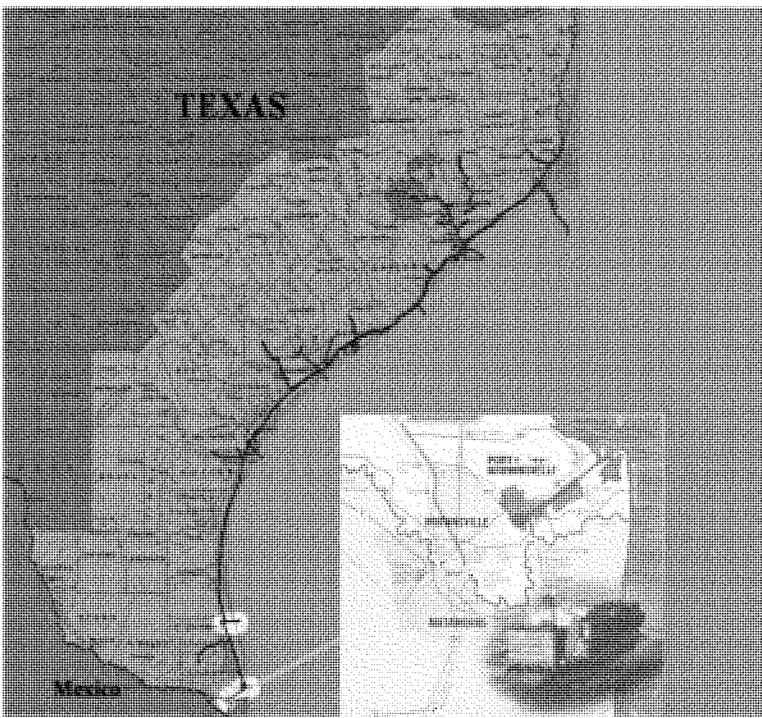


Figure 1-1: BIH Project Location Map

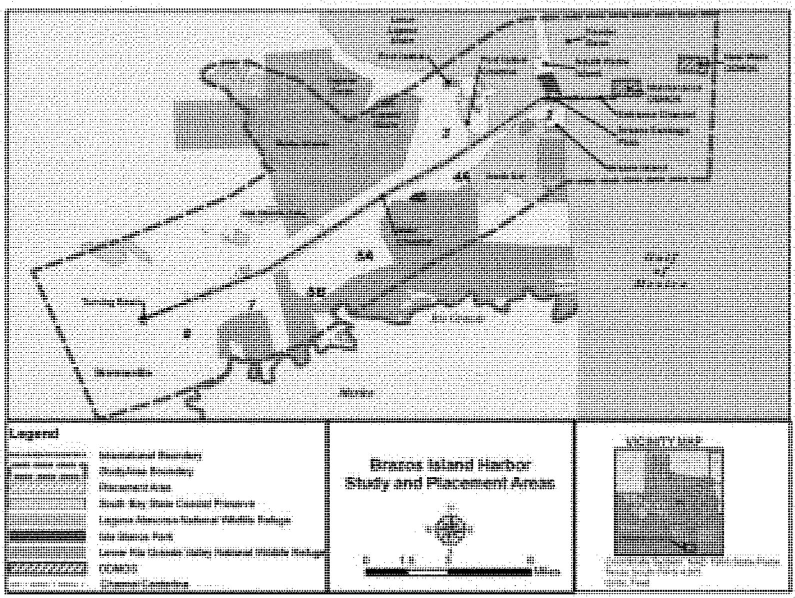


Figure 1-2: Brazos Island Harbor Study Area

1.2 FEDERAL PROJECT

The Port of Brownsville is located at the end of a 19.4-mile channel. The existing Entrance and Jetty Channel extends east to west for approximately 2.5 miles and is 44 feet deep and 300 feet wide. The Main Channel extends westward 14.8 miles and has an authorized depth of 42 feet and a width of 250 feet, although along some sections of the channel, the width is 300 feet. The Turning Basin Extension is 3,500 feet long, varies in width from 325 to 400 feet at a depth of 42 feet, and transitions into the Turning Basin, which is 1,200 feet wide with a depth of 36 feet for the remaining 1,780 feet. The GIWW channel to Port Isabel has an authorized depth of 12 feet and width of 125 feet.

1.3 PURPOSE, PROBLEMS, AND OPPORTUNITIES

The purpose of the BIH Feasibility Study is to evaluate problems and alternatives associated with navigation on the current channel, specifically inefficient vessel utilization of the channel and limited ability for oil drilling rig fabrication, maintenance, and repair at the Port due to current channel dimensions. The goal of the study is development and implementation of the National Economic Development (NED) plan. The BIH Feasibility Study has been developed in coordination with the Non-Federal Sponsor (Sponsor), the Brownsville Navigation District (BND).

Currently, one-way traffic along the channel is not efficient, i.e., vessels do not carry commodities at loaded drafts and there are draft restrictions, thereby causing more vessel trips than may be economically necessary. Due to the authorized channel depth, an absolute draft limit of 39 feet has been enforced by the Brazos Santiago Pilots Association (Pilots) for vessels to enter the channel. Vessels entering the channel with drafts between 34 and 39 feet require assistance from the Pilots, who provide restrictions in terms of tide and current for such vessels. However, the BSC has an average tidal range of about 1.3 feet, which is minimal compared to other United States (U.S.) ports. Until 2009, the harbor depth was lower than the authorized depth of 42 feet. In 2009, funding was appropriated to dredge the BSC to its authorized depth. Prior to maintenance dredging in 2009, hurricanes and delayed maintenance decreased channel depth in some sections of the channel, which impacted the size and loaded drafts of vessels calling on the Port and continues to have an impact.

In addition, as deepwater oil production in the Gulf of Mexico continues to increase, oil rigs become more technologically advanced for efficiency as well as to meet demand, but this also leads to larger sizes. The oil rigs require routine maintenance and inspections. Companies prefer to have such maintenance and inspections completed at ports closer to the drilling sites in order to minimize drilling downtime and sailing costs. The number of oil rigs that can visit the Port are limited by the channel dimensions, especially as rigs are built larger.

The Future Without-Project (FWOP) condition is maintaining the current authorized project depth of 42 feet and width of 250 feet. However, the volume of commodities is expected to grow in the future; thereby, there are efficiencies to be obtained for the vessel traffic as the annual number of vessel calls increase. The FWOP condition would continue restricting the draft of vessels and prevent larger vessels from utilizing the waterway. The alternatives examined included no widening, 50-foot widening, and 100-foot widening. For each action alternative, the following depths were examined: 45, 48, 50, and 52 feet. The deepening and widening alternatives evaluated in this study allow for the opportunity to have vessels carry commodities to their loaded drafts, as well as for commodities to be carried on larger vessels, which leads to transportation cost savings. Deepening of the channel will further prevent vessels from encountering possible delays due to waiting for appropriate conditions, as currently required by the Pilots. The increased channel dimensions would also allow the Port to serve larger offshore rigs presently operating in the U.S. Gulf Coast that need maintenance and inspection services.

1.4 GENERAL METHODOLOGY

The NED plan maximizes the net excess benefits, which will be assessed for the alternatives identified in the Purpose, Problems, and Opportunities section following the methodology for deep-draft commercial navigation analysis described in the *Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies* and other relevant U.S. Army Corps of Engineers (USACE) analyses and policy guidance.

Benefits equal the difference between without- and with-project transportation costs. The costs and benefits in the analysis were calculated using FY 2014 (October 2013) price levels and then converted to Average Annual Equivalent (AAE) values using the FY 2014 Federal discount rate of 3.50 percent, assuming a 50-year period of analysis. The NED plan is the Federal recommended plan, and may or may not be equal to the locally preferred plan.

In addition to the traditional NED benefits, additional benefits were calculated for the oil drilling rigs that visit the Port. The Director of Civil Works issued Implementation Guidance for Section 6009 of the Emergency Supplemental Appropriations Act for Defense, the Global War on Terror, and Tsunami Relief, 2005 (Public Law 109-13) – Offshore Oil and Gas Fabrication Ports in September 2012 (Section 6009). Section 6009 provides that in determining the economic justification for a navigation project involving offshore oil and gas fabrication ports, the Secretary is directed to measure and include in the NED calculation the value of future energy exploration and production fabrication contracts and transportation cost savings that would result from larger navigation channels. Separate benefit-cost ratios (BCR) were calculated to include the Section 6009 benefits. These calculations include proprietary information, and therefore are included in a separate addendum for official use only.

Note that the numerical information provided in the tables throughout the report may not exactly match due to rounding of values. This, however, has no impact on the analysis.

2.0 SOCIOECONOMIC PROFILE OF THE BIH STUDY AREA

2.1 POPULATION

The Port serves the Brownsville-Harlingen Metropolitan Statistical Area (MSA), which is solely encompassed in Cameron County, Texas. The population represents less than 2 percent of the Texas state population, as presented in Table 2-1. The population is forecasted to increase by approximately 66 percent by 2050, or an average annual increase of 1.3 percent, as shown in the following table. The change in population is expected to be twice that for the State of Texas (0.6 percent).

Table 2-1. Population: Historic and Projected

Location	2000 (Actual)	2010 (Actual)	2012 (Projected)	2050 (Projected)
Cameron County, TX	335,227	406,220	417,504	674,611
State of Texas	20,851,820	25,145,561	25,613,722	32,052,451

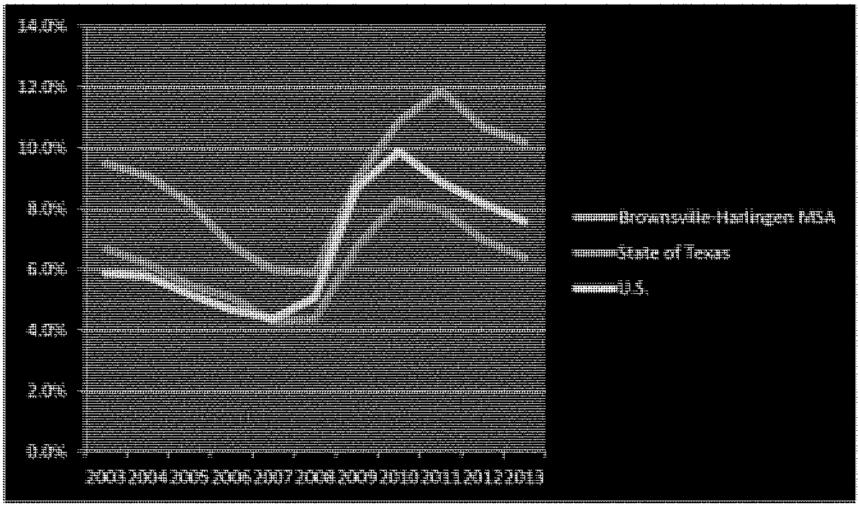
Source: Texas State Data Center, http://txsdc.utsa.edu/Data/TPEPP/Index.aspx

2.2 MEDIAN HOUSEHOLD INCOME

Based on U.S. Census data, over the period 2007–2011, the median household income for Cameron County was $32,156. This is approximately 40 percent lower than the median household income of $50,920 for the State of Texas, and $52,762 for the U.S. as a whole. The poverty rate in Cameron County for the period 2007–2011 was 34.9 percent, which is double the 17 percent poverty rate for the State of Texas.

2.3 UNEMPLOYMENT

Over the past 10 years, the unemployment rate in the Brownsville-Harlingen MSA has mirrored the ups and downs of the U.S. unemployment rate; however, the Brownsville-Harlingen MSA unemployment rate has been higher than both the State of Texas and U.S. unemployment rates. The unemployment rate peaked in 2011, but has been over 10 percent since 2009. The following Figure 2-1 shows the unemployment rate over the past decade, based on data from the Bureau of Labor Statistics (BLS).



Source: Bureau of Labor Statistics

Figure 2-1: BIH Study Area Unemployment Rate

2.4 EMPLOYMENT AND GDP

The Brownsville-Harlingen MSA has experienced steadily increasing employment numbers since 2001. The Brownsville-Harlingen MSA has also experienced a growing economy from $5 billion in 2001 to $8.1 billion in 2011, according to Bureau of Economic Analysis (BEA) figures. The following Table 2-2 provides details on employment and Gross Domestic Product (GDP) for the MSA over the past decade.

According to a Martin Associates report prepared for the Port in September 2012, of the 21,590 jobs that are in some way related to the cargo moving via the marine terminals and activity at the ship and rig repair yards within the BND, 4,373 direct jobs were generated in 2011 by the marine cargo and vessel activity and ship and rig repair operations. Overall, in 2011, marine cargo activity at the Port generated a total of $2 billion of economic activity in Texas, and $712 million of that was direct business revenue. Thus, BSC provides extensive business and employment opportunities for the people who live in the area.

Table 2-2. Brownsville-Harlingen MSA Economic Trends

Year	GDP (1,000 current $)	Employment (persons employed)	% Change in GDP	% Change in Employment
2001	5,074,000	119,524		
2002	5,378,000	123,314	5.99	3.17
2003	5,636,000	123,429	4.80	0.09
2004	5,893,000	125,001	4.56	1.27
2005	6,160,000	125,484	4.53	0.39
2006	6,565,000	130,697	6.57	4.15
2007	7,076,000	133,276	7.78	1.97
2008	7,444,000	135,047	5.20	1.33
2009	7,611,000	133,517	2.24	(1.13)
2010	7,927,000	135,026	4.15	1.13
2011	8,167,000	136,393	3.03	1.01

Source: Bureau of Economic Analysis

3.0 ECONOMIC STUDY AREA

3.1 THE BROWNSVILLE SHIP CHANNEL INFRASTRUCTURE AND TRANSPORTATION NETWORK

The Port is the closest deepwater port to industrialized Northern Mexico. As of September 2013, the Port was ranked as the number one U.S. Foreign Trade Zone (FTZ) for exports to other countries. According to the U.S. Department of Homeland Security, goods may be exported from an FTZ free of duty and excise taxes. In addition, an importer has the choice of paying duties at the rate of either the original foreign materials or the finished product, and the duties are not required until the merchandise enters U.S. Customs and Border Protection territory for domestic production. The FTZ program is designed to promote American competiveness by encouraging companies to maintain and expand operations in the U.S. Thus, the Port provides land transportation to Mexico that is linked with the GIWW inland waterway system, which provides a distribution advantage. The top commodities moved through the Port's FTZ include petroleum products, steel, metals, and offshore oil drilling platforms.

The variety of cargo that is transported along the channel includes chemicals; petroleum products, such as gasoline and distillate fuel oil; iron ore and iron and steel (I&S) products, such as aluminum and flat-rolled products; dry bulk and break bulk products, such as limestone and scrap; and food and farm products. As a bulk commodity port, the Port has developed a marine terminal operation covering both liquid and dry cargo handling. The Port has grain, dry bulk, and liquid bulk handling and storage facilities. The deep-draft vessels calling on the Port are primarily tankers and bulk carriers, while shallow-draft barge traffic enters the channel at the Port Isabel Wye. Table 3-1 provides a summary of the docks along BSC and the commodities and vessels that are expected to call at the docks. Table 3-2 provides detail on the dimensions of the channel and the reaches used in the analysis. The Port is the owner of the property along the channel and leases the land to the facility operators.

The Port estimates that the harbor dock capacity is 18.7 million tons. The Port owns approximately 40,000 acres of land in areas both North and South of the BSC. The available storage consists of 571,065 square feet of covered storage, 2.85 million square feet of open storage, and 3.4 million barrels of oil and liquid storage tanks.

The Port has a tenant public grain storage/elevator company that has the flexibility to load and unload both ships and barges with a capacity of over 3 million bushels. However, the grain elevator has not been functional in recent years. The Port owns and operates 10 transit warehouses, and the buildings are all located adjacent to vessel berths and are equipped with aprons and rail track on the landward side of all warehouses. Two open docks and three warehouses also have ship-side rail to facilitate efficient transfer to/from trucks or railroad cars.

Table 3-1. BIH Dock Information

Dock Name	Current Length (feet)	Current Limiting Depth (feet)	Vessel Type	Commodity Category
Amfels	2,700	40	Oil Rig	Drilling Rigs
BC Dock	800	39	Barge-Dry Open, Bulk Carrier	Chemicals, Dry Bulk & Break Bulk, Iron Ore/I&S Products
Docks 1, 2, and 4	1,250	32	Barge-Dry Open	Dry Bulk & Break Bulk, Iron Ore/I&S Products
Dock 3	450	32	General Cargo	Chemicals
Docks 7 and 8	1,000	29	Barge-Dry Open	Dry Bulk & Break Bulk, Iron Ore/I&S Products
Docks 10 and 11	1,250	32	Barge-Dry Open	Dry Bulk & Break Bulk, Iron Ore/I&S Products
Docks 12 and 13	1,120	32	Barge-Dry Open, Bulk Carrier	Dry Bulk & Break Bulk, Iron Ore/I&S Products
Docks 15 and 16[1]	1,450	42	Barge-Dry Open, Bulk Carrier, General Cargo	Chemicals, Dry Bulk & Break Bulk, Food & Farm Products, Iron Ore/I&S Products
Esco	2,060	35	Scrap	Iron Ore/I&S Products, Shipbreaking
International Shipbreaking	1,600	20	Scrap	Iron Ore/I&S Products, Shipbreaking
Liquid Dock	450	34	Barge-Liquid, Tank Ship	Petroleum Products
Oil Dock 1 and 2	675	32	Barge-Liquid, Tank Ship	Chemicals, Petroleum Products
Oil Dock 3 and 5	1,425	39	Barge-Liquid, Tank Ship	Chemicals, Petroleum Products
Transforma	1,000	20	Scrap	Iron Ore/I&S Products, Shipbreaking

Source: Port Series Book No. 26 (Revised 2003), Ports of Freeport, Port Lavaca/Point Comfort, Brownsville, and Ports Along the Gulf Intracoastal Waterway, TX

[1] Please note that as of May 2014, Dock 16 has not been built. However, the Port has plans to construct Dock 16 before the period of analysis begins, and thus, it has been included in the analysis.

Table 3-2. Current Dimensions of the Brownsville Ship Channel

Reach Name	Length (feet)	Width (feet)	Depth (feet)
Entrance Channel (Entry/Exit)	7,000	300	44
Jetty Channel (Topologic Node)	6,000	300	44
Laguna Madre (Topologic Node)	16,000	250	42
Brownsville Ship Channel	48,000	250	42
GIWW (Barge Entry/Exit)	100	150	12
Reach 5 (to Amfels Dock)	10,000	300	42
Reach 6 (to International Shipbreaking Dock)	1,000	300	42
Reach 7 (to Transforma Dock)	1,500	300	42
Reach 8 (to Esco Dock)	1,500	300	42
Reach 9 (to Liquid Dock)	1,610	300	42
Reach 10 (to Oil Docks 3 & 5)	1,690	400	42
Reach 11 (to Docks 15 & 16)	700	400	42
Reach 12 (to BC Dock)	2,000	400	42
Reach 13 (to Oil Docks 1 & 2)	1,100	325	42
Reach 14 (to Docks 12 & 13)	1,900	450	36
Reach 15 (to Docks 7 & 8)	500	690	36
Reach 16 (to Docks 10 & 11)	500	690	36
Reach 17 (to Docks 1, 2, & 4)	800	690	36
Reach 18 (to Dock 3)	200	690	36
Reach 19 (to Turning Basin)	500	861	36

Railroad car and truck loading racks at the various terminals provide for the transfer of petroleum products, chemicals, and edible oils moving in the U.S. and Mexican markets. The Port has over 33 miles of railroad tracks, with rail sidings serving warehouses, industries, and all docks in the Port area. The Union Pacific and the Burlington Northern Santa Fe provide rail service to and from the Port on the U.S. side. Grupo Transportacion Ferroviaria Mexicana, S.A. de C.V. provides rail service to and from the Port and Mexico directly. As a subsidiary of the BND, the Brownsville & Rio Grande International Railroad (BRG) has provided railroad service at the Port since 1984. Railroad operations maximize movement of a monthly average load of 4,000 plus cars. BRG has a direct interchange with the Union Pacific and the Burlington Northern Santa Fe rail lines.

3.2 MULTIPORT ANALYSIS

The purpose of the multiport analysis is to assess whether or not improvements at BIH would result in a diversion of cargo traffic from competing ports to Brownsville. Diverted traffic from competing U.S. ports is not an NED benefit as there is no increase in the net value of the national output of goods and services, except when the diversion results in a net reduction in transportation costs. If it is determined that there is an impact, the forecasted cargo traffic at BIH would be adjusted by an amount derived from the analysis of cargo movements and transportation costs at competing ports.

BIH is the southernmost major Gulf of Mexico port in Texas and borders Mexico. The BSC location compared to other Gulf of Mexico ports is as follows: 146 nautical miles to Corpus Christi Ship Channel, Texas, and 262 nautical miles to Galveston Ship Channel, Texas. These ports, as well as other Texas and Gulf of Mexico ports, could be a competing port for one or more of the commodities handled by BIH.

BIH handles dry bulk, break bulk, and liquid bulk. This analysis (1) identifies those commodities that would benefit from improvements to the Federal project; (2) for each benefiting cargo group, identifies their cargo volumes at competing ports; (3) assesses the extent of the overlap in the flow of these commodities and in the hinterlands served by each of the potential competing ports; and (4) identifies any advantageous/disadvantageous transportation costs and institutional and/or cargo capacity constraints resulting from port administration, terminal operators, and/or stevedore companies' policies, and/or future growth. Then, if appropriate, any diverted traffic due to improvements at BIH is quantified. Table 3-3 provides detail on the distribution of commodities in Texas by port.

3.3 BULK CARGOES

Dry and liquid bulk products are among the local/regional commodities of the BIH area to service the domestic economic hinterland. Liquid bulk is used primarily in support of transportation and electric power generation. Dry bulk commodities, such as crude materials, are used in support of local/regional construction aggregates.

The major liquid bulk cargo ports in Texas are Corpus Christi, Freeport, and Texas City. However, BIH handles a larger share of gasoline as a total of its petroleum and petroleum products imports and exports than the other ports. The primary petroleum products categories include gasoline and distillate fuel oil. As shown in Table 3-4, BIH has the second highest percentage of its petroleum products imports/exports from gasoline. BIH supplies southern Texas and Northern Mexico with transportation fuels.

Because of relatively high overland trucking costs, existing "institutional" arrangements such as the gasoline pipeline from BIH to Northern Mexico, and the use of a growth rate for future cargo volumes that is based on historical liquid bulk cargo levels at BIH that is consistent with other liquid bulk growth indicators, it is not anticipated that deepening improvements at BIH will significantly shift liquid bulk cargo movements to BIH from other ports, or vice versa.

Table 3-3. 2011 Texas Commodity Distribution (1,000s of short tons)

Commodity	BIH	Corpus Christi	Matagorda	Freeport	Galveston	Texas City
Coal	12	0	0	0	0	55
Petroleum and Petroleum Products	1,489	38,666	400	15,578	1,081	36,562
Chemicals and Related Products	2	3,085	2,071	2,303	867	2,202
Crude Materials, Inedible Except Fuels	608	6,653	4,619	96	718	0
Primary Manufactured Goods	1,257	82	0	55	62	23
Food and Farm Products	7	4,258	4	472	4,103	20
All Manufactured Equipment, Machinery and Products	11	118	0	62	348	25
Unknown or Not Elsewhere Classified	44	73	18	13	92	3
Total	3,430	52,935	7,112	18,579	7,271	38,890

Source: USACE, Waterborne Commerce of the U.S., Part 2, 2011.

Table 3-4. 2011 Petroleum Product Distribution by Port (1,000s of short tons)

Port	Petroleum Products	Gasoline	% of Petroleum Products	Distillate Fuel Oil	% of Petroleum Products
BIH	1,489	902	61	475	32
Corpus Christi	38,666	7,619	20	6,355	16
Matagorda	400	297	74	44	11
Freeport	14,211	272	2	255	2
Galveston	1,081	60	6	746	69
Texas City	36,562	1,640	45	3,737	10

Source: USACE, Waterborne Commerce of the U.S., Part 2, 2011.

Crude construction materials, which consist of dry bulk commodities, such as building stone, limestone, and sand and gravel, among others, are typically used to support regional private and public construction activity. As with liquid bulk cargo, BIH is positioned to service the southernmost part of Texas's construction aggregate demand. Improvements would not cause any significant shift of traffic from other ports to BIH. Moreover, given the high overland trucking costs, it is also doubtful if improvements at BIH would result in shifting aggregate traffic from Corpus Christi or other ports. Furthermore, the growth rate used for the future aggregate movements at BIH is consistent with historical traffic levels and does not depend on shifting traffic from other ports.

Primary manufactured goods, which consist of iron and steel primary forms and fabricated metal products, among others, are a primary commodity driver at BIH, but are relatively nonexistent at the other Texas ports. BIH is ideally situated to service Northern Mexico so these general cargo products are typically imported and then sent to Northern Mexico via rail; thus, improvements at BIH would not cause any significant shift of traffic from or to other ports. In addition, the growth rate used for the future aggregate movements at BIH is consistent with historical traffic levels and does not depend on shifting traffic from other ports.

3.4 MULTIPORT CONCLUSIONS

A multiport analysis was used to assess whether or not improvements at BIH would result in a diversion of cargo traffic that would either shift to or from competing ports to or from BIH. The analysis discussed previously did not find any reason to assume a shift in cargo to or from BIH. If it was determined that there is an impact, the forecasted cargo traffic at BIH would be adjusted by an amount derived from the cargo movements analysis and transportation costs at competing ports; however, in this case, there was no evidence that such a shift would occur.

Further, the multiport analysis was used to determine that the nonstructural measures developed to address at least one of the planning objectives are not reasonable. As explained above, utilizing another port would require additional transportation to the subject hinterland and the use of another port and alternative modes of commodity transport would add additional cost. Therefore, the additional cost compared to the transport to BIH leads to the nonstructural measures being removed from further consideration.

4.0 COMMODITY TYPES, FLOWS, AND FORECASTS

4.1 TYPES AND VOLUMES OF COMMODITY FLOW

The following section identifies the major past and present commodity volumes transiting BIH and forecasts future tonnages throughout the period of analysis. Cargo information is used for an initial determination of the economic study area and to provide the basis for commodity flow projections or forecasts. The existing and projected commodity flows developed in this section are integrated with the existing and projected fleet developed in Section 5 in order to provide a basis for NED benefits analysis. Ultimately, commodity projections drive vessel fleet projections in terms of the numbers and sizes of vessels for future without- and future with-project conditions.

4.1.1 DATA SOURCES

Data obtained from the Corps' Navigation Data Center (NDC) Waterborne Commerce Statistics Center (WCSC) U.S. publications and databases, as well as data from the Pilots and the Brownsville Port Authority was used for this analysis. Additional vessel data was obtained from terminal operators and from the Fairplay/Lloyds Vessel Register.

4.2 BIH COMMODITY CARGO COMPOSITION

The primary commodities at BIH include petroleum products, crude materials, and primary manufactured goods, all of which are the focus of the following sections. Table 4-1 presents BIH's major commodity groups through 2011. In addition to these commodities, there were 23 oil drilling rigs that called at the Port in 2011, which included 3 new-builds and 12 repairs.

The BIH tonnage experienced strong overall growth from the middle 1990s through 2011, with total tonnage increasing one and a half times from an average of 3.30 million short tons for 1999–2001 to 5.07 million short tons for 2009–2011. As shown on Figure 4-1, nearly half of BIH's tonnage is foreign imports. Table 4-2 displays the BIH 1980–2011 shallow-draft GIWW tonnage and the relative percentage of shallow-draft to total tonnage. The average shallow-draft tonnage of total tonnage has remained fairly steady, with an average of 43 percent in 1999–2001 compared to 40 percent in 2009–2011. There was a large decrease in shallow-draft tonnage in 2006 due to the use of the Valley Pipeline System for transporting gasoline from Corpus Christi to Harlingen and Brownsville. Gasoline barge movements on the GIWW have since increased, and again are at pre-2006 levels. In 2011, 62 percent of BIH's domestic exports were to other Texas ports, but the domestic exports to Texas and Louisiana ports combined is 75 percent. In 2011, 65 percent of BIH's domestic imports were from other Texas ports, but domestic imports from Texas and Louisiana ports combined is 76 percent.

Table 4-1. BIH Total Tonnage and Major Commodity Tonnage (1,000s of Short Tons)

Year	Total Tonnage	Total Deep-Draft Tonnage[2]	Principal Deep-Draft Commodities					
			Crude Materials		Petroleum Products		Primary Manufactured Goods	
			Imports	Exports	Imports	Exports	Imports	Exports
1980	2,875	1,196	132	45	250	37	100	0.21
1985	1,722	540	56	0	105	0	6	0
1990	1,641	472	122	13	10	35	4	9
1995	2,786	1,703	184	2	7	196	222	849
1996	2,515	1,250	172	1	9	21	207	471
1997	2,372	913	287	27	7	22	244	126
1998	2,829	1,470	500	7	144	17	481	5
1999	2,493	1,160	275	0	46	0	605	33
2000	3,273	1,933	441	0	46	9	1,187	46
2001	4,120	2,654	939	0	109	287	867	14
2002	4,741	3,330	621	4	354	396	1,694	0
2003	3,732	2,373	654	62	122	154	994	196
2004	4,173	2,292	408	1	193	154	1,285	52
2005	5,105	3,379	488	0	611	196	1,739	220
2006	5,310	4,444	440	0	674	368	2,686	21
2007	4,509	3,168	336	0	623	289	1,431	176
2008	5,669	4,202	857	0	927	213	1,655	72
2009	4,693	3,149	642	0	1,104	150	1,111	61
2010	4,617	2,481	287	0	858	209	1,065	0
2011	5,907	3,429	589	18	994	494	1,247	10

Source: USACE, Waterborne Commerce of the U.S., Part 2, 1980–2011.

[2] Includes commodities in addition to what is shown.

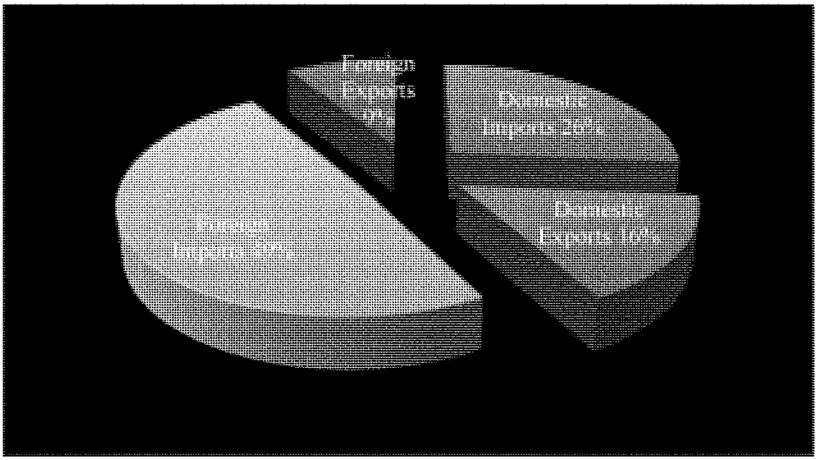


Figure 4-1: 2011 BIH Cargo Traffic Distribution

Table 4-2. Shallow-Draft Port and Deep-Draft Tonnage Comparison
(1,000s of Short Tons)

Year	Shallow-Draft Port Tonnage and GIWW Through Tonnage	Deep-Draft Tonnage	BIH Total	Shallow-Draft % of Total Tonnage
1980	1,679	1,196	2,875	58
1985	1,182	540	1,722	69
1990	1,169	472	1,641	71
1995	1,083	1,703	2,786	39
1996	1,265	1,250	2,515	50
1997	1,459	913	2,372	62
1998	1,359	1,470	2,829	48
1999	1,333	1,160	2,493	53
2000	1,340	1,933	3,273	41
2001	1,466	2,654	4,120	36
2002	1,411	3,330	4,741	30
2003	1,359	2,373	3,732	36
2004	1,881	2,292	4,173	45
2005	1,726	3,379	5,105	34
2006	866	4,444	5,310	16
2007	1,341	3,168	4,509	30
2008	1,467	4,202	5,669	26
2009	1,544	3,149	4,693	33
2010	2,134	2,481	4,617	46
2011	2,478	3,429	5,907	42

Source: USACE, Waterborne Commerce of the U.S., Part 2, 1980–2011

Crude materials and primary manufactured goods imports comprise approximately 18 percent and 37 percent of BIH's 2011 total oceangoing tonnage, respectively, as shown in Table 4-3. Whereas, petroleum products imports and exports comprise 43 percent of BIH's 2011 total oceangoing tonnage. While crude materials imports have fluctuated during the most recent 10-year period, BIH has experienced significant growth for petroleum products imports and exports and primary manufactured goods imports since 1998.

Table 4-3. 2011 BIH Commodity Distribution
(1,000s of short tons)

Commodity	BIH	% of BIH Total
Coal	12	0.4
Petroleum and Petroleum Products	1,489	43.4
Chemicals and Related Products	2	0.1
Crude Materials, Inedible Except Fuels	608	17.7
Primary Manufactured Goods	1,257	36.6
Food and Farm Products	7	0.2
All Manufactured Equipment, Machinery and Products	11	0.3
Unknown or Not Elsewhere Classified	44	1.3
Total	3,430	100

Source: USACE, Waterborne Commerce of the U.S., Part 2, 2011

4.3 COMMODITY ANALYSIS AND FORECASTS

The objective of this section is to identify the major commodities transiting BIH and assess the following topics: 1) cargo composition by commodity; 2) commodity usage; 3) sources and destinations; 4) past and present commodity volume; 5) projection of waterborne commerce; and 6) cargo categorization.

4.3.1 PETROLEUM PRODUCTS

BIH's primary petroleum products imports and exports consist of gasoline and distillate fuel oil. Petroleum products typical usage includes motor vehicle, aviation, and waterborne transportation, as well as electric power generation. Distillate fuel oil is also used for power generation.

As shown in Table 4-4, BIH handled 1,489 thousand short tons of petroleum products in 2011. Petroleum products increased between 2007 and 2011 by over 60 percent. There were no measurable gasoline imports into BIH before 2003 so petroleum products have increased dramatically in less than a decade. Gasoline and distillate fuel oil increased 11 and 183 percent, respectively, between 2010 and 2011.

Table 4-4. Petroleum Products Distribution 2007–2011 (1,000s of Short Tons)

Petroleum Products	2007	2008	2009	2010	2011	% Change 2007–2011	% Change 2010–2011
Gasoline	672	996	1,109	810	902	34	11
Distillate Fuel Oil	129	53	90	168	475	268	183
Residual Fuel Oil	25	0	0	21	26	4	24
Lube Oil and Greases	1	29	4	0	3	200	N/A
Petro Jelly and Waxes	28	34	46	57	50	79	–12
Naptha and Solvents	45	19	0	0	1	–98	N/A
Petroleum Coke	11	7	6	12	32	191	167
Total	911	1,140	1,254	1,067	1,489	63	40

Source: USACE, Waterborne Commerce of the U.S., Part 2, 2007–2011

The imports of gasoline can likely be attributed to the installation of a pipeline by Valero L.P., which has a terminal at the Port and installed a pipeline in 2006 that directly links the Port to the Burgos Basin near Reynosa, Mexico. In addition, Transmontaigne Partners L.P. has a Liquefied Petroleum Gas (LPG) terminal in Brownsville with a pipeline from the Port facilities to a terminal in Matamoros, Mexico. BIH's primary foreign petroleum product sources include the Netherlands and Italy, whereas 92 percent of the petroleum product exports are to Mexico and Central America. Over 98 percent of BIH's domestic petroleum product imports are from Texas and Louisiana, thus from U.S. Gulf of Mexico refineries. Table 4-5 provides information about the petroleum products regions.

Table 4-5. Petroleum Products Tonnage 2009–2011 Tonnage by Region (1,000s of Short Tons)

Region	2009	2009 % of Total	2010	2010 % of Total	2011	2011 % of Total	2009-2011 Average %
Asia[3]	35,031	2.7	58,121	5.5	52,576	3.5	3.9
Canada	0	0	31,397	3.0	0	0	1
Central America[4]	104,350	8.3	52,056	4.9	458,141	30.6	14.6
East Europe[5]	171,166	13.5	280,535	26.4	546,054	36.4	25.4
Mexico	39,665	3.1	116,201	10.9	41,905	2.8	5.6
North Africa[6]	120,891	9.6	170,615	16.1	217,971	14.6	13.4
North Europe[7]	744,490	58.9	324,899	30.6	141,070	9.4	33
Orient[8]	44,021	3.5	27,318	2.6	38,625	2.6	2.9
South America	4,748	0.4	0	0	1,608	0.1	0.2
Total	1,264,362	100	1,061,142	100	1,497,950	100	100

Source: USACE, NDC detailed unpublished data, 2009–2011

[3] Asia encompasses China, Taiwan, Malaysia, and Singapore.
[4] Central America encompasses Bahamas, Panama, Colombia, and Venezuela.
[5] East Europe encompasses Italy, Sweden, Lithuania, Latvia, Finland, and Russia.
[6] North Africa encompasses Portugal, Morocco, and Spain.
[7] North Europe encompasses Netherlands, Belgium, Norway, and United Kingdom.
[8] Orient encompasses Australia, Russia, Japan, and South Korea.

The number of vessels that are transporting petroleum products with deeper design drafts has been increasing, as presented in Table 4-6. For the period of 2009-2011, a comparison of vessel's design drafts versus sailing drafts is presented for a representative dock at BIH. Vessels with design drafts at or close to the channel depth but not utilizing the entire design draft are those of the historical fleet mix set to benefit from navigation deepening improvements. The 70 vessels importing from 2009 to 2011 account for the majority of the petroleum products being transferred across docks at BIH. Table 4-6 also presents the port-pair data for the vessel trips with the drafts at the foreign ports.

Table 4-6. 2009-2011 Trip Comparison of Vessel Design Draft and Sailing Draft for Petroleum Products

Design Draft (Feet)	39	40	41		42		43	44	45	Grand
Sailing Draft (Feet)	33-37	35-38	34-35	37	33-35	38-39	31-37	34	39	Total
Amsterdam, Netherlands (38ft)	2	8	1	0	0	1	7	0	0	20
Barcelona, Spain (30ft)	0	1	0	0	0	0	0	0	0	1
Donges, France (62ft)	0	0	0	0	0	1	0	0	0	1
Freeport, Grand Bahama I (52.5ft)	0	1	0	0	0	0	1	0	0	2
High Seas Gulf of Mexico	0	0	0	0	0	0	1	0	0	1
Kao Hsiung, Taiwan (50ft)	1	0	0	0	0	0	0	0	0	1
Klaipeda, Japan (48ft)	1	1	0	1	0	0	2	0	0	5
Le Havre, France (56ft)	0	0	0	0	0	0	1	0	0	1
New Amsterdam, Netherland (78ft)	0	1	0	0	0	0	0	0	0	1
Rotterdam, Netherland (77ft)	1	2	0	0	0	0	1	0	0	4
Sarroch Oil Terminal, Italy (68ft)	3	9	1	0	2	0	9	1	0	25
Sines, Portugal (76ft)	2	5	0	0	0	0	0	0	1	8
Grand Total	10	28	2	1	3	2	22	1	1	70

4.3.2 PETROLEUM PRODUCT PROJECTIONS

As shown on Figure 4-2, nearly all of the petroleum product tonnage consists of gasoline and distillate fuel oil, and these are anticipated to remain the major petroleum products commodities. As stated above, there are several terminals at the Port with direct pipeline access to Mexico and there are multiple-year contracts in place to supply LPG so the need for petroleum products is expected to continue. In addition, the Port's FTZ lends itself to continued trade with Mexico.

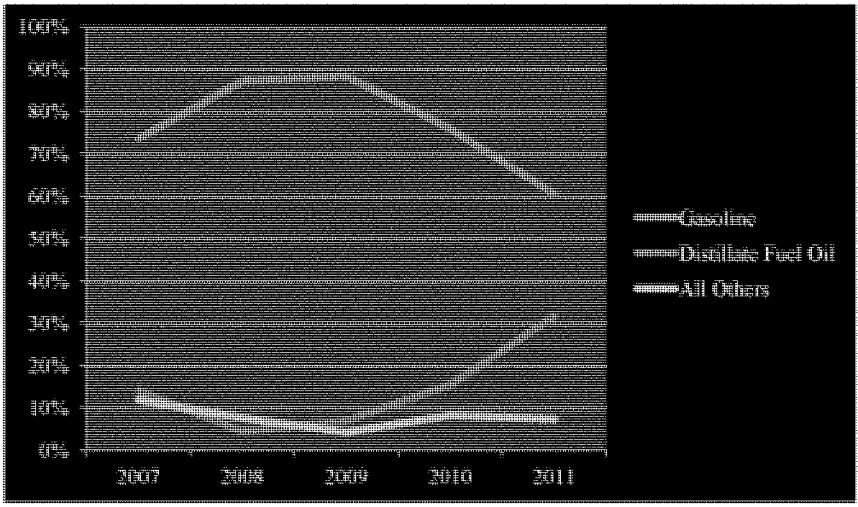


Figure 4-2: Percent of Total Petroleum Product Tonnage

Table 4-7 provides the average annual growth rate of petroleum products at BIH since 2007. Petroleum product volume grew at more than an average annual rate of 13 percent, which is greater than most Texas ports during the recession that began in 2007. The forecast of BIH's petroleum product tonnage is based on analysis of regional data and national trends. According to the Energy Information Administration's (EIA) Annual Energy Outlook (AEO) 2013, growth of petroleum products is expected to grow through 2040, as shown in Table 4-8. The AEO's projected gross refined product imports, as well as the liquefied petroleum gases consumption for both the U.S. and Mexico, were examined through 2040. Mexico's liquids consumption was also reviewed due to the large number of exports that are exported to Mexico via BIH. Based on the compiled information, a 2.5 percent growth rate is applied to the 2011 tonnage through 2017, then a 1.5 percent growth rate is projected for the first 10 years of the period of analysis, followed by a 0.5 percent growth rate for the next 10 years, and then no growth is projected for the remainder of the period of analysis. Thus, growth is only projected for the first 20 years of the period of analysis. An average annual growth rate of 0.4 percent is projected for petroleum products for the period of analysis.

Table 4-7. 2007–2011 Petroleum Product Growth Rates

Petroleum Products	BIH Petroleum Product Distribution 2007–11 (1,000s of short tons)					Average Annual Growth Rate 2007–2011	Average Annual Growth Rate 2009–2011
	2007	2008	2009	2010	2011		
Gasoline	672	996	1,109	810	902	7.6%	–9.8%
Distillate Fuel Oil	129	53	90	168	475	38.5%	129.7%
Total	911	1,140	1,254	1,067	1,489	13.1%	9.0%

Source: USACE, Waterborne Commerce of the U.S., Part 2, 2007–2011

4.3.3 CRUDE MATERIALS

BIH's primary crude material commodities include limestone, nonmetal minerals, building stone, and sand and gravel. Limestone is often used to create cement, and all the aforementioned crude materials are typically used as building materials, such as for roads, for private, commercial, and/or public infrastructure uses. Vulcan Materials Company is an example of a terminal operator that moves limestone along BIH.

Table 4-9 provides the crude materials tonnage for the period 2007-2011. In 2011, BIH saw 606 thousand short tons of crude materials, which was a 111 percent increase over 2010. For the period of 2007-2011, limestone has on average consisted of nearly 82 percent of the crude materials volume at BIH. Limestone had an average annual growth rate of 12 percent between 2007 and 2011. Table 4-10 presents the information about the crude materials regions.

Crude materials transport can be impacted by a variety of events, such as economic downturns, which leads to less building activity, sensitivity to energy costs, and high transportation costs. Due to their weight, crude materials are costly to transport via truck and to a lesser extent rail, so benefits accrue to coastal waterway producers, such as BIH. Construction is often tied to population growth; therefore, the forecast for crude materials is primarily based on population growth projections. Through 2021, the growth rate for crude materials is 3 percent, which is considered reasonable considering the significant growth rates over the past five years in these commodities at BIH. The first 10 years of the period of analysis will be half that growth rate at 1.5 percent, followed by 1 percent for the next 10 years, which is reasonable considering the projected 1.3 percent annual growth rate for population. No growth is projected for the remainder of the period of analysis; thus, growth is only projected for the first 20 years of the period of analysis. The average annual growth rate for crude materials at BIH is 0.5 percent.

Table 4-8. EIA's AEO 2013 Reference Case (million barrels per day)

Supply and Disposition	2010	2011	2021	2026	2031	2036	2040	Average Annual Growth Rate 2011–2021	Average Annual Growth Rate 2021–2031	Average Annual Growth Rate 2031–2040	Average Annual Growth Rate 2011–2040
Gross Refined Product Imports	1.23	1.15	2.62	1.50	1.54	1.49	1.42	2.62%	0.33%	–0.90%	0.73%
Liquefied Petroleum Gases Consumption	2.27	2.30	2.35	2.97	2.90	2.83	2.75	2.35%	0.0%	–0.59%	0.62%
Liquids Consumption in Mexico and Chile	2.40	2.41	1.10	2.83	3.05	3.26	3.47	1.10%	1.38%	1.44%	1.26%

Source: Energy Information Administration, 2013.

Table 4-9. BIH Crude Materials Distribution 2007–11
(1,000s of Short Tons)

Crude Materials, Inedible Except Fuels	2007	2008	2009	2010	2011	% Change 2007–2011	% Change 2010–2011
Building Stone	24	42	37	0	43	79	N/A
Limestone	247	726	541	287	388	57	35
Sand and Gravel	0	0	0	0	47	N/A	N/A
Iron Ore and Scrap	0	0	11	0	23	N/A	N/A
non-Ferrous Ores	11	31	0	0	6	–45	N/A
non-Metal Minerals	42	57	53	0	99	136	N/A
Total	324	856	642	287	606	87	111

Source: USACE, Waterborne Commerce of the U.S., Part 2, 2007–2011

Table 4-10. Crude Materials 2009–2011 Tonnage by Region
(1,000s of Short Tons)

Region	2009	2009 % of Total	2010	2010 % of Total	2011	2011 % of Total	2009–2011 Average %
Asia[9]	53,317	8.5	2,159	0.7	0	0	3.1
Canada	0	0	0	0	6,474	1.0	0.3
Central America[10]	0	0	0	0	6,157	1.0	0.3
Mexico	540,285	85.7	288,596	88.1	433,750	69.2	81
North Africa[11]	0	0	0	0	43,561	6.9	2.3
Orient[12]	0	0	0	0	94,392	15.0	5
South America	36,718	5.8	36,718	11.2	43,028	6.9	8
Total	630,320	100	327,473	100	627,362	100	100

Source: USACE, NDC detailed unpublished data, 2009–2011

4.3.4 PRIMARY MANUFACTURED GOODS

Primary manufactured goods at BIH generally consist of iron and steel products, to include plates and sheets and other primary forms. The primary use of iron and steel products includes construction, such as buildings and highways, but can also include domestic products, such as appliances. Mexico has implemented maquiladoras for trade, in which foreign companies are allowed to operate in Mexico and in return are given special customs treatment. There is a major maquila program that operates in Matamoros, Mexico, directly across the border from Brownsville. Manufacturing in Mexico has increased in recent years, which is evidenced by several manufacturing plants that have been built in the past 10 years. Primary manufactured

[9] Asia encompasses China, Taiwan, Malaysia, and Singapore.
[10] Central America encompasses Bahamas, Panama, Colombia, and Venezuela.
[11] North Africa encompasses Portugal, Morocco, and Spain.
[12] Orient encompasses Australia, Russia, Japan, and South Korea.

goods can be sent to Mexico via rail for a variety of items to be produced, such as appliances and nails.

Table 4-11 provides the primary manufactured goods tonnage over the past five years. While there has been a decline in total tonnage during the period 2007–2011, the change from 2010–2011 included an 18 percent increase. Primary Iron and Steel Products fell annually from 2007 to 2010, but Primary Non-Ferrous Metal Products has grown substantially. Table 4-12 presents the primary manufactured goods by region.

Table 4-11. BIH Primary Manufactured Goods Distribution 2007–2011 (1,000s of Short Tons)

Primary Manufactured Goods	2007	2008	2009	2010	2011	% Change 2007–2011	% Change 2010–2011
Primary Iron and Steel Products[13]	1,538	1,221	1,062	729	749	–51	3
Primary Non-Ferrous Metal Products[14]	69	461	98	334	508	636	52
Total	1,607	1,682	1,160	1,063	1,257	–22	18

Source: USACE, Waterborne Commerce of the U.S., Part 2, 2007–2011

Table 4-12. Primary Manufactured Goods 2009–2011 Tonnage by Region (1,000's of Short Tons)

Region	2009	2009 % of Total	2010	2010 % of Total	2011	2011 % of Total	2009–2011 Average %
Asia[15]	24,415	2.1	0	0	0	0	0.7
Canada	11,773	1.0	0	0	8,377	0.7	0.6
Central America[16]	87,991	7.6	0	0	0	0	2.5
East Europe[17]	30,991	2.7	16,768	1.6	0	0	1.4
Mexico	5,594	0.5	0	0	26,488	2.0	0.8
North Europe[18]	190,217	16.4	8,649	0.8	5,258	0.4	5.7
Orient[19]	349,316	30.2	567,331	55	933,082	72.8	52.7
South Africa	12,418	1.0	33,203	3.2	0	0	1.4
South America	445,547	38.5	406,343	39.4	308,255	24.1	34
Total	1,158,262	100%	1,032,294	100	1,281,460	100	100

Source: USACE, NDC detailed unpublished data, 2009–2011

[13] Primary Iron and Steel (I&S) Products consist of pig iron, ferro alloys, iron and steel primary forms, I%S plates and sheets, I&S bars and shapes, I&S pipe and tube, primary I&S nec.

[14] Primary Non-Ferrous Metal Products consist of copper, aluminum, smelted prod. Nec, and fabricated metal products.

[15] Asia encompasses China, Taiwan, Malaysia, and Singapore.

[16] Central America encompasses Bahamas, Panama, Colombia, and Venezuela.

[17] East Europe encompasses Italy, Sweden, Lithuania, Latvia, Finland, and Russia.

[18] North Europe encompasses Netherlands, Belgium, Norway, and United Kingdom.

[19] Orient encompasses Australia, Russia, Japan, and South Korea.

The number of vessels that are transporting primary manufactured goods with deeper design drafts has been increasing, as presented in Table 4-13. For the period of 2009-2011, a comparison of vessel's design drafts versus sailing drafts is presented for a representative dock at BIH. Vessels with design drafts at or close to the channel depth but not utilizing the entire design draft are those of the historical fleet mix set to benefit from navigation deepening improvements. The 28 vessels importing from 2009 to 2011 account for the majority of the primary manufactured goods being transferred across docks at BIH. Table 4-13 also presents the port-pair data for the vessel trips with the drafts at the foreign ports.

Table 4-13. 2009-2011 Trip Comparison of Vessel Design Draft and Sailing Draft for Primary Manufactured Goods

Vessel Design Draft (Feet)	36		37	38				39		41	42	Grand Total
Sailing Draft (Feet)	31	36	33-37	33	35	36	37	33	35	34-38	39	
All Other Argentina Ports	0	0	0	0	0	0	0	1	0	0	0	1
All Other Ukraine Ports	0	0	0	0	1	0	0	0	1	2	1	5
Mariupol, Ukraine (43ft)	0	0	0	0	0	0	1	0	1	0	0	2
North Tees, UK (46ft)	0	0	1	0	2	0	0	0	0	0	0	3
Odessa, Ukraine (44.5ft)	0	0	1	0	0	0	0	0	0	1	0	2
Novorossiysk, Russia (75ft)	0	0	0	0	0	0	1	0	1	0	0	2
Rio de Janeiro, Brazil (45ft)	0	0	0	0	0	0	0	1	0	0	0	1
San Nicolas, Argentina (59 ft)	0	0	0	0	0	0	0	1	0	1	0	3
Sao Paulo, Brazil (50ft)	1	1	0	1	0	0	0	1	0	0	0	4
Tuapse, Russia (47.5 ft)	0	0	0	0	0	1	0	0	0	0	0	1
Vostochnyy, Russia (54ft)	0	1	1	0	1	0	0	0	0	1	0	4
Grand Total	1	2	3	1	4	1	2	4	3	5	1	28

Similar to crude materials, the stability of primary manufactured goods imports and exports are often dependent on the health of the economy and the amount of construction occurring. Construction is often tied to population growth; therefore, the forecast for primary manufactured goods is primarily based on population growth projections. Through 2021, the growth rate for primary manufactured goods is 3 percent, which is reasonable considering the fluctuations in this commodity during 2007–2011 at BIH. The first 10 years of the period of analysis will be half that growth rate at 1.5 percent, followed by 1 percent for the next 10 years, which is reasonable considering the projected 1.3 percent annual growth rate for population. No growth is projected for the remainder of the period of analysis; thus, growth is only projected for the first 20 years of the period of analysis. The average annual growth rate for primary manufactured goods at BIH is 0.5 percent.

4.4 FORECASTED TONNAGE

The following Table 4-14 provides the forecasted tonnages for the major commodities at BIH throughout the period of analysis using the aforementioned growth rates.

For clarification through the remainder of the report, Crude Materials may be referred to as Dry Bulk & Break-Bulk, while Primary Manufactured Goods may be referred to as Iron Ore/I&S Products, as these were the groups used for the economic model.

Table 4-14. BIH Forecasted Tonnage in Short Tons

Commodity Name	2021	2031	2041	2051	2061	2071	Average Annual Growth Rate
Crude Materials	843,533	978,955	1,081,375	1,081,375	1,081,375	1,081,375	0.5%
Primary Manufactured Goods	1,387,315	1,610,036	1,778,482	1,778,482	1,778,482	1,778,482	0.5%
Petroleum Products[20]	3,036,645	3,524,151	3,704,376	3,704,376	3,704,376	3,704,376	0.4%
Total	5,267,494	6,113,142	6,564,233	6,564,233	6,564,233	6,564,233	0.44%

[20] Petroleum Products tonnage includes deep-draft domestic barges.

5.0 FLEET COMPOSITION AND FORECAST

Development of the existing, and future without-project fleet and associated transportation costs was based on analysis of BIH's existing fleet composition. The purpose of this section is to analyze the present and likely future operations, composition, and characteristics of the vessels that constitute the fleet currently calling at BIH. Also, an examination of the commodities and their associated tonnages per vessel type will be explored. The data sources used in the analysis of the fleet include the WCSC, Lloyds Registry of Ships, the Pilots, and the Port. The composition of the BIH fleet was determined by compiling all vessels that called on BIH during 2009–2011 and using an average of the vessel calls.

5.1 COMPOSITION AND CHARACTERISTICS

The BIH fleet consists primarily of liquid barges, dry open barges, tank ships, bulk carriers, general cargo, oil drilling rigs, and shipbreaking scrap vessels. Domestic cargo is generally carried on non-self-propelled vessels that require towboat assistance to move freight. The most common type of liquid barge that traverses the GIWW to BIH is assumed to be a double-hull tank barge that is 297.5 feet x 54 feet x 12 feet in dimensions. These liquid barges carry petroleum products and chemicals. Domestic deep-draft liquid barges also traverse the channel with design drafts up to 32 feet. The most common dry open barge that traverses the GIWW to BIH is assumed to be an open-hopper barge that is 195 feet x 35 feet x 12 feet in dimensions. Dry open barges can carry a variety of cargo, such as dry bulk and iron and steel products commodities. As explained in previous sections, the domestic cargo that travels on barges is primarily coming from or to other Texas ports or Louisiana ports.

Self-propelled vessels that carry BIH's foreign cargo are primarily found on bulk carriers and tankers, although general cargo ships are also used. Bulk carriers primarily carry dry bulk and iron and steel products commodities, while the tankers carry petroleum products. Table 5-1 provides a percentage breakdown of BIH's self-propelled and non-self-propelled vessel trips between 2007 and 2011. Less than 20 percent of the vessel fleet is representative of bulk carriers and tankers; rather, the majority of the fleet is composed of shallow-draft vessels.

Table 5-1. 2007–2011 BIH Vessel Trip Percentages

Vessel Type	2007	2008	2009	2010	2011	Average
Non-Self-Propelled Dry Cargo	19	24	12	22	23	20
Non-Self-Propelled Tanker	20	21	30	25	21	23
Towboat	34	38	40	40	43	39
Self Propelled Dry Cargo	23	12	10	7	8	12
Self Propelled Tanker	4	5	8	6	5	6

Source: USACE, Waterborne Commerce of the U.S., Part 2, 2007–2011

5.2 EXISTING OPERATING CONSTRAINTS

BIH's existing deep-draft traffic is subject to vessel size limitations due to the current channel dimensions. The maximum ship dimensions permitted by the Pilots are presented in Table 5-2. The Pilots only allow daylight movement for oil drilling rigs and vessels being brought into the shipbreakers to be scrapped.

Table 5-2. BIH Pilots' Vessel Operating Constraints

Vessel Dimensions	Feet	Meters
Maximum Length	850	259.0
Maximum Beam	135	41.1
Maximum Draft	39	11.88

Source: Brazos Santiago Pilots Association Navigation Guidelines

The size range of the existing self-propelled vessels includes barges to the largest Panamax-size ships. Panamax ships refer to vessels that can transit the Panama Canal, whose lock dimensions are 1,000 feet long and 110 feet wide. For safety purposes, the Panama Canal Authority restricts the size of the ships to a beam of 106 feet and an overall length of 950 feet. The largest bulk carriers that have transited BIH have had a beam up to 106 feet and a length of 797 feet. On three occasions since 2006, BIH has received tankers with beams of 140 feet and a length of 793 feet, but those vessels were not drafting near their design draft, as they were light-loaded, and received special permission by the Pilots. The current typical maximum-sized tanker that transits BIH has a beam of 106 feet and a length of 600 feet.

5.3 VESSEL UTILIZATION

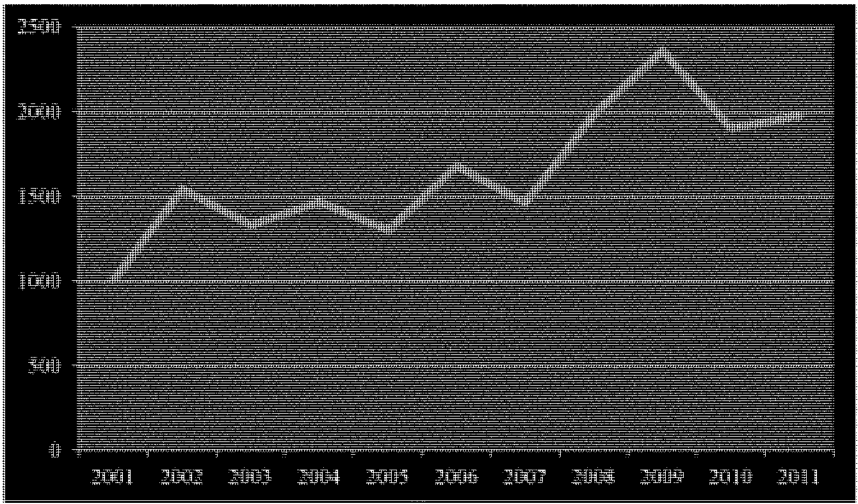
Table 5-3 presents the 2007–2011 sailing draft distribution by vessel trips. Between 98 and 99 percent of all trips drafted less than 35 feet of water. There was an overall decrease of 0.8 percent annually of total trips between 2007 and 2011. However, total trips for drafts of 35 feet or greater grew at an average annual rate of 17.9 percent.

Table 5-3. BIH Total Trips by Sailing Draft (number of trips)

Draft (feet)	2007	2008	2009	2010	2011	Average
39	0	0	4	0	2	1.2
38	6	5	6	2	3	4.4
37	6	14	10	11	8	9.8
36	6	34	24	18	18	20
35	12	15	9	15	27	15.6
0–34	3,053	2,788	1,934	2,379	2,930	2,616.8
Total	3,083	2,856	1,987	2,425	2,988	2,667.8

Source: USACE, Waterborne Commerce of the U.S., Part 2, 2007–2011

As shown on Figure 5-1, the average tonnage per trip has increased over the past decade, which is consistent with fewer trips and greater volumes of tonnage. While the increases in the volume of tonnage per trip are primarily associated with petroleum products and dry bulk, larger vessels are also being used for Iron Ore/I&S products. It is anticipated that over the period of analysis, which in part will be due to the Panama Canal Expansion, there will be an increase in deeper-drafting vessels. If a deeper channel is available at BIH, vessels could be loaded to deeper drafts to maintain the patterns of the world vessel fleet. Also, the ability to deploy larger vessels or load existing fleet more fully will reduce per ton transportation costs for vessels using BIH, as the percentage increase tonnage per ship will be greater than the percentage increase in cost.



Source: USACE, Waterborne Commerce of the U.S., Part 2, 2001–2011

Figure 5-1: BIH Short Tons per Vessel Movement 2001–2011

5.4 UNDERKEEL CLEARANCE

Underkeel clearance is defined as the minimum clearance available between the deepest point on the vessel and the channel bottom, in still water. The Pilots require a 3-foot underkeel clearance for all deep-draft vessels; hence, the 39-foot draft restriction on all vessels at BIH. However, as larger bulk carriers and tankers enter the channel, the largest vessels may require a 4-foot underkeel clearance, which is consistent with the 10 percent standard often used for deep-draft navigation. In addition, there is a 1-foot underkeel clearance for all shallow-draft vessels. There is a 4-foot underkeel clearance for oil drilling rigs to transit the channel.

5.5 BULK CARRIERS

BIH's fleet of bulk carriers consists of foreign flag vessels with a variety of sizes. The following Table 5-4 provides the characteristics in which bulk carriers were classified for the analysis.

Table 5-4. BIH Bulk Carrier Fleet Classification Characteristics

Bulker Size	Capacity Range (DWT)	Design Draft Range (feet)	Beam Range (feet)	LOA Range (feet)
Very Small	3,000–20,000	25–30	60–75	400–480
Small	20,001–30,000	31–35	76–90	481–550
Medium Small	30,001–40,000	36—37	91–95	551–590
Medium Large	40,001—50,000	38–40	96–103	591–620
Large	50,001–60,000	41–43	104–106	621–700
Very Large	60,001–105,000	44–50	107–140	701–800

On average, 90 percent of the cargo tonnage transported by bulk carriers along BIH was on Medium Large or larger bulk carriers. Table 5-5 presents the average percentage of tonnage for dry bulk/break bulk products on bulkers by vessel Deadweight Tonnage (DWT). The average for 2007–2011 is more than 45 percent of dry bulk volume carried on very large bulkers. As shown in Figure 5-2, over the past decade, dry bulk tonnage has shifted from being carried solely on Very Small bulkers to predominantly Medium Large, Large, and Very Large bulkers.

Table 5-5. BIH Dry Bulk/Break Bulk Percentage of Tonnage by Vessel DWT

DWT Range	2007	2008	2009	2010	2011	Average
0–19,999	0	0	0	0.6	0	0.1
20,000–29,999	0	0.4	0	0	4.5	1.0
30,000–39,999	10.5	0	5.8	0	0	3.3
40,000–49,999	25.9	26.8	21.5	0	53	25.4
50,000–59,999	13.9	48.3	33.1	13.4	15.8	24.9
60,000+	49.7	24.5	39.6	86	26.7	45.3
Total	100	100	100	100	100	100

Source: USACE, NDC detailed unpublished data, 2007–2011

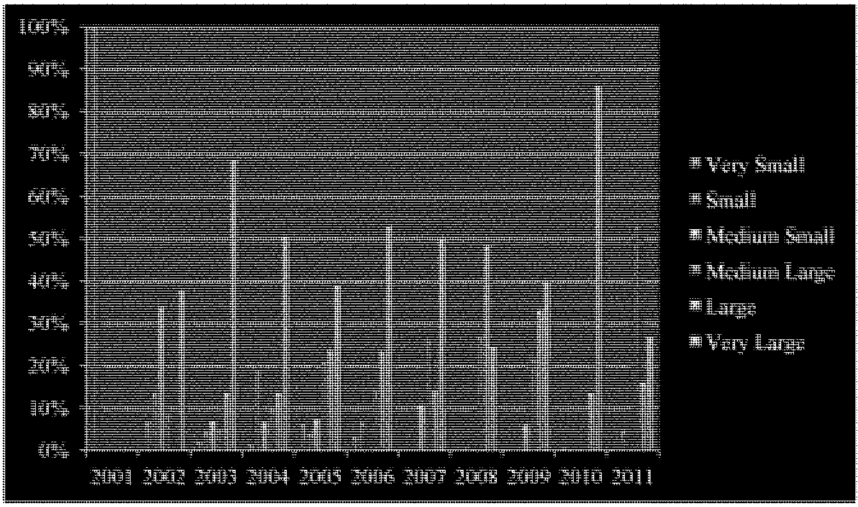


Figure 5-2: Percentage of Dry Bulk Tonnage on Bulkers

Table 5-6 presents the dry bulk tonnage carried on bulkers with design drafts of 39 feet or greater. Approximately 76 percent of the dry bulk tonnage for 2009–2011 was carried on bulkers with design drafts of 39 feet or greater.

Table 5-6. 2009–2011 Dry Bulk/Break Bulk Percentage of Tonnage on Bulkers with Design Drafts of 39 Feet or More

39	40	41	43	44	46
18.3%	2.8%	9.9%	13.5%	23.6%	7.5%

Source: USACE, NDC detailed unpublished data, 2009–2011

Table 5-7 presents the average percentage of tonnage for Iron Ore/I&S products on bulkers by vessel DWT. Nearly half of the iron ore volume is carried on Medium Large bulkers and another third is carried on Large bulkers. As shown on Figure 5-3, over the past decade, iron ore tonnage has shifted from being carried solely on Very Small bulkers to predominantly Medium Large and Large bulkers.

Table 5-8 presents the iron ore tonnage carried on bulkers with design drafts of 39 feet or greater. Approximately 50 percent of the dry bulk tonnage for 2009–2011 was carried on bulkers with design drafts of 39 feet or greater.

Table 5-7. BIH Iron Ore/I&S Products Percentage of Tonnage by Vessel DWT

DWT Range	2007	2008	2009	2010	2011	Average
0–19,999	4.2	4.8	4.3	2.7	1.6	3.5
20,000–29,999	9.6	10.8	3.8	0.8	0.3	5.1
30,000–39,999	23.5	8.0	0.8	1.3	3.5	7.4
40,000–49,999	46.1	47.3	64.6	46.0	37.2	48.2
50,000–59,999	16.6	25.8	26.5	49.2	57.4	35.1
60,000+	0	3.3	0	0	0	0.7
Total	100	100	100	100	100	100

Source: USACE, NDC detailed unpublished data, 2007–2011

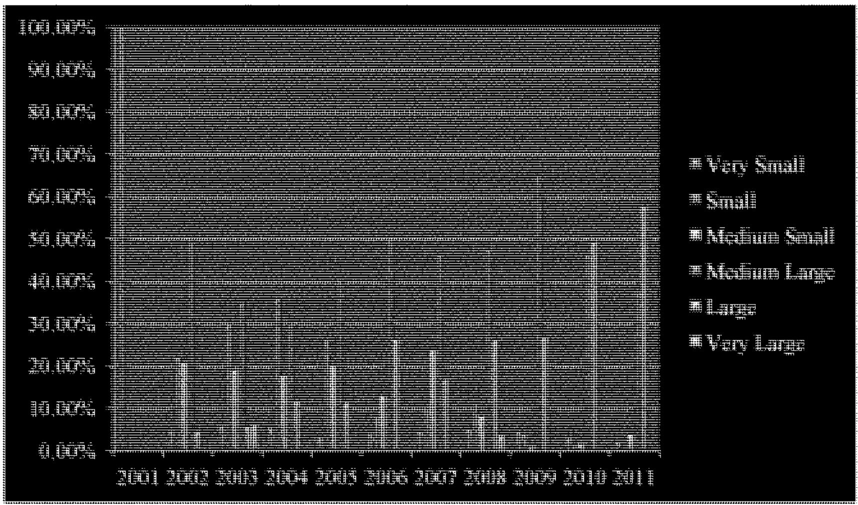


Figure 5-3: Percentage of Iron Ore/I&S Products Tonnage on Bulkers

Table 5-8. 2009–2011 Iron Ore/I&S Products Percentage of Tonnage on Bulkers with Design Drafts of 39 Feet or More

39	40	41	42
19.8	3.6	17.6	8.5

For both crude materials and primary manufactured goods, the fleet composition for 2007–2011 has shown a trend towards vessels with larger DWT ranges. Medium Large and larger bulk carriers have a deeper design draft and a greater average shipment size.

Table 5-9 presents the average world bulker fleet as of 2010. As shown, the Large and Very Large bulkers have been built most recently and with greater design drafts. It is assumed that the world fleet will continue this trend, especially as vessels are replaced.

Table 5-9. Bulker World Fleet Characteristics

Size	Number of Vessels	Average Design Draft (Feet)	Average Year Built
Very Small	2,142	22	1985
Small	1,920	32	1986
Medium Small	2,043	32	1996
Medium Large	963	37	1991
Large	1,954	36	2005
Very Large	2,729	41	2000

Source: Lloyd's Register – Fairplay, Register of Ships, 2010

5.6 TANKERS

BIH's fleet of tankers consists of foreign flag vessels with a variety of sizes. The following Table 5-10 provides the characteristics in which tankers were classified for the analysis.

Table 5-10. BIH Tanker Fleet Classification Characteristics

Size	Capacity Range (DWT)	Draft Range (feet)	Beam Range (feet)	LOA Range (feet)
Very Small	3,000–20,000	19–32	40–85	275–475
Small	20,001–30,000	32–35	86–90	476–615
Medium Small	30,001–40,000	36–37	91–105	616–660
Medium Large	40,001–50,000	38–41	106–110	661–670
Large	50,001–60,000	42–43	111–115	671–730
Very Large	60,001–110,000	44–50	116–140	731–800

Table 5-11 presents the average percentage of tonnage for petroleum products on tankers by vessel DWT. More than 90 percent of the petroleum volume is carried on Medium Large tankers or larger. As shown in Figure 5-4, over the past decade, petroleum products tonnage has shifted to primarily Medium Large and Large tankers.

Table 5-12 presents the petroleum products tonnage carried on tankers with design drafts of 39 feet or greater. Nearly 90 percent of the petroleum products tonnage for 2009–2011 was carried on tankers with design drafts of 39 feet or greater.

Table 5-11. BIH Petroleum Products Percentage of Tonnage by Vessel DWT

DWT Range	2007	2008	2009	2010	2011	Average
0–19,999	3.0	7.1	4.0	5.2	2.8	4.4
20,000–29,999	3.2	1.6	0.6	2.2	0.6	1.6
30,000–39,999	0	7.4	1.2	1.6	3.2	2.7
40,000–49,999	80.0	74.4	59.2	59.8	49.8	64.6
50,000–59,999	4.5	9.5	31.8	29.5	43.6	23.8
60,000+	9.3	0	3.2	1.7	0	2.8
Total	100	100	100	100	100	100

Source: USACE, NDC detailed unpublished data, 2007–2011

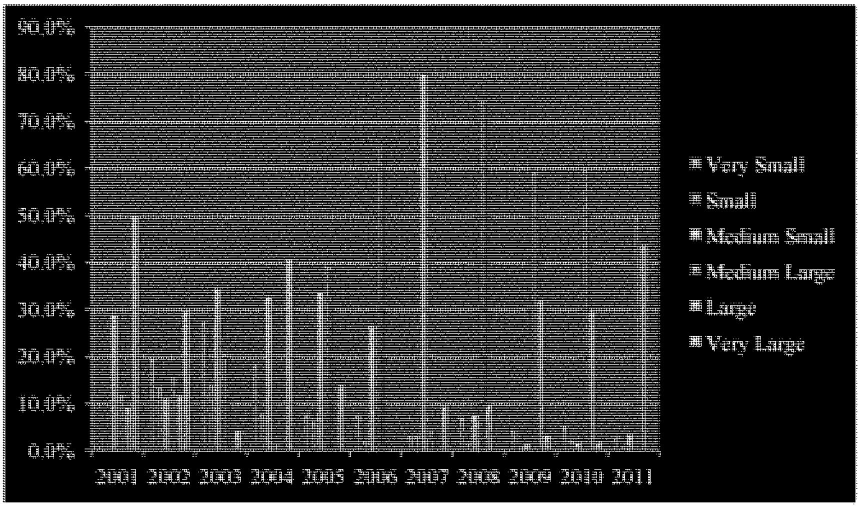


Figure 5-4: Percentage of Petroleum Products Tonnage on Tankers

Table 5-12. 2009–2011 Petroleum Products Percentage of Tonnage on Tankers with Design Drafts of 39 Feet or More

39	40	41	42	43	44	46	48
11.4	34.8	4.2	7.0	28.1	1.4	0.5	1.2

Source: USACE, NDC detailed unpublished data, 2009–2011

The fleet composition for 2007–2011 for petroleum products has shown a trend towards vessels with larger DWT ranges. Medium Large and larger tankers have a deeper design draft and a greater average shipment size.

Petroleum products that are carried on tankers have different densities, which affect the sailing drafts of vessels. While the vessel may be filled to capacity, the sailing draft will not be as deep. This is because certain petroleum products, such as gasoline, are not as dense, and therefore, not as heavy as other petroleum products, such as crude oil or distillate fuel oil. Gasoline is on average 90 percent of the petroleum products tonnage at BIH, while distillate fuel oil is approximately 10 percent of the volume. A representative Very Large tanker that visits BIH with a design draft of 48 feet would have a sailing draft of 43 feet if it was solely carrying gasoline, and 47 feet if it was solely carrying distillate fuel oil. A combination of gasoline and distillate fuel oil based on the historical tonnage composite at BIH would lead to a sailing draft of 44 feet.

The following Table 5-13 presents the average world tanker fleet as of 2010. As shown, the Medium Large and Large tankers have been built most recently and with greater design drafts. It is assumed that the world fleet will continue this trend, especially as vessels are replaced.

Table 5-13. Tanker World Fleet Characteristics

Size	Number of Vessels	Average Design Draft (feet)	Average Year Built
Very Small	10,760	22	1995
Small	737	32	1989
Medium Small	1,011	36	1994
Medium Large	1,344	37	2002
Large	592	41	2003
Very Large	1,401	42	1994

Source: Lloyd's Register – Fairplay, Register of Ships, 2010

5.7 OIL DRILLING RIGS

The following Table 5-14 provides the characteristics in which rigs were classified for the analysis.

Table 5-14. BIH Oil Drilling Rigs Classification Characteristics

Size	Capacity Range (DWT)	Draft Range (feet)	Beam Range (feet)	LOA Range (feet)
Jack Up	10,000–13,000	0–25	100–250	140–160
Semi-Submersible-Small	13,001–19,000	26–40	150–250	161–250
Semi-Submersible-Large	19,001–27,000	41–65	251–500	251–500

Keppel AmFELS (Amfels) is a large offshore rig facility at the Port that assembles and repairs oil drilling rigs and offshore platforms and also performs American Bureau of Shipping (ABS) inspections. The oil drilling rig fleet at BIH currently consists of jack-up and semi-submersible platform rigs.

Jack-up rigs are self-elevating with several movable legs that can be extended above or below the hull, and the legs are jacked downward through the water and into the sea floor. Jack-up rigs are typically for shallower water and are not self-propelled, but have been the most popular and numerous mobile platforms. These types of rigs generally are the smallest mobile platforms in terms of beam and length. Figure 5-5 is an example of a jack-up rig.

Semi-submersible rigs can float on top of the water, to allow transportation to various locations, and then are partially submerged during drilling operations, which can take place in deep ocean water. Semi-submersible rigs have become popular because the combination of the submerged portion of the rig and anchors ensure stability for use in turbulent offshore waters. The vast majorities of new drilling rigs are built or are being built to meet so called ultra deepwater specifications, generally described as the ability to drill in at least 12,000 feet of water and to a total vertical drilling depth of at least 30,000 feet. These types of rigs are grouped into generations based upon their era of construction, with a trend for increasing depth and capacities, such as dynamic positioning, over time. The newest semi-submersible rigs are classified as sixth and seventh generation and were either constructed or upgraded after 2004 and 2012, respectively. Dynamic positioning is used to keep a rig in place while drilling by using different motors or propulsion units on the vessel to counteract against the motions of the water. One such dynamic positioning unit is an azimuth thruster, which is retractable and removable. Tugs or heavy-lift vessels are used to transport a semi-submersible rig to its drilling location. Figure 5-6 is an example of a semi-submersible rig.

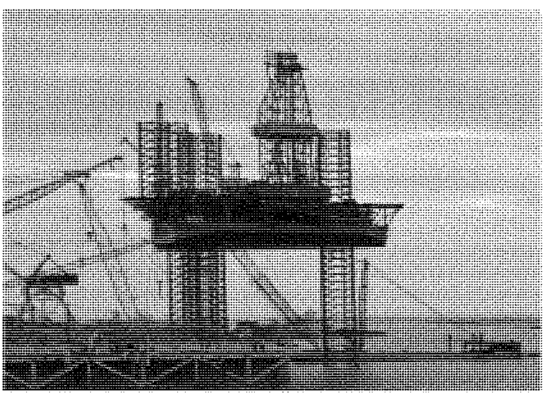


Figure 5-5: Jack-Up Rig Example

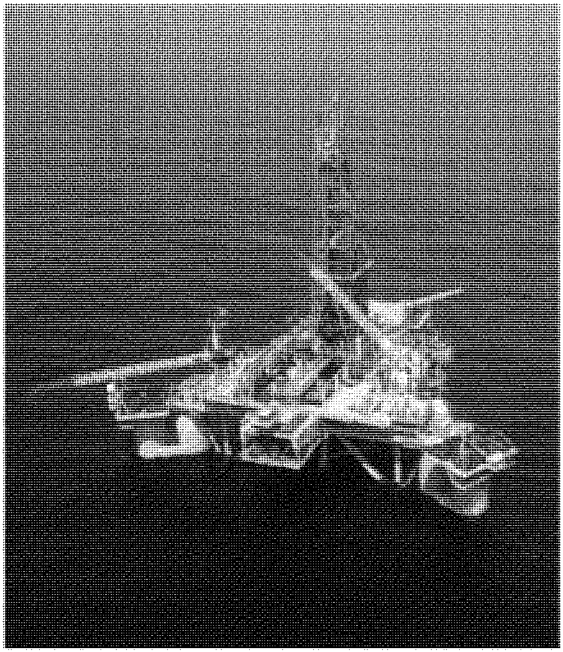


Figure 5-6: Semi-Submersible Rig Example

Since 1990, Amfels has built, inspected, modified, or upgraded 81 jack-up rigs and 26 semi-submersible rigs. The following Table 5-15 presents the average age of offshore structures in the Gulf of Mexico and the rest of the world. Rigs generally have a life span of 30-35 years, but this can be extended with upgrades to the rig for an additional 25–30 years.

The number of rigs operating in the Gulf of Mexico is very dependent on the oil industry and regulations for the industry. For example, when the moratorium was placed on deepwater offshore drilling on the Outer Continental Shelf in 2010, several rigs relocated to the African coast. Since the moratorium was lifted, those rigs have returned to the Gulf of Mexico and the Bureau of Ocean Energy Management continues to offer leases for deepwater offshore exploration and drilling. The ABS regulations require a rig to be inspected every five years, which can be completed in the water, but every 10 years, a full inspection is required on a dry dock. Also, rig owners often choose to return a rig to dry dock within a year or two of construction for inspection to review for the warranty. In the mid-1990s, Amfels purchased a former U.S. Navy dry dock that was operated in Europe to service nuclear submarines and was decommissioned after the Cold War. Amfels purchased the dry dock for $1 million, which represents considerable savings compared to a new dry dock that would have cost $50 million. The dry dock is one of the largest in the industry, which offers a competitive advantage to

Table 5-15. Offshore Drilling Structures Age

	Drill Ship		Jack-Up		Semi-Submersible		Submersible		Total	
	Rest of the World	**Gulf of Mexico**	**Rest of the World**	**Gulf of Mexico**	**Rest of the World**	**Gulf of Mexico**	**Rest of the World**	**Gulf of Mexico**	**Rest of the World**	**Gulf of Mexico**
Average Age	25.7	6.2	21.8	28.9	23.5	19.7		28.3	23	25.4
Decade Offshore Structure was Built										
<1970	56	N/A	45	2	12	1	N/A	N/A	113	3
1970–1979	36	N/A	112	42	106	11	N/A	N/A	254	53
1980–1989	46	N/A	239	54	105	7	N/A	6	390	67
1990–1999	29	3	31	1	15	1	N/A	N/A	75	5
2000–2009	15	5	111	4	42	10	N/A	N/A	168	19
>2009	55	3	96	6	48	5	N/A	N/A	199	14
Unknown	35	N/A	85	N/A	9	N/A	N/A	N/A	129	
Total	272	11	719	109	337	35	N/A	6	1,328	161

Amfels. Pascagoula, Mississippi, is the only other U.S. port that has a dry dock where jack-ups and semi-submersible rigs can be constructed, modified, or inspected. However, Pascagoula has a shallower depth than BIH. If a rig needs to be placed on a dry dock that cannot fit into the Brownsville or Pascagoula channels, the rig would have to travel to another country, such as Brazil, Norway, or Singapore.

As drilling rigs are built larger, the ability for semi-submersibles to transit the BSC becomes limited due to the current dimensions of the channel. A semi-submersible's breadth is mostly above water, not near the seabed and the depth is only significant due to the rig's thrusters, as the thrusters can add an additional 15 to 20 feet in depth to the hull of a semi-submersible rig. Therefore, the limitations of a rig traveling to BIH are mostly due to the thrusters, which can be used to move the rig into and through the channel. Thrusters can be removed from the rig before entering the channel to remove the depth restrictions, but this has yet to be done at BIH for a variety of reasons.

Removing thrusters before entering the channel can be cost prohibitive because of the additional expense this adds to the vessel transportation to the channel. Among the elements included in the thruster removal costs are tractor tugs (to be transported from Corpus Christi Ship Channel), divers to remove the thrusters, a crane barge, crew, and miscellaneous support. On average it takes one day to remove or reattach one thruster and a semi-submersible rig typically has four to eight thrusters that need to be removed to enter the channel and then reattached after the work on the rig in the channel has been completed. The total cost to remove and then reattach the thrusters offshore can be upwards of $15 million. In addition, as shown in Table 5-15, over 100 semi-submersible rigs have been built since 2000, and so not all have required their decadal ABS dry dock inspection. Also, the rigs have not yet required significant retrofitting due to their age.

However, while thrusters have not, to date, been removed offshore for a rig to enter the BSC, it is reasonable to assume that in the future, the without project condition will experience rigs entering the channel with their thrusters removed for a variety of reasons. No matter where in the world a rig travels to, including BIH for modifications or inspections, if it will be dry docked, the thrusters will need to be removed. Thrusters protrude significantly and because of their height, scaffolding would likely have to be 20 feet high for work to be completed, which increases the difficulty and adds additional risk. Thus, thrusters will always be removed; it is just a matter of whether or not it will be done at the dock or in the case of BIH, outside the channel in the without-project condition. The with-project condition assumes thrusters will also be removed at BIH, but that would be done dockside in that condition.

As mentioned above, the newest semi-submersible rigs have not reached the age in which they have required their decadal ABS inspection or modifications. As the fleet ages, though, drilling rig owners would rather have a rig operating in the Gulf of Mexico visit a local port for repair or inspection in order to reduce the transit time and cost. BIH will be competitive because Rolls-Royce, a major thruster manufacturer, is located in Houston so the thrusters can be removed for service within 300 miles of where the rig is being serviced. Even with the cost to remove and reattach the thrusters at sea before entering BIH, it is more time effective than moving the rig to a foreign country. With the assumption that it will take a week to remove the thrusters and another week to reattach the thrusters for a rig to visit BIH, this is only two weeks of downtime, but the downtime would be longer if a rig has to move to a foreign country for service. A semi-submersible rig can only move five knots an hour under its own power, and if a rig were to move from the Gulf of Mexico to Brazil, it would take the rig over 40 days to relocate. Typically, a rig would be moved under tow, which would still take over 20 days to reach Brazil. A rig owner could also choose to move the rig via heavy-lift vessel, which would take 20 days to reach West Africa or 40 days to reach Singapore. Either way, a rig will experience at least an additional week of downtime to travel overseas. In addition, an offshore oil drilling rig can produce 200,000 barrels of oil daily, which may lead the rig owner to earn $500,000 a day. Therefore, the cost to remove the thrusters to visit BIH will in the future be as cost effective as moving the rig overseas because it will reduce downtime and avoid additional risk of damage from moving the rig over large distances, which significantly increases the insurance rates on the rig.

Taking into consideration the competition to keep rigs near the Gulf of Mexico, the time and cost savings to remove the thrusters at BIH, and the upcoming need for inspections and modifications, it is reasonable to assume that thrusters will be removed at BIH in the near future, even without the channel modifications. Amfels has taken measures to be ready for such activities by securing a regulatory permit from USACE for a square mile of land six miles from the channel jetties where the thrusters will be able to be removed. Amfels has incurred the cost for this permit as commitment to remove thrusters in the without project condition in attempt to remain competitive in the oil drilling rig fabrication market while oil production occurs in the Gulf of Mexico because if the channel dimensions are increased, it will eliminate the need to remove thrusters from a rig before entering the channel.

The number of rigs that can be docked at the Amfels facilities at one time is dependent on a variety of factors, to include yard capacity, Gulf of Mexico drilling demand, and the type of work that is required. For example, an inspection will generally only take 60 days, while repairs can take 6 months or longer. As the rigs do not fall within the traditional transportation cost savings category because they are in Port for months on end, the only costs allocated to the rigs in the analysis are related to the thruster removal, which only applies in the without-project condition since they do not need to be removed offshore with the recommended plan. To account for all of these conditions, the analysis assumed a conservative number of rigs in the with- and without-project conditions during the period of analysis, with just a different mix of the types of rigs that would visit the Port.

5.8 DESIGN VESSELS

A design vessel for a particular vessel type represents among the largest vessels that are expected to call over the study period of analysis on a recurring basis. The identification of the design vessel(s) is important so that decision makers can be reasonably confident that the project costs will result in a channel design that will accommodate cost-effective vessel traffic for the future at BIH.

In May and September of 2010, the Engineering Research and Development Center (ERDC) performed ship simulations for BIH for depths of 42, 45, and 48 feet and various widths, with an assumed three feet of underkeel clearance. This simulation included a 2-foot allowance so it could also be applied to the 50-foot depth. ERDC modeled two vessels, a tanker with dimensions of 846 feet x 157 feet x 47 feet and a Very Large Crude Carrier (VLCC) with dimensions of 1,087 feet x 195 feet x 24 feet. The tanker was selected because it was one of the vessels ERDC had in their database that was larger than any vessels currently coming into the channel. The VLCC was selected because it was a part of ERDC's database and represented the largest vessel that would come in to be scrapped. Originally, a bulker vessel was to be modeled for future conditions, but the one selected could already safely travel in the existing channel dimensions. However, since the ship simulation was completed, it was determined that the tanker modeled will not be part of the vessel fleet that will visit BIH in the future.

In addition, the BIH shipbreaker industry recently conducted a separate ship simulation study with ERDC to model transits of aircraft carriers, which is now the largest vessel the shipbreaker facilities expect to service. This simulation study indicated these aircraft carriers can come in under the current channel dimensions. Based on these results, the modeled VLCC should also be able to use the existing channel with no restrictions. The updated fleet forecast and shipbreaker modeling outcome have negated the results of the 2010 ship simulation so that the ship simulation's recommendations should no longer be used as the basis to increase the size of the channel.

In May 2010, a geometric analysis was performed by DOF Subsea to show a real time oil rig movement simulation for two rigs. The design rig for the modeling was based on the widest beam and deepest draft expected to be accommodated in future transit of the Port of Brownsville navigation channel. The analysis was performed with the rig's thrusters in place. These thrusters require additional channel depth beneath the oil rig. Significant savings could occur if these thrusters did not have to be removed offshore because the offshore removal process requires additional time and specialized diver expertise. The geometric analysis included channel widths of 300 and 350 feet. The geometric analysis results supported the need for the 50-foot channel depth and 350-foot width.

For the rigs, 43 percent of the original list of rigs used in the rig geometric analysis needed a maximum width of 300 feet; 11 percent more, or 54 percent of total, require 325 feet; and 74 percent of all the rigs could get in with a width of 350 feet. However, the recent report developed for the Section 6009 benefits forecasts more drillships working in the Gulf of Mexico rather than semi-submersibles in the future. These drillships need more depth to traverse the channel and would not need additional widening. This has negated the need to widen the channel to the 350-foot width as was shown in the geometric rig movement analysis.

The design vessel for the proposed deepening is the oil rig with a draft of 48 feet and 4 feet of underkeel clearance. This is a large semi-submersible rig that will enter the channel with its thrusters still attached. An additional design vessel is a tanker that has a design draft of 47.5 feet and a beam of 106 feet. This vessel assumes a 4 feet underkeel clearance.

5.9 FUTURE FLEET COMPOSITION

Projections of BIH's future fleet composition are based on the integration of an average of 2009–2011 vessel and commodity movements with commodity growth projections as presented in Section 6. Vessel and commodity movements were initially developed using commodity movement data acquired from WCSC, and compared to the Pilots logs. Each movement consists of an individual vessel calling the Port to transport a certain type and tonnage of commodity to or from a terminal within the harbor. The commodity movements for 2010 became the basis for future fleet growth to the base year of 2021, and throughout the period of analysis. The fleet grew based on the following methodology:

1. Each 2010 commodity movement was broken down to its essential components as follows: date of call, vessel type, calling port, dock visited, commodity type, and tonnage transported.

2. The commodity movement's proportion of the annual tonnage for the commodity type being transported on the individual vessel fleet size categories was calculated. Based on this proportion, future forecasted tonnages were disaggregated to individual commodity movements. Thus, forecasted tonnages for 2021 were developed based on 2010 commodity movement proportions. Commodity forecast tonnages for each additional 10 years were disaggregated based on 2021 commodity movement proportions, thereby increasing the tonnage transported per vessel.
3. Generally, each future individual commodity movement transports more cargo than the preceding forecasted year throughout the period of analysis (or less in some cases where negative growth rates occur). An additional vessel call is added in the event of the following:
   a. When cargo tonnage carried by the vessel exceeds the vessel's capacity.
   b. Tonnage added to the vessel would result in a sailing draft in excess of the channel and/or berthing depth.

Therefore, the number of vessel calls is primarily dependent on the proportion of tonnage for the individual vessel categories and sizes. The difference between the number of vessel calls in the without-project and with-project conditions is that the larger vessels are able to carry more volume and have deeper sailing drafts, thereby leading to fewer vessel calls in the with-project condition. Also, for the period of analysis for both the with- and without-project condition, it is assumed that all vessels are transiting as efficiently as possible, which leads to fewer overall vessel calls than in the current condition.

The following Tables 5-16 through 5-19 present the fleet composition for the primary benefiting commodities for the period of analysis. The future fleet is based on the information presented above in this section, such as the world fleet. Due to the lag before the period of analysis is scheduled to begin and the fact that there are a relatively small number of annual vessel trips, it was assumed that shippers would be fully aware of the new channel dimensions at BIH and could prepare by transitioning the vessel fleet to larger capacity limit vessels by 2021. Based on the bulker world fleet, in which there are newer and a greater number of Very Large bulkers, it was reasonable to transition to a larger percentage of tonnage on such vessels. The Very Large bulkers were also introduced for the Iron Ore/I&S Products for the same reason. The tonnage for petroleum products experienced a shift from Medium Large tankers to Very Large tankers because the world fleet also has a new and greater number of Very Large tankers. For each commodity, the vessel fleet transition from 2010 to 2021 remained the same for the first 20 years of the period of analysis, and then there was an additional shift in 2041, which remained the same for the remainder of the period of analysis. These assumptions for the vessel fleet will lead to transportation cost savings as tonnage is transported on larger vessels with a reduced number of total vessel trips.

Table 5-16. Dry Bulk/Break Bulk Bulker Forecasted Vessel Trips

Bulker Size	2010 % of Total Tonnage	2021 % of Total Tonnage	2021 Without Project Trips	2021 With Project Trips	2031 % of Total Tonnage	2031 Without Project Trips	2031 With Project Trips	2041–2071 % of Total Tonnage	2041–2071 Without Project Trips	2041–2071 With Project Trips
Very Small	5	5	3	2	5	3	4	5	4	2
Medium Large	13	5	1	1	5	1	1	0	0	0
Large	15	10	2	1	10	2	2	5	1	1
Very Large	66	80	11	8	80	13	11	90	16	14
Total	100	100	17	12	100	19	18	100	21	17

Table 5-17. Iron Ore/I&S Products Bulker Forecasted Vessel Trips

Bulker Size	2010 % of Total Tonnage	2021 % of Total Tonnage	2021 Without Project Trips	2021 WP Trips	2031 % of Total Tonnage	2031 Without Project Trips	2031 With Project Trips	2041–2071 % of Total Tonnage	2041–2071 Without Project Trips	2041–2071 With Project Trips
Small	1	0	0	0	0	0	0	0	0	0
Medium Small	1	4	1	0	4	2	0	4	3	3
Medium Large	46	31	10	8	31	12	12	25	11	11
Large	49	40	12	9	40	13	13	36	13	13
Very Large	0	25	6	5	25	7	7	35	10	8
Total	100	100	29	22	100	34	32	100	37	35

Table 5-18. Petroleum Products Tanker and Deep-Draft Barge Forecasted Vessel Trips

Vessel Size	2010 % of Total Tonnage	2021 % of Total Tonnage	2021 Without Project Trips	2021 With Project Trips	2031 % of Total Tonnage	2031 Without Project Trips	2031 With Project Trips	2041–2071 % of Total Tonnage	2041–2071 Without Project Trips	2041–2071 With Project Trips
Liquid Barge-Ocean	100	100	39	39	100	45	45	100	47	47
Very Small	4	4	6	4	4	7	5	2	3	3
Small	2	0	0	0	0	0	0	0	0	0
Medium Small	6	4	3	2	4	3	3	2	2	1
Medium Large	51	21	10	9	21	12	12	11	6	6
Large	26	30	12	10	30	14	14	25	12	12
Very Large	11	40	13	10	40	15	13	60	24	21
Total	100	100	83	74	100	96	92	100	94	90

Table 5-19. Oil Drilling Rigs Forecasted Vessel Trips

Rig Size	2021–2051 Yearly Without Project Trips	2021–2051 Yearly With Project Trips	2061–2071 Yearly Without Project Trips	2061–2071 Yearly With Project Trips
Rig-Jack-Up	4	2	3	2
Rig-Semi-Submersible Small	3	5	3	4
Rig-Semi-Submersible Large	1	1	1	1
Total	8	8	7	7

6.0 ALTERNATIVE EVALUATION

6.1 METHODOLOGY

A HarborSym analysis was conducted to determine the Recommended Plan. The analysis used the most current data available at the time, which was 2010. Based on the various alternatives studied, the analysis determined the Recommended Plan width and depth selection.

HarborSym is a discrete-event Monte Carlo simulation model of vessel movements in harbors that measures delays and allocates costs to a navigation system. The HarborSym model is the primary, approved evaluation tool used by USACE to evaluate economic benefits for channel deepening and/or widening alternatives. The model measures the economic effects of modifications to deep draft harbors as overall reductions in transit times and associated changes in total vessel operating costs. The model is oriented primarily towards improvements that reduce congestion in the waterway or increase vessel operating efficiencies, as opposed to landside materials handling improvements, although changes to loading/unloading times can be represented. The simulation results can be used in a comparative analysis of alternative harbor improvements and to support a general benefit-cost analysis of proposed navigation improvements.

6.2 BIH HARBORSYM MODEL

This section describes the BIH HarborSym Model Version 1.5.5 and its inputs. HarborSym is a data-driven Monte Carlo simulation model and was developed by the USACE Institute of Water Resources (IWR) to assist in economic analyses of proposed deep-draft channel improvements. It is a planning-level model that creates an event-driven simulation based on data stored in a database. Transit rules that are BIH specific are included in the system, and the model processes each vessel call in order to compute transit delays within the system. HarborSym used the alternatives to determine the potential transportation cost savings from reduced delays and improved efficiencies, which equate to benefits. HarborSym served as the primary evaluation tool for estimating navigation benefits for the proposed channel improvement alternatives. The model determines transportation cost savings by computing quantities, such as transit times, unloading times, and transportation costs. All calculations and assumptions are based on BIH-specific data and information, such as commodity and fleet forecasts and traffic rules, all of which have been reviewed by the Deep-Draft Navigation Planning Center of Expertise (DDNPCX).

HarborSym is a tree-structured network of reaches and nodes built by the user. The reaches represent channels in the harbor, whereas the nodes represent docks, anchorages, and turning areas. When a vessel visits the Port, it is called a vessel call. All vessel calls may adhere to transit restrictions that are based on the channel dimensions and/or vessel characteristics that result in delays until the restriction is alleviated. The vessel classifications, commodity categories, and basic vessel call information are defined by the user. The HarborSym model then uses these inputs to simulate vessel traffic in user-defined scenarios. Transportation cost savings are computed for each project alternative, which allows for a comparison of the plans.

HarborSym's Monte Carlo simulations mimic movements of vessels through a harbor. The systems created in HarborSym have randomized behavior in terms of generation of trips, loading and unloading times at docks, and docking and undocking time. The user inputs statistical parameters with minimum, maximum, and most likely values. The key features of the model are:

- User defined network describing the port;
- Historical vessel calls, with multiple commodities and docks;
- User definition of vessel classes commodity types, and route groups;
- Tidal influence and internal calculation of tide height and current by reach;
- Transit analysis based on user-parameterized rules; and
- Intra-harbor vessel movements.

6.2.1 Specific Physical and Descriptive Characteristics of BIH

This includes the specific network of BIH, such as the node locations and types, reaches, and tide and current stations, as appropriate. The following Table 6-1 provides the list of reaches and nodes used in HarborSym to simulate the channel. HarborSym does not allow vessels to wait within the turning basin and other traffic must wait while turning maneuvers are completed. A triangular distribution of minimum, maximum, and most likely time required to utilize the turning basin is required for each vessel type, and in the case of BIH those times range from 10 minutes to 90 minutes. These times are based on historical information gathered from the end-users and pilots and there are no changes to these times in the without-project versus the with-project condition since the turning basin dimensions are not expected to change. While the oil rigs and scrap vessels have the highest vessel turning basin times, these types of vessels are not expected to use the turning basin. In addition, the bulkers and tankers are required to use the turning basin at their lightest condition, meaning they may offload their cargo before using the turning basin and loading to exit the channel.

Further physical characteristic inputs of the channel used in HarborSym are presented in Table 6-2, BIH Dock Information and Table 6-3, Current Dimensions of the Brownsville Ship Channel. The dock depths used for the Recommended Plan alternative are presented in Table 6-2.

Table 6-1. BIH Reach Names

Entrance Channel (Entry/Exit)
Jetty Channel (Topologic Node)
Laguna Madre (Topologic Node)
Brownsville Ship Channel
GIWW (Barge Entry/Exit)
Reach 5 (to Amfels Dock)
Reach 6 (to International Shipbreaking Dock)
Reach 7 (to Transforma Dock)
Reach 8 (to Esco Dock)
Reach 9 (to Liquid Dock)
Reach 10 (to Oil Docks 3 & 5)
Reach 11 (to Docks 15 & 16)
Reach 12 (to BC Dock)
Reach 13 (to Oil Docks 1 & 2)
Reach 14 (to Docks 12 & 13)
Reach 15 (to Docks 7 & 8)
Reach 16 (to Docks 10 & 11)
Reach 17 (to Docks 1, 2, & 4)
Reach 18 (to Dock 3)
Reach 19 (to Turning Basin)

Table 6-2.BIH HarborSym Dock Information for Recommended Plan

Dock Name	Length (feet)	Limiting Depth (feet)
Amfels	2,700	51
BC Dock	800	49
Docks 1, 2, and 4	1,250	32
Dock 3	450	32
Docks 7 and 8	1,000	29
Docks 10 and 11	1,250	32
Docks 12 and 13	1,120	32
Docks 15 and 16[21]	1,450	49
Esco	2,060	35
International Shipbreaking	1,600	20
Liquid Dock	450	49
Oil Dock 1 and 2	675	42
Oil Dock 3 and 5	1,425	49
Transforma	1,000	20

6.2.2 Vessel Speeds

Vessel speeds for the BSC by vessel class for both loaded and light-loaded conditions were determined with assistance of the Pilots and end-users. For the reaches past the BSC reach, 5 knots was used for all vessels, except for oil drilling rigs, which used a speed of 2.5 knots. The speeds are fixed numbers, not defined by a distribution and were determined not to be different in the without and with-project condition because of the docks.

6.2.3 Transit Rules for each Reach

Rules for each reach reflect restrictions on passing, overtaking, and meeting, and are used to determine delays in the system. There are several types of rules (such as no passing or no meeting) that are applicable to a certain condition (day, night, always), and that are restricted by vessel specifications (beam, draft, length). The rules are BIH specific and were derived from the Pilots' rules. Rules are specific to a particular vessel type and reach. The rules for transiting the reaches of BIH under the without-project condition are as follows.

Entrance Channel

Draft limit of 38 feet plus tide to a maximum draft of 39 feet.

Draft limit of 34 feet to transit inbound or outbound if the current is 1 knot or greater.

[21] Please note that as of May 2014, Dock 16 has not been built. However, the Port has plans to construct Dock 16 before the period of analysis begins, and thus, it has been included in the analysis.

No vessel may meet (as this is not a two-way traffic channel).
Scrap vessels are not allowed to travel at night.

Jetty Channel Reach

No vessel may meet (as this is not a two-way traffic channel).

Laguna Madre Reach

No vessel may meet (as this is not a two-way traffic channel).

Brownsville Ship Channel Reach

No vessel may meet (as this is not a two-way traffic channel).

Reach 19

Draft limit of 35 feet plus tide to a maximum draft of 36 feet.
Draft limit of 34 feet in the absence of tide.

Entire BIH Channel

Oil rigs are not allowed to travel at night.
No channel entrance if the draft plus tide or underkeel is greater than the moving vessel's draft.
Vessels must always stay within the safety zone limits as set throughout the projects.

6.2.4 General Information

General information includes BIH specific vessel and commodity classes (classified by WCSC data and Pilots' logs), commodity transfer rates at dock (provided by end-users at BIH), and specifications of vessel docking time at each dock, estimated to be 0.25–2 hours (depending on the vessel type). The following Table 6-3 provides more detail on examples of the commodity transfer rates used in the model. When a vessel arrives at a dock, the HarborSym model will pick from the triangular distribution of commodity transfer rates to determine how long it will take to load or unload the cargo.

6.2.1 Vessel Calls

Vessel call lists are made up of vessel calls that are specific to a given year. Each call is given a movement number based on its date and time of entry. The vessel call list is imported into HarborSym using an Excel spreadsheet. Vessel call lists were developed using WCSC data from 2010, in comparison to the 2010 Pilots' logs. Future growth rates were developed and applied to out-year vessel call lists using a variety of methods based on the individual commodity group, as explained above in Section 5. Call lists were developed for 2017, 2037, and 2067.

Table 6-3. BIH HarborSym Commodity Transfer Rates (Short Tons per Hour)

Vessel Type	Commodity Category	Loading Rate (hourly) Units			Unloading Rate (hourly) Units		
		Minimum	Most Likely	Maximum	Minimum	Most Likely	Maximum
Barge-Liquid	Petroleum Products	300	1,125	1,500	300	1,125	1,500
Barge-Dry Open	Iron Ore/I&S Products	200	350	500	150	250	350
Barge-Dry Open	Dry Bulk/Break-Bulk Products	200	350	500	150	250	350
Bulk Carrier	Iron Ore/I&S Products	150	275	400	100	175	250
Bulk Carrier	Dry Bulk/Break-Bulk Products	200	350	500	150	250	350
Tanker	Petroleum Products	750	1,500	2,250	750	1,500	2,250
Shipbreaking	Scrap	900	1,100	1,300	0.001	0.001	0.001
Oil Rig	Drilling Rigs	10	10	10	0.005	0.01	0.015

6.2.2 Vessel Call Lists

The Vessel Call List is the primary parameter of the Monte Carlo simulation. For all ports, there is a fleet of specific vessel types that transit. BIH has the following vessel types currently transiting: Bulk Carriers, Tankers, General Cargo, Barges, Tugboats, Shipbreaking vessels, and Oil Rigs. The fleet of vessels at the port is described in Tables 5-4, BIH Bulk Carrier Fleet Classification Characteristics, 5-10, BIH Tanker Fleet Classification Characteristics, and 5-14, BIH Oil Drilling Rigs Classification Characteristics.

Each vessel call list contains the following information: Arrival Date, Arrival Time, Vessel Name, Entry Point, Exit Point, Arrival Draft, Import/Export, Dock, Dock Number, Dock Order, Commodity, Commodity Number, Tons, Origin/Destination, Vessel Type, Vessel Type Number, Unique Vessel Identifier (IMO), Net Register Tonnage (NRT), Gross Register Tonnage (GRT), DWT, Capacity, LOA, Beam, Draft, Flag, and Tons per Inch (TPI) Factor. The call list was compiled using data provided by the WCSC, the Pilots, Lloyds Register, and the IWR NED Procedures Manual. Table 6-4 presents the cargo capacity factors published in the deep-draft manual for bulkers and tankers that was used for the load factors.

Table 6-4. Adjustments for Estimating Actual Vessel Capacity Shorts Tons of Cargo as a Percentage of Vessel DWT

Vessel DWT	% of Cargo to DWT
<20,000	90
20,000-70,000	92
70,000-120,000	95

Source: USACE[22]

The route groups and the mileage assumed are presented in Table 6-5.

Table 6-5. BIH HarborSym Route Groups

Route Group Name	Assumed Countries Included	Mileage Distance Distribution (Nautical Miles)
Asia	China, Taiwan, Malaysia, Singapore	10,110–11,742
Canada	Canada	2,500–3,500
Central America/Northern South America	Bahamas, Panama, Colombia, Venezuela	1,074–1,759
East Europe	Italy, Sweden, Lithuania, Latvia, Finland, Russia	5,531–6,055
Mexico	Mexico	500–600
North Africa/West Europe	Portugal, Morocco, Spain	4,610–4,819
North Europe	Netherlands, Belgium, Norway, United Kingdom	5,099–5,127
Orient	Australia, Russia, Japan, South Korea	9,167–9,613
South Africa	South Africa	7,000–8,000
South America	South America	4,253–5,326

Source: Distances received from http://sea-distances.com/index.htm

[22] USACE, IWR Report 91-R-13, National Economic Development Procedures Manual, Deep-Draft Navigation, November 1991, p. 77 and May 2008 draft.

6.3 INITIAL MODEL RUNS/SCREENING

The HarborSym analysis was performed to assess the vessel transit time reductions and increased vessel operating efficiencies for proposed channel improvements. The benefits of channel improvements were estimated in terms of reductions in harbor transit times and consequent vessel delays, as well as the reduction in total harbor costs as a result of efficiencies gained through the improvements. Transit times and transportation costs were estimated by analyzing the most likely condition in the absence of an improved channel at BIH, which is the without-project condition, and the proposed channel improvement alternatives for the 50-year period of analysis. The without-project scenario was analyzed next to 12 channel improvement alternative scenarios, each for three distinct years during the period of analysis, i.e., 2017: the beginning of the period of analysis, 2037: the middle of the period of analysis, and 2067: the end of the period of analysis. Please note that the period of analysis has since changed, as described later (see Section 7). Table 6-6 provides the list of alternatives evaluated in the HarborSym analysis.

Table 6-6. HarborSym Model Alternative Runs

CurrentCondition2010 (used as validation)	*45x250WP2017	48x250WP2017	50x250WP2017	52x250WP2017
*WOP2017	45x250WP2037	48x250WP2037	50x250WP2037	52x250WP2037
WOP2037	45x250WP2067	48x250WP2067	50x250WP2067	52x250WP2067
WOP2067	45x300WP2017	48x300WP2017	50x300WP2017	52x300WP2017
	45x300WP2037	48x300WP2037	50x300WP2037	52x300WP2037
	45x300WP2067	48x300WP2067	50x300WP2067	52x300WP2067
	45x350WP2017	48x350WP2017	50x350WP2017	52x350WP2017
	45x350WP2037	48x350WP2037	50x350WP2037	52x350WP2037
	45x350WP2067	48x350WP2067	50x350WP2067	52x350WP2067

*WP = with project; WOP = without project

6.3.1 Parameters of the Simulation Run

This includes start date, duration, number of iterations, wait time before rechecking rules, and the level of detail of the results output.

The model for BIH was run for the Base Year and Years 20 and 50 for all alternatives. Using the HarborSym output files, it was determined that the model results for the vessel operating times in the system became consistent after approximately 50 iterations; thus, this was the number of iterations run for this analysis. The duration for each model run was 8,760 hours, or 1 year. The wait time is the amount of time a vessel is delayed before attempting to move once it has been delayed, and for this analysis, 10 minutes was used for the wait time.

There are several elements of variability that are incorporated into the model when more than one iteration is run, which includes, vessel arrival time, vessel operating costs, turning time, vessel docking time, commodity transfer rates, speed at sea, and at sea distances. HarborSym perturbs the arrival date and time of each call between iterations, but the other factors stated above are all drawn from the triangular distribution, based on the information provided in the model.

6.3.2 Legs and Wait Times

Each vessel call is composed of a system of legs. A leg is a system of reaches between a stopping point, such as a dock or anchorage. A vessel cannot stop unless it is at a dock, anchorage, or a turning basin. If a rule restricts a vessel, that vessel must wait at a dock, anchorage, turning basin, or at the entry node until the rule restriction is no longer valid, at which point in time the vessel may continue to transit the system. A vessel will wait for a time period, specified for BIH, and then attempt to enter the leg again. This process is repeated in the system until the vessel may enter. The accumulated waiting times at each location are stored in HarborSym, along with the statistics associated with each rule. On arrival at a dock, the quantity of commodity transferred is used, in conjunction with the vessel TPI, to calculate the departure draft based on the arrival draft. Draft on departure from the dock is important in the process of checking the leg to determine if the vessel can proceed.

6.3.3 Priority Vessels

As a Monte Carlo event-driven model, each vessel call is modeled separately and its particular interactions with other vessels are applied. Each iteration places vessel calls in a priority queue based on arrival time. All of BIH's deep-draft vessels are priority vessels, as they have priority over the barges. Priority vessels are not typically subjected to delays, but would still benefit from improvements to the channel, such as deeper drafts, higher unloading rates, etc.

6.3.4 Outputs

A number of parameters are collected and stored in HarborSym after the model runs occur. Among those parameters are the number of vessels entering and exiting BIH, the average time a vessel spends in the BIH system (to include time at a dock and transiting), total cost of the fleet and the average cost per vessel class, vessel times spent waiting, vessel times in anchorage areas, vessel times docking and undocking, vessel times loading and unloading, commodity quantities transferred, and total commodity statistics at the port. These outputs are then used to compute benefits. All outputs have been reviewed by the DDNPCX.

6.3.5 Economic Analysis

The economic analysis compares the without-project condition to each alternative with-project condition over a 50-year period of analysis. The without-project condition shows the existing channel conditions, as well as any anticipated channel changes that will be implemented in absence of the project. The traffic and commodity forecasts for the without-project condition are based on conditions of the channel without the project. The model simulates the without-project condition based upon the parameters that are currently maintained. The existing rules and their parameters were programmed into HarborSym to allow for an accurate picture of the current reality. The future parameters of the system were used to represent channel conditions both under the with- and without-project conditions. The with-project conditions illustrate the channel system if the particular alternative is implemented. Benefits for BIH were computed based on a decrease in delay times/transit costs for a channel alternative.

Commodity tonnage volumes, vessel loadings, and distributions of vessel classes were extrapolated from Pilots' logs and WCSC data using the commodity traffic forecasts discussed in previous sections. For each alternative and decade, transit times and delays were estimated by individual vessel movements. HarborSym measures the cost of delays in the system associated with transit rules and restrictions. The vessel operating costs are by vessel type and are for both in port and at sea. However, each vessel type will only have an operating cost related to domestic or foreign cost depending on the country flag of the vessel, for example, the barges are domestic vessels and thus are only associated with domestic operating costs. The deep-draft vessel operating costs were supplied by IWR per EGM 11-05, while the Shallow-Draft/Inland Vessel Operating Costs were provided by Informa Economics. The following Tables 6-7 and 6-8 present the vessel operating costs used in HarborSym.

6.3.1 Analysis Results

HarborSym provides detailed output from simulations. The Total Time in the System is the time vessels spend between arrival at the harbor and exit from the harbor and is based upon the number of vessels exiting the system. The hourly costs for each vessel class (at sea/in port) are then used to derive the Total Operating Costs for the system. Ultimately, the goal when using Harborsym is to measure the benefits of potential harbor improvements. Once the model has estimated the amount of time vessels spend in the harbor under current harbor conditions, and therefore has quantified the total operating cost for the system, the benefits of any harbor improvements will be reduced time that vessels spend in the harbor, in return reducing cost.

Table 6-7. BIH HarborSym Barge, Tank, and Bulker Operating Costs in Dollars[23]

Vessel Type	Hourly Domestic Operating Cost						Hourly Foreign Operating Cost					
	At Sea			In Port			At Sea			In Port		
	Min	Most Likely	Max	Min	Most Likely	Max	Min	Most Likely	Max	Min	Most Likely	Max
Barge-Liquid	261	300	435	271	291	312	1	1	1	1	1	1
Barge Ocean-Liquid	1,131	1,230	1,422	956	1,062	1,168	1	1	1	1	1	1
Barge-Dry Open	261	300	435	256	274	296	1	1	1	1	1	1
Tank Ship-Very Small	1	1	1	1	1	1	738	825	920	400	453	678
Tank Ship-Small	1	1	1	1	1	1	806	903	1,008	450	500	751
Tank Ship-Medium Small	1	1	1	1	1	1	915	1,020	1,135	500	578	858
Tank Ship-Medium Large	1	1	1	1	1	1	1,004	1,116	1,240	570	633	929
Tank Ship-Large	1	1	1	1	1	1	1,140	1,263	1,399	658	731	1,056
Tank Ship-Very Large	1	1	1	1	1	1	1,269	1,403	1,552	741	823	1,181
Bulk Carrier-Very Small	1	1	1	1	1	1	598	690	790	340	377	648
Bulk Carrier-Small	1	1	1	1	1	1	695	793	901	397	441	731
Bulk Carrier-Medium Small	1	1	1	1	1	1	783	889	1,004	448	497	804
Bulk Carrier-Medium Large	1	1	1	1	1	1	881	995	1,122	513	569	900
Bulk Carrier-Large	1	1	1	1	1	1	954	1,075	1,210	551	612	957
Bulk Carrier-Very Large	1	1	1	1	1	1	1,003	1,131	1,273	569	632	988

[23] Each vessel type has a placeholder of $1 for either the domestic or foreign operating cost for use in HarborSym.

Table 6-8. BIH HarborSym Rig and Scrap Operating Costs in Dollars

Vessel Type	Hourly Domestic Operating Cost						Hourly Foreign Operating Cost					
	At Sea			In Port			At Sea			In Port		
	Min	Most Likely	Max	Min	Most Likely	Max	Min	Most Likely	Max	Min	Most Likely	Max
Oil Rig-JackUp	1	1	1	1	1	1	1	1	1	1	1	1
Oil Rig-Semi-Submersible Small	1	1	1	1	1	1	1	1	1	1	1	1
Oil Rig-Semi-Submersible Large[24]	1	1	1	1	1	1	1	1	1	2,000	3,000	4,000
Scrap-Small	261	300	435	256	274	296	1	1	1	1	1	1
Scrap-Medium	287	330	435	281	301	325	1	1	1	1	1	1
Scrap-Large	315	363	525	309	331	357	1	1	1	1	1	1

[24] The operating costs for the Oil Rig-Semi-Submersible Large is only included in the without-project conditions because this cost is related to the removal of thrusters, which is not required in the with-project conditions. These costs were calculated based on interviews with Amfels and in coordination with IWR. The hourly operating costs are based on the distribution of the total thruster removal costs.

6.4 BENEFIT COST RATIO

The resulting benefits as calculated by HarborSym were then discounted back to the present value. The same was done for the project costs for each alternative. The following Tables 6-9 through 6-11 display the Alternative Net Excess Benefits and BCRs at the FY13 Federal Discount rate of 3.75 percent. Based on this, the alternative to deepen the channel to 52 feet with no widening was selected as the Recommended Plan.

Table 6-9. BCR Results for 250-Foot Width Alternatives

	Depth Alternatives (feet)									
	43	**44**	**45**	**46**	**47**	**48**	**49**	**50**	**51**	**52**
Project Cost	$67,773.3	$78,486.7	$89,200.0	$99,913.3	$110,626.7	$121,340.0	$141,755.0	$162,170.0	$178,060.0	$193,950.0
Interest during construction (IDC)	$1,350.5	$1,765.6	$2,236.4	$2,763.4	$3,346.6	$3,986.5	$5,352.4	$6,923.4	$8,308.7	$9,824.0
AAE Costs (w/operations & maintenance [O&M])	$3,366.6	$4,148.0	$4,932.0	$5,509.0	$6,088.5	$6,670.5	$7,761.4	$8,861.4	$9,721.0	$10,586.4
AAE Benefits	$3,239.1	$5,795.9	$9,717.2	$11,213.0	$12,503.7	$14,204.6	$15,792.7	$17,380.8	$18,627.3	$19,873.8
Net Excess Benefits	($127.5)	$1,647.8	$4,785.2	$5,704.0	$6,415.2	$7,534.1	$8,031.4	$8,519.5	$8,906.3	$9,287.4
BCR (at 3.75%)	1.0	1.4	2.0	2.0	2.1	2.1	2.0	2.0	2.0	1.9

Table 6-10. BCR Results for 300-Foot Width Alternatives

	Depth Alternatives (feet)									
	43	**44**	**45**	**46**	**47**	**48**	**49**	**50**	**51**	**52**
Project Cost	$83,863.3	$104,976.7	$126,090.0	$147,203.3	$168,316.7	$189,430.0	$210,080.0	$230,730.0	$252,475.0	$274,220.0
IDC	$1,886.5	$3,107.5	$4,636.9	$6,478.9	$8,637.9	$11,118.2	$13,608.3	$16,360.4	$19,461.7	$22,844.5
AAE Costs (w/O&M)	$4,569.0	$6,311.2	$8,067.3	$9,218.4	$10,383.6	$11,563.2	$12,709.3	$13,867.0	$15,098.4	$16,342.2
AAE Benefits	$3,614.4	$6,542.9	$10,843.1	$11,815.6	$12,609.6	$13,760.4	$15,849.8	$17,939.3	$19,189.8	$20,440.4
Net Excess Benefits	($954.6)	$231.6	$2,775.9	$2,597.2	$2,226.0	$2,197.3	$3,140.6	$4,072.2	$4,091.5	$4,098.1
BCR (at 3.75%)	0.8	1.0	1.3	1.3	1.2	1.2	1.3	1.3	1.3	1.3

Table 6-11. BCR Results for 350-Foot Width Alternatives

	Depth Alternatives (feet)									
	43	**44**	**45**	**46**	**47**	**48**	**49**	**50**	**51**	**52**
Project Cost	$160,890.0	$182,930.0	$204,970.0	$227,010.0	$249,050.0	$271,090.0	$290,985.0	$310,880.0	$338,370.0	$365,860.0
IDC	$7,935.1	$10,244.8	$12,860.6	$15,786.4	$19,026.2	$22,583.8	$24,847.9	$27,196.6	$32,448.7	$38,194.8
AAE Costs (w/O&M)	$8,976.7	$11,513.5	$14,063.9	$15,355.1	$16,660.2	$17,979.5	$19,159.1	$20,342.4	$21,968.5	$23,616.5
AAE Benefits	$2,986.1	$5,382.2	$8,958.2	$10,685.6	$12,255.7	$14,140.2	$15,413.6	$16,687.0	$18,291.6	$19,896.1
Net Excess Benefits	($5,990.6)	($6,131.3)	($5,105.7)	($4,669.5)	($4,404.5)	($3,839.3)	($3,745.5)	($3,655.4)	($3,676.9)	($3,720.4)
BCR (at 3.75%)	0.3	0.5	0.6	0.7	0.7	0.8	0.8	0.8	0.8	0.8

7.0 RECOMMENDED PLAN OPTIMIZATION

7.1 HARBORSYM ANALYSIS

The alternative to deepen the channel to 52 feet with no widening was selected as the Recommended Plan. It is not known if the Recommended Plan is the NED plan, which maximizes net excess benefits, because the net excess benefits were still increasing with deeper channel dimensions and a deeper alternative was not included in the Final Array of alternatives. However, the Recommended Plan was the most cost effective of the Final Array of alternatives considered and the deepest channel dimension that the non-Federal sponsor would support at this time. Once the Recommended Plan was selected, additional efforts were required to optimize the plan. For example, the future vessel fleet composition was updated (as presented in Section 7) and certain model inputs were updated based on new information, as explained below.

To begin with, due to the timing of the project, the base year of the project was deferred to 2021 to represent a more realistic start date. Therefore, the Recommended Plan optimization examined the following projects in HarborSym, as shown in Table 7-1.

Table 7-1. Recommended Plan HarborSym Model Runs

WOP2021	52x250WP2021
WOP2031	52x250WP2031
WOP2041	52x250WP2041
WOP2051	52x250WP2051
WOP2061	52x250WP2061
WOP2071	52x250WP2071

Based on interviews with the Pilots and end-users, several model inputs were updated. The speed in the reaches was increased to 5.5 knots, per the Pilots. Also, the loading and unloading rates were updated for the following vessel types, as shown in Table 7-2.

In addition, the vessel operating costs for the oil drilling rigs in the without-project condition were also updated, as presented in Table 7-3. These updated costs are more consistent with the cost to remove a semi-submersible rig's thrusters before entering the channel.

The model was run with the above changes for 50 iterations. The following Figure 7-1 presents the total time all vessels spent in the system throughout the period of analysis, which on average is less for the with-project condition. Figure 7-2 presents the average wait time for all vessels, which is reduced in the with-project condition.

Table 7-2. BIH HarborSym Vessel Commodity Rates (Short Tons per Hour)

		Loading Rate (hourly) Units			Unloading Rate (hourly) Units		
Vessel Type	Commodity Category	Minimum	Most Likely	Maximum	Minimum	Most Likely	Maximum
Bulk Carrier	Dry Bulk/ Break-Bulk	4,000	4,400	5,800	4,000	4,400	5,800
Oil Rig	Drilling Rigs	10	10	10	0.0033	0.01	0.02

Table 7-3. BIH HarborSym Oil Rig Operating Costs in dollars

	Hourly Domestic Operating Cost						Hourly Foreign Operating Cost					
	At Sea			In Port			At Sea			In Port		
Vessel Type	Min	Most Likely	Max	Min	Most Likely	Max	Min	Most Likely	Max	Min	Most Likely	Max
Oil Rig-Semi-submersible Large	1	1	1	1	1	1	1	1	1	3,000	5,000	7,000

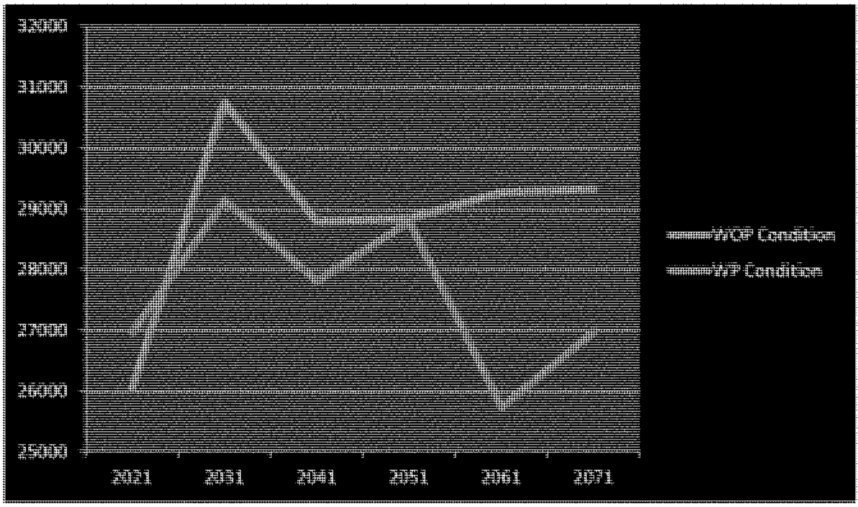


Figure 7-1: Average Total Vessel Time in BIH Channel (Hours)

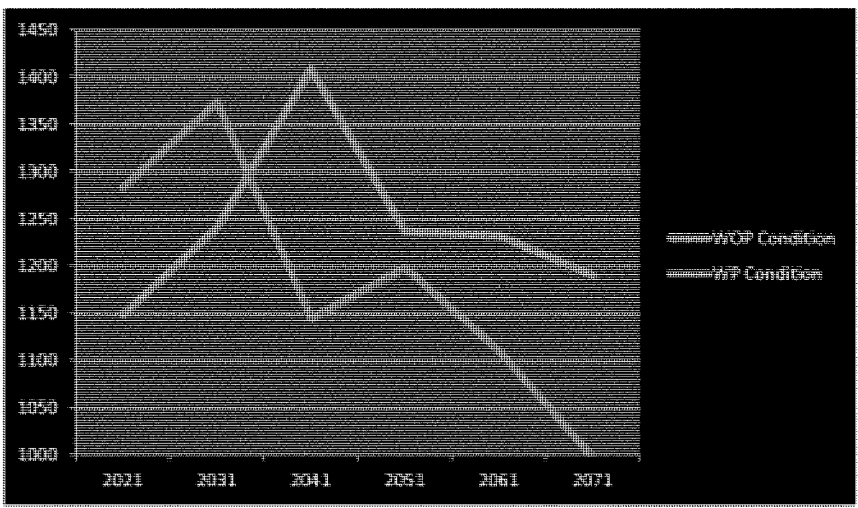


Figure 7-2: Average Total Vessel Wait Time in BIH Channel (Hours)

Figure 7-3 presents the annual costs for the without-project and with-project conditions. This is also presented in the following Table 7-4.

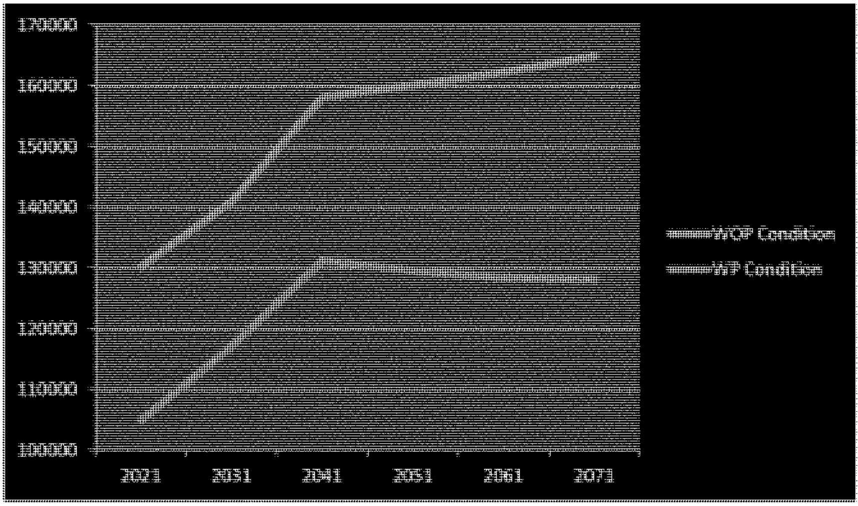


Figure 7-3: Total Annual Costs of Vessels in BIH Channel (1,000s of $)

Table 7-4. Total Annual Vessel Costs and Benefits (1,000s of $)

Year	WOP Condition	WP Condition	Benefits
2021	122,757	105,049	17,708
2031	133,746	117,293	16,453
2041	153,175	131,367	21,809
2051	153,707	129,651	24,056
2061	155,615	128,545	27,070
2071	157,038	128,206	28,832
Total	**876,038**	**740,111**	**135,927**

7.2 AVERAGE ANNUAL BENEFITS

The following Table 7-5 presents the annualized benefits for the with-project condition at the current interest rate of 3.5 percent.

Table 7-5. Benefits at 3.5% Interest Rate (1,000s of $)

Year	Benefits
2021	17,109
2031	11,269
2041	10,590
2051	8,281
2061	6,606
2071	4,988
Average Annual Benefits	**20,539**

7.3 INCREMENTAL ANALYSIS

To complete the required incremental analysis, the channel was also analyzed using two distinct reaches. The first reach begins at the entrance channel and extends to and includes the Amfels dock, which is assumed to be 14.5 miles in length. The second reach begins after Amfels and extends to the turning basin, which is assumed to be 2.5 miles in length. The following Table 7-6 presents the annualized benefits for Reach 1. Table 7-7 presents the annualized benefits for Reach 2.

Table 7-6. Reach 1 Benefits at 3.5% Interest Rate (1,000s of $)

Year	Benefits
2021	7,930
2031	5,468
2041	2,688
2051	2,443
2061	1,764
2071	1,486
Average Annual Benefits	**7,330**

Table 7-7. Reach 2 Benefits at 3.5% Interest Rate (1,000s of $)

Year	Benefits
2021	9,179
2031	5,801
2041	7,902
2051	5,838
2061	4,842
2071	3,501
Average Annual Benefits	**13,209**

In addition, the benefits are being presented for the individual vessel classes. Three vessel classes, very large tankers, very large bulkers, and large semi-submersible rigs comprise 90 percent of the benefits, and are presented in Tables 7-8 to 7-10.

Table 7-8. Very Large Tanker Benefits at 3.5% Interest Rate (1,000s of $)

Year	Benefits
2021	3,596
2031	3,559
2041	3,161
2051	2,158
2061	1,639
2071	1,103
Average Annual Benefits	**5,532**

Table 7-9. Very Large Bulker Benefits at 3.5% Interest Rate (1,000s of $)

Year	Benefits
2021	3,526
2031	805
2041	3,897
2051	2,848
2061	2,089
2071	1,595
Average Annual Benefits	**5,246**

Table 7-10. Large Semi-Submersible Rig Benefits at 3.5% Interest Rate (1,000s of $)

Year	Benefits
2021	7,923
2031	5,460
2041	2,648
2051	2,440
2061	1,762
2071	1,485
Average Annual Benefits	**7,321**

7.4 SENSITIVITY ANALYSIS

In order to examine areas of risk and uncertainty, sensitivity analyses were conducted to use as a comparison of the degree of reliability of the estimated benefits of the alternatives. The first sensitivity assumes no growth in the commodities during the period of analysis. A scenario with 1 percent growth rate is used to grow the tonnage from 2011 to 2021, which is a reasonable assumption that there will be minimal continued growth over the next decade. However, the tonnage remains constant throughout the period of analysis. Table 7-11 presents the annualized benefits for the no-growth sensitivity at the 3.5 interest rate.

Table 7-11. Benefits for No Growth Sensitivity at 3.5% Interest Rate (1,000s of $)

Year	Benefits
2021	16,183
2031	13,372
2041	7,662
2051	5,321
2061	4,759
2071	2,942
Average Annual Benefits	**17,472**

In another sensitivity that was developed, the current vessel fleet mix and the resultant tonnage percentage associated with the fleet sizes was carried throughout the period of analysis, while incorporating the tonnage growth, as presented in Section 6. The resultant benefits are presented in Table 7-12.

Table 7-12. Benefits for No Fleet Transition Sensitivity at 3.5% Interest Rate (1,000s of $)

Year	Benefits
2021	11,728
2031	4,603
2041	7,184
2051	4,230
2061	2,728
2071	2,294
Average Annual Benefits	**11,060**

Finally, sensitivities were developed that only involve changes to the assumptions used for the oil drilling rigs visiting the channel. In the without project condition, it was assumed that one large semi-submersible rig would visit yearly that would require thruster removal outside the channel. In the sensitivity shown in Table 7-13, the large semi-submersible rig was completely removed leaving the resultant benefits. In Table 7-14, benefits are shown for a sensitivity in which the semi-submersible rig only occurs every other year. Finally, in Table 7-15, benefits are shown for a sensitivity in which the costs related to thruster removal is increased to a range of $7,000-$12,000 hourly compared to the original $3,000-$7,000 hourly.

Table 7-13. Benefits for No Semi-Submersible Rigs at 3.5% Interest Rate (1,000s of $)

Year	Benefits
2021	9,186
2031	5,809
2041	7,906
2051	5,841
2061	4,844
2071	3,503
Average Annual Benefits	**13,218**

Table 7-14. Benefits for Fewer Semi-Submersible Rigs at 3.5% Interest Rate (1,000s of $)

Year	Benefits
2021	17,109
2031	5,809
2041	10,590
2051	5,841
2061	6,606
2071	3,503
Average Annual Benefits	**15,484**

Table 7-15. Benefits for Higher Semi-Submersible Rig Operating Costs at 3.5% Interest Rate (1,000s of $)

Year	Benefits
2021	24,438
2031	16,316
2041	13,049
2051	10,512
2061	8,243
2071	6,363
Average Annual Benefits	**27,291**

8.0 ECONOMIC SUMMARY

This section presents summaries of the costs and benefits, with the resultant BCRs for the most likely scenario as well as sensitivity items. Table 8-1 presents the economic summary for the Recommended Plan project at 3.5 percent. This scenario represents the most likely commodity and fleet forecast as well as the most likely rig behavior. Table 8-2 shows the channel incrementally segmented into two reaches. Table 8-2 presents the economic summary for Reach 1 at 3.5 percent. Table 8-3 presents the economic summary for Reach 2 at 3.5 percent.

Table 8-1. Economic Summary of Recommended Plan at 3.5%
(1,000s of $)

First Cost of Construction	251,952.0
Interest During Construction	10,563.3
Total Investment	262,515.3
Average Annual Cost	11,192.0
Average Annual O&M	2,971.3
Total Annual Cost	14,163.3
Average Annual Benefits	20,539.4
Net Excess Benefits	6,376.1
B/C Ratio	**1.5**

Table 8-2. Economic Summary of Reach 1 at 3.5%
(1,000s of $)

First Cost of Construction	214,900.2
Interest During Construction	7,605.6
Total Investment	222,505.8
Average Annual Cost	9,486.2
Average Annual O&M	2,534.3
Total Annual Cost	12,020.6
Average Annual Benefits	7,330.1
Net Excess Benefits	(4,690.5)
B/C Ratio	**0.6**

Table 8-3. Economic Summary of Reach 2 at 3.5%
(1,000s of $)

First Cost of Construction	37,051.8
Interest During Construction	176.8
Total Investment	37,228.6
Average Annual Cost	1,587.2
Average Annual O&M	437.0
Total Annual Cost	2,024.1
Average Annual Benefits	13,209.3
Net Excess Benefits	11,185.2
B/C Ratio	**6.5**

While the details of the benefits that include Section 6009 are provided in the addendum, the BCR is 6.4. Per Section 6009 Implementation Guidance, Keppel-AmFELS provided a statement of their certification to the data related to such benefits.

Benefits were also developed for the sensitivity analyses, to include the different commodity and fleet forecasts. Table 8-4 presents the economic summary for the Recommended Plan project with the no commodity growth sensitivity. Table 8-5 presents the economic summary for the Recommended Plan project with the sensitivity in which there is no change in the fleet composition.

Table 8-4. Economic Summary of No Growth Sensitivity
(1,000s of $)

	@ 3.5%
Average Annual Benefits	17,471.7
Total Annual Cost	14,163.3
Net Excess Benefits	3,308.4
B/C Ratio	**1.2**

Table 8-5. Economic Summary of No Fleet Transition Sensitivity
(1,000s of $)

	@ 3.5%
Average Annual Benefits	11,060.0
Total Annual Cost	14,163.3
Net Excess Benefits	(3,103.2)
B/C Ratio	**0.8**

Table 8-6 presents the economic summary for the Recommended Plan project with the sensitivities in which the assumptions regarding the large semi-submersible rigs are changed. The most likely rig behavior was shown in Table 8-1 at the beginning of this section.

Table 8-6. Economic Summary of Large Semi-Submersible Rig Sensitivity at 3.5% (1,000s of $)

	No Large Semi-Submersible Rigs	**Fewer Large Semi-Submersible Rigs**	**Higher Large Semi-Submersible Rig Operating Costs**
Average Annual Benefits	13,218.4	15,484.5	27,291.5
Total Annual Cost	14,163.3	14,163.3	14,163.3
Net Excess Benefits	(944.9)	1,321.2	13,128.2
B/C Ratio	**0.9**	**1.1**	**1.9**

Brazos Island Harbor, Texas Channel Improvement Project

Appendix B
Engineering Design, Cost Estimates, and Cost Risk Analysis

P2-370840 - BRAZOS ISLAND HARBOR, TEXAS CHANNEL IMPROVEMENT PROJECT
FEASIBILITY STUDY
COST ANALYSIS SUMMARY

LOCATION AND DESCRIPTION:
Port of Brownsville is located on the south Texas coast near the border of U.S. and Mexico. The study area encompasses the entire Brownsville Ship Channel and surrounding region. The entrance channel is located offshore of Cameron County, Texas, in the Gulf of Mexico, and ends at Port of Brownsville Main Harbor. Brownsville Ship Channel provides deep draft access from the Gulf of Mexico through a jetty entrance channel to Brownsville, and a side channel, authorized to 36-feet, and a shallow draft Fishing Boat Harbor near Port Isabel. The primary purpose of the study is navigation, which consists of enlarging the existing Brownsville Ship Channel by deepening the entrance channel, jetty channel, the lower section of the main channel, the upper section of the main channel, and turning basin.

The MII is developed using October 2013 price levels and the latest labor rates for Galveston District. The estimate is divided into seven (7) contracts. Each contract is organized in accordance with a work breakdown structure. Midpoint dates for the construction contracts are developed in conjunction with the project manager for developing the fully-funded costs. The estimate is prepared in accordance with ER 1110-2-1302 Civil Works Cost Engineering, dated 15 Sep 08. The costs are escalated in accordance with the above Engineering Regulation and EM 1110-2-1304 Civil Works Construction Cost Index System (CWCCIS), dated 31 Mar 2013. All data is input into the Total Project Cost Sheet (TPCS).

Marine fuel price is averaged, locked in at $3.30/gallon (October 2013). Diesel fuel price is locked in at $4.00/gallon (October 2013). There are no impacts to utilities anticipated. There are no Hazardous, Toxic, and Radioactive Wastes anticipated. The Operation and Maintenance estimate is dated October 2013, with an effective pricing date of October 2013. A formal Cost Risk Analyses is performed with the cooperation of the PDT and Cost Engineering Directory of Expertise (DX) of the Walla Walla District (October 2013). The risks are quantified and a cost risk model developed to determine a contingency at 80% Confidence Level (CL). An ATR Certification of Cost Estimate is provided by Walla Walla District.

CONTRACT 01:
This contract is for hopper dredging -17+000 to 00+000 and delivery to New Work Ocean Dredged Material Placement Area (offshore). The stationing listed is located on the Gulf of Mexico side of the jetties (entrance channel) and is unsuitable for a pipeline dredge due to wave action. The approximate duration is seven (7) months.

CONTRACT 02:
This contract is for dike raising and rehabilitation of Placement Area 4B and Placement Area 5A. The approximate duration is 15 months. Associated Costs provided by Department of Engineering Services of the Brownsville Navigation District (21 Oct 2013).

CONTRACT 03:
This contract is for dike raising and rehabilitation of Placement Area 7 and Placement Area 8. The approximate duration is seven (7) months. In addition, this contract is for pipeline dredging 70+000 to 82+000 and 82+000 to 89+500 and delivery to Placement Area 7 and Placement Area 8, respectively. The stationing listed is located in the upper section of the main channel and turning basin. The approximate duration is 10 months. The approximate duration of the total contract is 13 months as dike raising and rehabilitation can occur, in some instances, concurrently with pipeline dredging.

CONTRACT 04:
This contract is for pipeline dredging 25+000 to 50+000 and delivery to Placement Area 5A. The stationing listed is located in the middle section of the main channel. The approximate duration is 16 months.

<u>CONTRACT 05</u>:
This contract is for dike raising and rehabilitation of Placement Area 2. The approximate duration is three (3) months. In addition, this contract is for pipeline dredging 00+000 to 07+000 and delivery to Placement Area 2. The stationing listed is located in the lower section of the main channel near the jetties (entrance channel). The approximate duration is three (3) months.

<u>CONTRACT 06</u>:
This contract is for pipeline dredging 07+000 to 25+000 and delivery to Placement Area 4B. The stationing listed is located in the middle section of the main channel. The approximate duration is 11 months.

<u>CONTRACT 07</u>:
This contract is for dike raising and rehabilitation of Placement Area 5B. The approximate duration is three (3) months. In addition, this contract is for pipeline dredging 50+000 to 70+000 and delivery to Placement Area 5B. The stationing listed is located in the upper section of the main channel near the turning basin. The approximate duration is nine (9) months.

<u>ACCOUNT CODE 12 - NAVIGATION PORTS AND HARBORS</u>:
Dredge quantities are developed by SWG, Engineering Division, General Engineering (EC-EG). One (1) large hopper dredge is to be used for Contract 01 with offshore placement (with an option for the Contractor to bid Contract 05 as pump-out to PA 2 based on durations and schedules). The remainder of the channel is to be dredged with 30" pipeline dredges, with the material discharged into various, existing placement areas located along the waterway (PA 2, 4B, 5A, 5B, 7, and 8). Dredging costs are developed using Cost Engineering Dredge Estimating Program (CEDEP). Dredge production rates and losses are reduced to account for Resident Management System (RMS) historical effective working times and stiffer "new work" materials. Cost for mobilization and demobilization are developed using CEDEP, assuming the dredges are based in New Orleans, Louisiana. Dredge estimates are based on standard operation practices for the Galveston District, which assume conventional contracting practices of large business IFBs. For estimation purposes and contractor capabilities (derived from current Sabine-Neches Waterway dredging project, which includes four pipeline dredges working simultaneously), no more than three (3) dredges will be underway at any given time. In addition, dredges will be located no less than one (1) mile apart due to Coast Guard regulations; for estimate purposes, the dredges have been strategically spaced at stations so as not to impede dredging workflow.

The cost for Sea Turtle Protection is associated with hopper dredging and includes: 1) cost for two (2) trawlers per hopper; 2) a sea turtle protection device fitted to the hopper; and 3) 24-hour monitoring survey.

The cost for raising placement areas is included under this code of account. Part of the cost for raising a placement area includes clearing, grubbing, and stripping the area; seeding the outside of the dikes is not considered. Labor rates and overhead costs are adjusted to reflect Galveston District, Region 6. The placement area dikes are built using 3-CY dragline buckets, with an optimal production rate of 125-CY/HR, respectively. A total of three (3) draglines are working at the same time. For estimate purposes, dike works are lumped by perimeter and training dikes, locations, and bucket sizes. Articulated concrete block is to be placed approximately 22+000 to 34+000. Production assumed at 50-CY/HR in addition to transport of material from Central Texas via railcars, then trucks, then barges, and finally to the site. Material characteristics are provided by SWG, Engineering Division, Geotechnical and Structural Section (EC-ES).

<u>ACCOUNT CODE 30 - ENGINEERING AND DESGIN</u>:
The cost for this account are developed using the guidelines provided in the TPCS, with the agreement of the cost engineer and the project manager.

<u>ACCOUNT CODE 31 - CONSTRUCTION MANAGEMENT</u>:

The cost for this account are developed using the guidelines provided in the TPCS, with the agreement of the cost engineer and the project manager.

WALLA WALLA COST ENGINEERING MANDATORY CENTER OF EXPERTISE

COST AGENCY TECHNICAL REVIEW

CERTIFICATION STATEMENT

For Project No. 370840

SWG – Brazos Island Harbor, TX
Channel Improvement

The Brazos Island Harbor Channel Improvement project, as presented by Galveston District, has undergone a successful Cost Agency Technical Review (Cost ATR), performed by the Walla Walla District Cost Engineering Mandatory Center of Expertise (Cost MCX) team. The Cost ATR included study of the project scope, report, cost estimates, schedules, escalation, and risk-based contingencies. This certification signifies the products meet the quality standards as prescribed in ER 1110-2-1150 Engineering and Design for Civil Works Projects and ER 1110-2-1302 Civil Works Cost Engineering.

As of February 3, 2014, the Cost MCX certifies the estimated total project cost of:

FY 2015 Price Level: $257,211,000
Fully Funded Amount: $279,817,000

It remains the responsibility of the District to correctly reflect these cost values within the Final Report and to implement effective project management controls and implementation procedures including risk management throughout the life of the project.

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Date: 2014.02.03 13:34:46 -08'00'

Kim C. Callan, PE, CCE, PM
Chief, Cost Engineering MCX
Walla Walla District

**** TOTAL PROJECT COST SUMMARY ****

Printed:2/18/2014
Page 1 of 8

PROJECT: P2-370840 Brazos Island Harbor, Texas, Channel Improvement Project
LOCATION: Cameron County, Texas

DISTRICT: SWG Galveston District PREPARED: 1/21/2014
POC: CHIEF, COST ENGINEERING, Willie Honza

This Estimate reflects the scope and schedule in report: BIH Engineering Appendix 2014

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
						Program Year (Budget EC): 2015 Effective Price Level Date: 1 OCT 14								
WBS NUMBER A	Civil Works Feature & Sub-Feature Description B	COST ($K) C	CNTG ($K) D	CNTG (%) E	TOTAL ($K) F	ESC (%) G	COST ($K) H	CNTG ($K) I	TOTAL ($K) J	Spent Thru 1-Oct-13 ($K) K	L	COST ($K) M	CNTG ($K) N	FULL ($K) O
12	NAVIGATION PORTS & HARBORS													
12	non-Federal	$95,019	$19,384	20%	$114,403	1.8%	$96,763	$19,740	$116,503	$0		$104,711	$21,361	$126,072
12	Federal	$85,367	$17,415	20%	$102,782	1.8%	$86,935	$17,735	$104,669	$0		$93,627	$19,100	$112,727
	CONSTRUCTION ESTIMATE TOTALS:	$180,386	$36,799		$217,185	1.8%	$183,698	$37,474	$221,172	$0		$198,338	$40,461	$238,798
01	LANDS AND DAMAGES													
01	non-Federal	$4	$1	25%	$5	1.8%	$4	$1	$5	$0		$4	$1	$5
01	Federal	$9	$2	25%	$11	1.8%	$0	$2	$11	$0		$10	$2	$12
22	FEASIBILITY STUDY (non-CAP)									$0		$0	$0	$0
	non-Federal									$0		$0	$0	$0
	Federal									$0		$0	$0	$0
30	PLANNING, ENGINEERING & DESIGN	$18,039	$3,680	20%	$21,719	3.7%	$18,699	$3,815	$22,513	$0		$20,874	$4,258	$25,133
31	CONSTRUCTION MANAGEMENT	$10,824	$2,208	20%	$13,032	3.7%	$11,220	$2,289	$13,509	$0		$13,180	$2,689	$15,869
	PROJECT COST TOTALS:	$209,262	$42,690	20%	$251,952		$213,630	$43,581	$257,211	$0		$232,406	$47,411	$279,817

CHIEF, COST ENGINEERING, Willie Honza

PROJECT MANAGER, Byron Williams

CHIEF, REAL ESTATE, Terry Rupe

CHIEF, PLANNING, Dolan Dunn

CHIEF, ENGINEERING, Joe King

CHIEF, OPERATIONS, Joe Hrametz

CHIEF, CONSTRUCTION, Don Carelock

CHIEF, CONTRACTING, Curtis Cole

CHIEF, PM-PB, Valerie Miller

CHIEF, DPM, [redacted] Edmond Russo

Filename: PLAN BIH - ~~NON-CAP TPCS R4 (2013-03) - 2014-02-03~~.xlsx
TPCS

**** TOTAL PROJECT COST SUMMARY ****

**** CONTRACT COST SUMMARY ****

PROJECT: P2-370840 Brazos Island Harbor, Texas, Channel Improvement Project
LOCATION: Cameron County, Texas
This Estimate reflects the scope and schedule in report: BIH Engineering Appendix 2014

DISTRICT: SWG Galveston District PREPARED: 1/21/2014
POC: CHIEF, COST ENGINEERING, Willie Honza

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
		Estimate Prepared: / Effective Price Level:			1/9/2014 / 1-Oct-2013	Program Year (Budget EC): / Effective Price Level Date:			2015 / 1 OCT 14	FULLY FUNDED PROJECT ESTIMATE				
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	RISK BASED CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*P*	*L*	*M*	*N*	*O*
	PHASE 1 or CONTRACT 1													
12	NAVIGATION PORTS & HARBORS													
12	non-Federal	$5,570	$1,136	20%	$6,706	1.8%	$5,672	$1,157	$6,829	2018Q2	6.3%	$6,030	$1,230	$7,260
12	Federal	$8,334	$1,700	20%	$10,035	1.8%	$8,487	$1,731	$10,219	2018Q2	6.3%	$9,023	$1,841	$10,864
12	Navigation Aids (Federal)	$90	$18	20%	$108	1.8%	$92	$19	$110	2018Q3	6.8%	$98	$20	$118
							$0							
	CONSTRUCTION ESTIMATE TOTALS:	$13,994	$2,855	20%	$16,849		$14,251	$2,907	$17,158			$15,151	$3,091	$18,242
01	LANDS AND DAMAGES													
01	non-Federal	$4	$1	25%	$5	1.8%	$4	$1	$5	2017Q1	3.8%	$4	$1	$5
01	Federal	$9	$2	25%	$11	1.8%	$9	$2	$11	2017Q1	3.8%	$10	$2	$12
30	PLANNING, ENGINEERING & DESIGN													
0.5%	Project Management	$70	$14	20%	$84	3.7%	$73	$15	$87	2017Q1	8.7%	$79	$16	$95
1.0%	Planning & Environmental Compliance	$140	$29	20%	$169	3.7%	$145	$30	$175	2017Q1	8.7%	$158	$32	$190
5.0%	Engineering & Design	$700	$143	20%	$843	3.7%	$726	$148	$874	2017Q1	8.7%	$788	$161	$949
0.7%	Reviews, ATRs, IEPRs, VE	$98	$20	20%	$118	3.7%	$102	$21	$122	2017Q1	8.7%	$110	$23	$133
0.5%	Life Cycle Updates (cost, schedule, risks)	$70	$14	20%	$84	3.7%	$73	$15	$87	2017Q1	8.7%	$79	$16	$95
0.8%	Contracting & Reprographics	$112	$23	20%	$135	3.7%	$116	$24	$140	2017Q1	8.7%	$126	$26	$152
1.5%	Engineering During Construction	$210	$43	20%	$253	3.7%	$218	$44	$262	2018Q2	14.5%	$249	$51	$300
0.0%	Planning During Construction	$0	$0	20%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
0.0%	Project Operations	$0	$0	20%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
31	CONSTRUCTION MANAGEMENT													
5.0%	Construction Management	$700	$143	20%	$843	3.7%	$726	$148	$874	2018Q2	14.5%	$831	$169	$1,000
0.5%	Project Operation:	$70	$14	20%	$84	3.7%	$73	$15	$87	2018Q2	14.5%	$83	$17	$100
0.5%	Project Management	$70	$14	20%	$84	3.7%	$73	$15	$87	2018Q2	14.5%	$83	$17	$100
	CONTRACT COST TOTALS:	$16,247	$3,315		$19,562		$16,586	$3,384	$19,970			$17,752	$3,622	**$21,374**

Filename: PLAN BIH - NON-CAP TPCS R4 (2013-03) - 2014-02-03.xlsx
TPCS

**** TOTAL PROJECT COST SUMMARY ****

**** CONTRACT COST SUMMARY ****

PROJECT: P2-370840 Brazos Island Harbor, Texas, Channel Improvement Project
LOCATION: Cameron County, Texas
This Estimate reflects the scope and schedule in report: BIH Engineering Appendix 2014

DISTRICT: SWG Galveston District PREPARED: 1/21/2014
POC: CHIEF, COST ENGINEERING, Willie Honza

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
		Estimate Prepared: / Effective Price Level:			1/9/2014 / 1-Oct-2013	Program Year (Budget EC): / Effective Price Level Date:			2015 / 1 OCT 14	FULLY FUNDED PROJECT ESTIMATE				
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*P*	*L*	*M*	*N*	*O*
	PHASE 2 or CONTRACT 2													
12	NAVIGATION PORTS & HARBORS													
12	non-Federal	$2,285	$466	20%	$2,751	1.8%	$2,327	$475	$2,802	2018Q3	6.8%	$2,486	$507	$2,993
12	Federal	$6,856	$1,399	20%	$8,254	1.8%	$6,982	$1,424	$8,406	2018Q3	6.8%	$7,458	$1,521	$8,979
12	Associated Costs (non-Federal)	$39,250	$8,007	20%	$47,257	1.8%	$39,971	$8,154	$48,125	2019Q3	8.9%	$43,508	$8,876	$52,384
							$0							
	CONSTRUCTION ESTIMATE TOTALS:	$48,391	$9,872	20%	$58,263		$49,279	$10,053	$59,332			$53,452	$10,904	$64,356
30	PLANNING, ENGINEERING & DESIGN													
0.5%	Project Management	$242	$49	20%	$291	3.7%	$251	$51	$302	2017Q1	8.7%	$273	$56	$328
1.0%	Planning & Environmental Compliance	$484	$99	20%	$583	3.7%	$502	$102	$604	2017Q1	8.7%	$545	$111	$656
5.0%	Engineering & Design	$2,420	$494	20%	$2,914	3.7%	$2,509	$512	$3,020	2017Q1	8.7%	$2,728	$556	$3,282
0.7%	Reviews, ATRs, IEPRs, VE	$339	$69	20%	$408	3.7%	$351	$72	$423	2017Q1	8.7%	$382	$78	$460
0.5%	Life Cycle Updates (cost, schedule, risks)	$242	$49	20%	$291	3.7%	$251	$51	$302	2017Q1	8.7%	$273	$56	$328
0.8%	Contracting & Reprographics	$387	$79	20%	$466	3.7%	$401	$82	$483	2017Q1	8.7%	$436	$89	$525
1.5%	Engineering During Construction	$726	$148	20%	$874	3.7%	$753	$154	$906	2018Q3	15.7%	$871	$178	$1,049
0.0%	Planning During Construction	$0	$0	20%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
0.0%	Project Operations	$0	$0	20%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
31	CONSTRUCTION MANAGEMENT													
5.0%	Construction Management	$2,420	$494	20%	$2,914	3.7%	$2,509	$512	$3,020	2018Q3	15.7%	$2,903	$592	$3,496
0.5%	Project Operation:	$242	$49	20%	$291	3.7%	$251	$51	$302	2018Q3	15.7%	$290	$59	$350
0.5%	Project Management	$242	$49	20%	$291	3.7%	$251	$51	$302	2018Q3	15.7%	$290	$59	$350
	CONTRACT COST TOTALS:	$56,135	$11,452		$67,587		$57,307	$11,691	$68,997			$62,441	$12,738	**$75,179**

**** TOTAL PROJECT COST SUMMARY ****

**** CONTRACT COST SUMMARY ****

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PROJECT: P2-370840 Brazos Island Harbor, Texas, Channel Improvement Project
LOCATION: Cameron County, Texas
This Estimate reflects the scope and schedule in report: BIH Engineering Appendix 2014

DISTRICT: SWG Galveston District PREPARED: 1/21/2014
POC: CHIEF, COST ENGINEERING, Willie Honza

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
		Estimate Prepared: Effective Price Level:			1/9/2014 1-Oct-2013	Program Year (Budget EC): Effective Price Level Date:			2015 1 OCT 14	FULLY FUNDED PROJECT ESTIMATE				
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	B	C	D	E	F	G	H	I	J	P	L	M	N	O
	PHASE 3 or CONTRACT 3													
12	NAVIGATION PORTS & HARBORS													
12	non-Federal	$8,317	$1,697	20%	$10,014	1.8%	$8,470	$1,728	$10,198	2018Q3	6.8%	$9,048	$1,846	$10,894
12	Federal	$13,463	$2,746	20%	$16,209	1.8%	$13,710	$2,797	$16,506	2018Q3	6.8%	$14,645	$2,988	$17,632
							$0							
	CONSTRUCTION ESTIMATE TOTALS:	$21,780	$4,443	20%	$26,223		$22,180	$4,525	$26,704			$23,693	$4,833	$28,526
30	PLANNING, ENGINEERING & DESIGN													
0.5%	Project Management	$109	$22	20%	$131	3.7%	$113	$23	$136	2017Q1	8.7%	$123	$25	$148
1.0%	Planning & Environmental Compliance	$218	$44	20%	$262	3.7%	$226	$46	$272	2017Q1	8.7%	$246	$50	$296
5.0%	Engineering & Design	$1,089	$222	20%	$1,311	3.7%	$1,129	$230	$1,359	2017Q1	8.7%	$1,227	$250	$1,477
0.7%	Reviews, ATRs, IEPRs, VE	$152	$31	20%	$183	3.7%	$158	$32	$190	2017Q1	8.7%	$171	$35	$206
0.5%	Life Cycle Updates (cost, schedule, risks)	$109	$22	20%	$131	3.7%	$113	$23	$136	2017Q1	8.7%	$123	$25	$148
0.8%	Contracting & Reprographics	$174	$35	20%	$209	3.7%	$180	$37	$217	2017Q1	8.7%	$196	$40	$236
1.5%	Engineering During Construction	$327	$67	20%	$394	3.7%	$339	$69	$408	2018Q3	15.7%	$392	$80	$472
0.0%	Planning During Construction	$0	$0	20%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
0.0%	Project Operations	$0	$0	20%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
31	CONSTRUCTION MANAGEMENT													
5.0%	Construction Management	$1,089	$222	20%	$1,311	3.7%	$1,129	$230	$1,359	2018Q3	15.7%	$1,307	$267	$1,573
0.5%	Project Operation:	$109	$22	20%	$131	3.7%	$113	$23	$136	2018Q3	15.7%	$131	$27	$157
0.5%	Project Management	$109	$22	20%	$131	3.7%	$113	$23	$136	2018Q3	15.7%	$131	$27	$157
	CONTRACT COST TOTALS:	$25,265	$5,154		$30,419		$25,792	$5,262	$31,054			$27,738	$5,659	**$33,396**

**** TOTAL PROJECT COST SUMMARY ****

**** CONTRACT COST SUMMARY ****

PROJECT: P2-370840 Brazos Island Harbor, Texas, Channel Improvement Project
LOCATION: Cameron County, Texas
This Estimate reflects the scope and schedule in report: BIH Engineering Appendix 2014

DISTRICT: SWG Galveston District PREPARED: 1/21/2014
POC: CHIEF, COST ENGINEERING, Willie Honza

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
		Estimate Prepared: / Effective Price Level:			1/9/2014 / 1-Oct-2013	Program Year (Budget EC): / Effective Price Level Date:			2015 / 1 OCT 14	FULLY FUNDED PROJECT ESTIMATE				
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*P*	*L*	*M*	*N*	*O*
	PHASE 4 or CONTRACT 4													
12	NAVIGATION PORTS & HARBORS													
12	non-Federal	$15,667	$3,196	20%	$18,864	1.8%	$15,955	$3,255	$19,210	2018Q4	7.3%	$17,124	$3,493	$20,617
12	Federal	$21,543	$4,395	20%	$25,938	1.8%	$21,939	$4,475	$26,414	2018Q4	7.3%	$23,546	$4,803	$28,349
							$0							
	CONSTRUCTION ESTIMATE TOTALS:	$37,210	$7,591	20%	$44,801		$37,894	$7,730	$45,624			$40,670	$8,297	$48,967
30	PLANNING, ENGINEERING & DESIGN													
0.5%	Project Management	$186	$38	20%	$224	3.7%	$193	$39	$232	2017Q2	9.8%	$212	$43	$255
1.0%	Planning & Environmental Compliance	$372	$76	20%	$448	3.7%	$386	$79	$464	2017Q2	9.8%	$423	$86	$510
5.0%	Engineering & Design	$1,861	$380	20%	$2,241	3.7%	$1,929	$394	$2,323	2017Q2	9.8%	$2,118	$432	$2,550
0.7%	Reviews, ATRs, IEPRs, VE	$260	$53	20%	$313	3.7%	$270	$55	$324	2017Q2	9.8%	$296	$60	$356
0.5%	Life Cycle Updates (cost, schedule, risks)	$186	$38	20%	$224	3.7%	$193	$39	$232	2017Q2	9.8%	$212	$43	$255
0.8%	Contracting & Reprographics	$298	$61	20%	$359	3.7%	$309	$63	$372	2017Q2	9.8%	$339	$69	$408
1.5%	Engineering During Construction	$558	$114	20%	$672	3.7%	$578	$118	$696	2018Q4	17.0%	$677	$138	$815
0.0%	Planning During Construction	$0	$0	20%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
0.0%	Project Operations	$0	$0	20%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
31	CONSTRUCTION MANAGEMENT													
5.0%	Construction Management	$1,861	$380	20%	$2,241	3.7%	$1,929	$394	$2,323	2018Q4	17.0%	$2,256	$460	$2,717
0.5%	Project Operation:	$186	$38	20%	$224	3.7%	$193	$39	$232	2018Q4	17.0%	$226	$46	$272
0.5%	Project Management	$186	$38	20%	$224	3.7%	$193	$39	$232	2018Q4	17.0%	$226	$46	$272
	CONTRACT COST TOTALS:	$43,164	$8,806		$51,970		$44,065	$8,989	$53,055			$47,654	$9,721	**$57,375**

****** TOTAL PROJECT COST SUMMARY ******

****** CONTRACT COST SUMMARY ******

PROJECT: P2-370840 Brazos Island Harbor, Texas, Channel Improvement Project
LOCATION: Cameron County, Texas
This Estimate reflects the scope and schedule in report: BIH Engineering Appendix 2014

DISTRICT: SWG Galveston District PREPARED: 1/21/2014
POC: CHIEF, COST ENGINEERING, Willie Honza

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
		Estimate Prepared: / Effective Price Level:			1/9/2014 / 1-Oct-2013	Program Year (Budget EC): / Effective Price Level Date:			2015 / 1 OCT 14	FULLY FUNDED PROJECT ESTIMATE				
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*P*	*L*	*M*	*N*	*O*
	PHASE 5 or CONTRACT 5													
12	NAVIGATION PORTS & HARBORS													
12	non-Federal	$2,769	$565	20%	$3,334	1.8%	$2,820	$575	$3,395	2018Q3	6.8%	$3,012	$615	$3,627
12	Federal	$4,850	$989	20%	$5,839	1.8%	$4,939	$1,008	$5,947	2018Q3	6.8%	$5,276	$1,076	$6,352
							$0							
	CONSTRUCTION ESTIMATE TOTALS:	$7,619	$1,554	20%	$9,173		$7,759	$1,583	$9,342			$8,288	$1,691	$9,979
30	PLANNING, ENGINEERING & DESIGN													
0.5%	Project Management	$38	$8	20%	$46	3.7%	$39	$8	$47	2017Q2	9.8%	$43	$9	$52
1.0%	Planning & Environmental Compliance	$76	$16	20%	$92	3.7%	$79	$16	$95	2017Q2	9.8%	$86	$18	$104
5.0%	Engineering & Design	$381	$78	20%	$459	3.7%	$395	$81	$476	2017Q2	9.8%	$434	$88	$522
0.7%	Reviews, ATRs, IEPRs, VE	$53	$11	20%	$64	3.7%	$55	$11	$66	2017Q2	9.8%	$60	$12	$73
0.5%	Life Cycle Updates (cost, schedule, risks)	$38	$8	20%	$46	3.7%	$39	$8	$47	2017Q2	9.8%	$43	$9	$52
0.8%	Contracting & Reprographics	$61	$12	20%	$73	3.7%	$63	$13	$76	2017Q2	9.8%	$69	$14	$84
1.5%	Engineering During Construction	$114	$23	20%	$137	3.7%	$118	$24	$142	2018Q3	15.7%	$137	$28	$165
0.0%	Planning During Construction	$0	$0	20%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
0.0%	Project Operations	$0	$0	20%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
31	CONSTRUCTION MANAGEMENT													
5.0%	Construction Management	$381	$78	20%	$459	3.7%	$395	$81	$476	2018Q3	15.7%	$457	$93	$550
0.5%	Project Operation:	$38	$8	20%	$46	3.7%	$39	$8	$47	2018Q3	15.7%	$46	$9	$55
0.5%	Project Management	$38	$8	20%	$46	3.7%	$39	$8	$47	2018Q3	15.7%	$46	$9	$55
	CONTRACT COST TOTALS:	$8,837	$1,803		$10,640		$9,021	$1,840	$10,862			$9,709	$1,981	**$11,690**

**** TOTAL PROJECT COST SUMMARY ****

**** CONTRACT COST SUMMARY ****

PROJECT: P2-370840 Brazos Island Harbor, Texas, Channel Improvement Project
LOCATION: Cameron County, Texas
This Estimate reflects the scope and schedule in report: BIH Engineering Appendix 2014

DISTRICT: SWG Galveston District PREPARED: 1/21/2014
POC: CHIEF, COST ENGINEERING, Willie Honza

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
		Estimate Prepared: 1/9/2014 Effective Price Level: 1-Oct-2013				Program Year (Budget EC): 2015 Effective Price Level Date: 1 OCT 14				FULLY FUNDED PROJECT ESTIMATE				
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	*B*	C	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*P*	*L*	*M*	*N*	*O*
	PHASE 6 or CONTRACT 6													
12	NAVIGATION PORTS & HARBORS													
12	non-Federal	$12,305	$2,510	20%	$14,815	1.8%	$12,531	$2,556	$15,087	2019Q3	8.9%	$13,640	$2,783	$16,423
12	Federal	$17,002	$3,468	20%	$20,471	1.8%	$17,314	$3,532	$20,846	2019Q3	8.9%	$18,847	$3,845	$22,691
							$0							
	CONSTRUCTION ESTIMATE TOTALS:	$29,307	$5,979	20%	**$35,286**		$29,845	$6,088	$35,934			$32,487	$6,627	$39,114
30	PLANNING, ENGINEERING & DESIGN													
0.5%	Project Management	$147	$30	20%	$177	3.7%	$152	$31	$183	2018Q2	14.5%	$174	$36	$210
1.0%	Planning & Environmental Compliance	$293	$60	20%	$353	3.7%	$304	$62	$366	2018Q2	14.5%	$348	$71	$419
5.0%	Engineering & Design	$1,465	$299	20%	$1,764	3.7%	$1,519	$310	$1,828	2018Q2	14.5%	$1,739	$355	$2,094
0.7%	Reviews, ATRs, IEPRs, VE	$205	$42	20%	$247	3.7%	$212	$43	$256	2018Q2	14.5%	$243	$50	$293
0.5%	Life Cycle Updates (cost, schedule, risks)	$147	$30	20%	$177	3.7%	$152	$31	$183	2018Q2	14.5%	$174	$36	$210
0.8%	Contracting & Reprographics	$234	$48	20%	$282	3.7%	$243	$49	$292	2018Q2	14.5%	$278	$57	$334
1.5%	Engineering During Construction	$440	$90	20%	$530	3.7%	$456	$93	$549	2019Q3	20.7%	$551	$112	$663
0.0%	Planning During Construction	$0	$0	20%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
0.0%	Project Operations	$0	$0	20%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
31	CONSTRUCTION MANAGEMENT													
5.0%	Construction Management	$1,465	$299	20%	$1,764	3.7%	$1,519	$310	$1,828	2019Q3	20.7%	$1,833	$374	$2,207
0.5%	Project Operation:	$147	$30	20%	$177	3.7%	$152	$31	$183	2019Q3	20.7%	$184	$38	$221
0.5%	Project Management	$147	$30	20%	$177	3.7%	$152	$31	$183	2019Q3	20.7%	$184	$38	$221
	CONTRACT COST TOTALS:	$33,997	$6,935		**$40,933**		$34,707	$7,080	$41,787			$38,195	$7,792	**$45,987**

****** TOTAL PROJECT COST SUMMARY ******

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**** CONTRACT COST SUMMARY ****

PROJECT: P2-370840 Brazos Island Harbor, Texas, Channel Improvement Project
LOCATION: Cameron County, Texas
This Estimate reflects the scope and schedule in report: BIH Engineering Appendix 2014

DISTRICT: SWG Galveston District PREPARED: 1/21/2014
POC: CHIEF, COST ENGINEERING, Willie Honza

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
		Estimate Prepared: 1/9/2014 Effective Price Level: 1-Oct-2013				Program Year (Budget EC): 2015 Effective Price Level Date: 1 OCT 14				FULLY FUNDED PROJECT ESTIMATE				
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*P*	*L*	*M*	*N*	*O*
	PHASE 7 or CONTRACT 7													
12	NAVIGATION PORTS & HARBORS													
12	non-Federal	$8,855	$1,806	20%	$10,661	1.8%	$9,018	$1,840	$10,857	2019Q4	9.4%	$9,862	$2,012	$11,874
12	Federal	$13,230	$2,699	20%	$15,928	1.8%	$13,472	$2,748	$16,221	2019Q4	9.4%	$14,734	$3,006	$17,740
							$0							
	CONSTRUCTION ESTIMATE TOTALS:	$22,065	$4,505	20%	$26,590		$22,490	$4,588	$27,078			$24,597	$5,018	$29,614
30	PLANNING, ENGINEERING & DESIGN													
0.5%	Project Management	$110	$22	20%	$132	3.7%	$114	$23	$137	2018Q2	14.5%	$131	$27	$157
1.0%	Planning & Environmental Compliance	$221	$45	20%	$266	3.7%	$229	$47	$276	2018Q2	14.5%	$262	$54	$316
5.0%	Engineering & Design	$1,104	$225	20%	$1,329	3.7%	$1,144	$233	$1,378	2018Q2	14.5%	$1,310	$267	$1,578
0.7%	Reviews, ATRs, IEPRs, VE	$155	$32	20%	$187	3.7%	$161	$33	$193	2018Q2	14.5%	$184	$38	$222
0.5%	Life Cycle Updates (cost, schedule, risks)	$110	$22	20%	$132	3.7%	$114	$23	$137	2018Q2	14.5%	$131	$27	$157
0.8%	Contracting & Reprographics	$177	$36	20%	$213	3.7%	$183	$37	$221	2018Q2	14.5%	$210	$43	$253
1.5%	Engineering During Construction	$331	$68	20%	$399	3.7%	$343	$70	$413	2019Q4	22.0%	$419	$85	$504
0.0%	Planning During Construction	$0	$0	20%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
0.0%	Project Operations	$0	$0	20%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
31	CONSTRUCTION MANAGEMENT													
5.0%	Construction Management	$1,104	$225	20%	$1,329	3.7%	$1,144	$233	$1,378	2019Q4	22.0%	$1,396	$285	$1,681
0.5%	Project Operation:	$110	$22	20%	$132	3.7%	$114	$23	$137	2019Q4	22.0%	$139	$28	$167
0.5%	Project Management	$110	$22	20%	$132	3.7%	$114	$23	$137	2019Q4	22.0%	$139	$28	$167
	CONTRACT COST TOTALS:	$25,617	$5,226		$30,842		$26,151	$5,335	$31,486			$28,917	$5,899	$34,817

Filename: PLAN BIH - NON-CAP TPCS R4 (2013-03) - 2014-02-03.xlsx
TPCS

US Army Corps
of Engineers®

P2-370840

Brazos Island Harbor, Texas, Channel Improvement Project Feasibility Study Project Cost and Schedule Risk Analysis Report

Prepared by:

U.S. Army Corps of Engineers,
Galveston District

Reviewed by:

U.S. Army Corps of Engineers
Cost Engineering Directory of Expertise, Walla Walla

February 2014

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EXECUTIVE SUMMARY

The US Army Corps of Engineers (USACE), Galveston District, presents this cost and schedule risk analysis (CSRA) report regarding the risk findings and recommended contingencies for Brazos Island Harbor (BIH), Texas, Channel Improvement Project. In compliance with Engineer Regulation (ER) 1110-2-1302 CIVIL WORKS COST ENGINEERING, dated September 15, 2008, a formal risk analysis, *Monte-Carlo* based-study was conducted by the Project Development Team (PDT) on remaining costs. The purpose of this risk analysis study is to present the cost and schedule risks considered, those determined and respective project contingencies at a recommend 80% confidence level of successful execution to project completion.

Port of Brownsville is located on the south Texas coast near the border of U.S. and Mexico. The study area encompasses the entire Brownsville Ship Channel and surrounding region. The entrance channel is located offshore of Cameron County, Texas, in the Gulf of Mexico, and ends at Port of Brownsville Main Harbor. Brownsville Ship Channel provides deep draft access from the Gulf of Mexico through a jetty entrance channel to Brownsville, and a side channel, authorized to 36-feet, and a shallow draft Fishing Boat Harbor near Port Isabel. The primary purpose of the study is navigation, which consists of enlarging the existing Brownsville Ship Channel by deepening the entrance channel, jetty channel, the lower section of the main channel, the upper section of the main channel, and turning basin.

Specific to the BIH, Texas, Channel Improvement Project, the current fully funded estimate approximates $280M. The estimated base project cost for the work approximates $209M. This CSRA study excludes spent costs and is expressed in FY 2014 dollars. Since the Real Estate office provided a separate 25% contingency for its real estate requirements, SWG performed the study on the estimated construction costs. Since the Port of Brownsville provided Associated Costs, the developed construction contingency was applied to the Associated Costs. Based on the results of the analysis, the Galveston District (preparer) and the Cost Engineering Mandatory Center of Expertise for Civil Works (MCX located in Walla Walla District) (reviewer) recommend a contingency value of $42.6M or approximately 20.4% of base project cost.

Galveston District performed a risk analysis using the *Monte Carlo* technique for the estimated construction costs, supported by District PDT input. The following table, ES-1, portrays the development of the construction contingencies (20.4%). The contingency is based on an 80% confidence level, as per USACE Civil Works guidance.

Table ES-1. Construction Contingency Results

Base Case Construction Cost Estimate	209,248,193	
Confidence Level	**Construction Value ($$)**	**Contingency (%)**
5%	$222,142,395	6.2%
50%	$240,194,321	14.8%
80%	**$251,852,693**	**20.4%**
90%	$256,888,586	22.8%

KEY FINDINGS/OBSERVATIONS RECOMMENDATIONS

The PDT worked through the risk register on 18 Jun 2013, in addition to follow-on e-mails and discussions. That period of time allowed improved project scope definition, investigations, design and cost information, and resulted in reduced risks in certain project areas. The key risk drivers identified through sensitivity analysis suggest a cost contingency of $24.8M and schedule risks adding another potential of $17.8, both at an 80% confidence level.

Cost Risks: From the CSRA, the key or greater Cost Risk items include:

- Q-5: Quantities for Current Scope: Pipeline Dredging – Surveys are required during PED. New surveys may indicate high shoaling (or eroding) areas not previously accounted for in modeling, which increase (or decrease) quantities (required depth) for current scope. Hopper could be used for reach adjacent to entrance channel (with pump-out), which could decrease cost by removing one mobilization and demobilization from project costs. Any changes in quantities due to storms during construction are found in "Programmatic Risks." Any changes in quantities due to storms after construction are handled in OM.
- CT-5: Estimate and Schedule Risks: Pipeline Dredging – On dredging projects, fuel is a major cost driver for equipment. Fuel has fluctuated in FY13, e.g. minimum ($3.09), maximum ($3.64), and average ($3.30). An upswing in fuel cost is anticipated.

Moderate risks, when combined, can also become a cost impact.

- EX-5: Programmatic Risks: Pipeline Dredging – There is a potential for weather damages and delays, e.g. tropical depressions or hurricane, should project construction occur during hurricane season, which is anticipated. A recurrence interval of 25-years (4% chance of occurrence in any given year) over three-year project duration was assumed, which resulted in 11.5 probability of occurrence.

- AS-3: Contract Acquisition Strategy Risks: Mobilization and Demobilization – Dredges are limited in quantity. It is unknown how competitive the market will be at time of award. The schedule is organized to encourage dredges working on one contract to finish on time in order to bid on the next contract, which could be recognized as cost savings to the Government via reduction in mobilization and demobilization costs. These potential (but not guaranteed) savings are not included in the estimate.
- CE-6: Construction Risks: Containment Dikes – There is minimal access to placement area sites, only one-way-in and one-way-out accessibility, in most cases. For PA2, access is assumed by water due to low beach access and piping plover wintering season at nine (9) months. Water access may prove difficult should depth of water not be adequate for tug to ground barge near PA.
- Q-4: Quantities for Current Scope: Hopper Dredging – Surveys are required during PED. New surveys may indicate high shoaling (or eroding) areas not previously accounted for in modeling, which increase (or decrease) quantities (required depth) for current scope. Any changes in quantities due to storms during construction are found in "Programmatic Risks." Any changes in quantities due to storms after construction are handled in OM.
- Q-6: Quantities for Current Scope: Containment Dikes – Quantities are neat line. That is, quantities are based on old survey data (one typical section along the edge of work defines the volume), densities are assumed in the areas based on historical practices, and take-offs do not include contingencies. Any changes in quantities due to storms during construction are found in "Programmatic Risks."

Schedule Risks: The high value of schedule risk indicates a significant uncertainty of key risk items, time duration growth that can translate into added costs. Over time, risks increase on those out-year contracts where there is greater potential for change in new scope requirements, uncertain market conditions, and unexpected high inflation. The greatest risks are the following:

- EX-10: Programmatic Risks: Congressional Funding – It is uncertain whether all needed Congressional funding for PED will be made available in a timely manner. Construction is assumed multiple contracts (7) to account for an uneven construction funding stream, i.e. each contract is approximately one (1) year in duration. Delays in funding may result in additional PED expenses as well as escalation in schedule growth. If authorization has already been received, even if the construction funding is delayed, the funding will add the OMB escalation onto the funding request.
- CE-5: Construction Risks: Pipeline Dredging – Project is likely to experience boat traffic issues due to long pipeline lengths and one-way traffic. There is minimal access to placement area sites, only one-way-in and one-way-out accessibility, in most cases. For estimate purposes and contractor capabilities, no more than three (3) dredges will be underway at any given time. In addition, dredges will be

located no less than one (1) mile apart due to Coast Guard regulations; for estimate purposes, the dredges have been strategically spaced at stations so as not to impede dredging workflow.

Moderate risks, when combined, can also become a time and (resulting) cost impact.

- AS-3: Contract Acquisition Strategy Risks: Mobilization and Demobilization – Dredges are limited in quantity. It is unknown how competitive the market will be at time of award. The schedule is organized to encourage dredges working on one contract to finish on time in order to bid on the next contract, which could be recognized as cost savings to the Government via reduction in mobilization and demobilization costs. These potential (but not guaranteed) savings are not included in the estimate.

Recommendations: The PDT must include the recommended cost and schedule contingencies and incorporate risk monitoring and mitigation on those identified risks. Further iterative study and update of the risk analysis throughout the project life-cycle is important in support of the remaining project work within an approved budget and appropriation.

MAIN REPORT

1.0 PURPOSE

Under the auspices of the US Army Corps of Engineers (USACE), Galveston District, this report presents a recommendation for the total project cost and schedule contingencies for Brazos Island Harbor (BIH), Texas, Channel Improvement Project: Feasibility Study.

2.0 BACKGROUND

Port of Brownsville is located on the south Texas coast near the border of U.S. and Mexico. The study area encompasses the entire Brownsville Ship Channel and surrounding region. The entrance channel is located offshore of Cameron County, Texas, in the Gulf of Mexico, and ends at Port of Brownsville Main Harbor. Brownsville Ship Channel provides deep draft access from the Gulf of Mexico through a jetty entrance channel to Brownsville, and a side channel, authorized to 36-feet, and a shallow draft Fishing Boat Harbor near Port Isabel. The primary purpose of the study is navigation, which consists of enlarging the existing Brownsville Ship Channel by deepening the entrance channel, jetty channel, the lower section of the main channel, the upper section of the main channel, and turning basin.

Galveston District is preparing the Project Cost and Schedule Risk Analysis (CSRA) Report. As a part of this effort, Galveston District requested that the USACE Cost Engineering Technical Center of Expertise for Civil Works (Cost Engineering MCX) provide an Agency Technical Review (ATR) of the cost estimate and schedule.

3.0 REPORT SCOPE

The scope of the risk analysis report is to identify cost and schedule risks with a resulting recommendation for contingencies at the 80 percent confidence level using the risk analysis processes, as mandated by U.S. Army Corps of Engineers (USACE) Engineer Regulation (ER) 1110-2-1150, Engineering and Design for Civil Works, ER 1110-2-1302, Civil Works Cost Engineering, and Engineer Technical Letter 1110-2-573, Construction Cost Estimating Guide for Civil Works. The report presents the contingency results for cost risks for construction features. The CSRA excludes Real Estate costs and does not include consideration for life cycle costs.

3.1 Project Scope

The formal process included extensive involvement of the PDT for risk identification and the development of the risk register. The analysis process evaluated the Micro Computer Aided Cost Estimating System (MCACES) cost estimate, project schedule, and funding profiles using Crystal Ball software to conduct a *Monte Carlo* simulation and statistical sensitivity analysis, per the guidance in Engineer Technical Letter (ETL) Construction Cost Estimating Guide for Civil Works, dated September 30, 2008.

The project technical scope, estimates and schedules were developed and presented by the Galveston District. Consequently, these documents serve as the basis for the risk analysis.

The scope of this study addresses the identification of concerns, needs, opportunities and potential solutions that are viable from an economic, environmental, and engineering viewpoint.

3.2 USACE Risk Analysis Process

The risk analysis process for this study follows the USACE Headquarters requirements as well as the guidance provided by the Cost Engineering MCX. The risk analysis process reflected within this report uses probabilistic cost and schedule risk analysis methods within the framework of the Crystal Ball software. Furthermore, the scope of the report includes the identification and communication of important steps, logic, key assumptions, limitations, and decisions to help ensure that risk analysis results can be appropriately interpreted.

Risk analysis results are also intended to provide project leadership with contingency information for scheduling, budgeting, and project control purposes, as well as to provide tools to support decision making and risk management as the project progresses through planning and implementation. To fully recognize its benefits, cost and schedule risk analysis should be considered as an ongoing process conducted concurrent to, and iteratively with, other important project processes such as scope and execution plan development, resource planning, procurement planning, cost estimating, budgeting and scheduling.

In addition to broadly defined risk analysis standards and recommended practices, this risk analysis was performed to meet the requirements and recommendations of the following documents and sources:

- Cost and Schedule Risk Analysis Process guidance prepared by the USACE Cost Engineering MCX.

- Engineer Regulation (ER) 1110-2-1302 Civil Works Cost Engineering, dated September 15, 2008.

- Engineer Technical Letter (ETL) Construction Cost Estimating Guide for Civil Works, dated September 30, 2008.

4.0 METHODOLOGY / PROCESS

The Galveston District performed the Cost and Schedule Risk Analysis. The Cost Engineer facilitated a risk identification meeting with the Project Delivery Team (PDT) on 18 June 2013. The initial risk identification meeting also included qualitative analysis to produce a risk register that served as the framework for the risk analysis. The PDT held sanity checks of the risk analysis, and additional analysis between the dates of 18 June 2013 thru (a final risk register date of) 09 January 2014. This time period included a preliminary ATR of the project documents, which necessitated changes to both the cost estimate and the Cost and Schedule Risk Analysis.

Participants in the risk identification meeting of 18 June 2013, in addition to follow-on e-mails and discussions, included:

Name	Organization	Title
Byron Williams	USACE - SWG	Project Manager
Sheridan Willey	USACE - SWG	Planning Lead
Brenda Hayden	USACE - SWG	Engineering Lead
Janelle Stokes	USACE - SWG	Environmental Lead
Kathleen Williams	USACE - SWG	Regional Economist
Kimberly Jackson	USACE – SWT	Real Estate Specialist
Sarah Xie DeSoto	USACE – SWG	Structures, Geotechnical Engineer
Eric Wood	USACE – SWG	Hydrology, Hydraulics Engineer
Eduardo Irigoyen	USACE - SWG	Construction Manager
Alicia Rea	USACE - SWG	Operations Manager
Martin Regner	USACE - SWG	Contracting Officer Representative
Martin Regner	USACE - SWG	Cost Engineer / Risk Facilitator

The risk analysis process for this study is intended to determine the probability of various cost outcomes and quantify the required contingency needed in the cost estimate to achieve the desired level of cost confidence. Per regulation and guidance, the P80 confidence level (80% confidence level) is the normal and accepted cost confidence level. District Management has the prerogative to select different confidence levels, pending approval from Headquarters, USACE.

In simple terms, contingency is an amount added to an estimate to allow for items, conditions or events for which the occurrence or impact is uncertain and that experience suggests will likely result in additional costs being incurred or additional time being required. The amount of contingency included in project control plans depends, at least in part, on the project leadership's willingness to accept risk of project overruns. The less risk that project leadership is willing to accept the more contingency should be applied in the project control plans. The risk of overrun is expressed, in a probabilistic context, using confidence levels.

The Cost MCX guidance for cost and schedule risk analysis generally focuses on the 80-percent level of confidence (P80) for cost contingency calculation. It should be noted that use of P80 as a decision criteria is a risk averse approach (whereas the use of P50 would be a risk neutral approach, and use of levels less than 50 percent would be risk seeking). Thus, a P80 confidence level results in greater contingency as compared to a P50 confidence level. The selection of contingency at a particular confidence level is ultimately the decision and responsibility of the project's District and/or Division management.

The risk analysis process uses *Monte Carlo* techniques to determine probabilities and contingency. The *Monte Carlo* techniques are facilitated computationally by a commercially available risk analysis software package (Crystal Ball) that is an add-in to Microsoft Excel. Cost estimates are packaged into an Excel format and used directly for cost risk analysis purposes. The level of detail recreated in the Excel-format schedule is sufficient for risk analysis purposes that reflect the established risk register, but generally less than that of the native format.

The primary steps, in functional terms, of the risk analysis process are described in the following subsections. Risk analysis results are provided in Section 6.

4.1 Identify and Assess Risk Factors

Identifying the risk factors via the PDT is considered a qualitative process that results in establishing a risk register that serves as the document for the quantitative study using the Crystal Ball risk software. Risk factors are events and conditions that may influence or drive uncertainty in project performance. They may be inherent characteristics or conditions of the project or external influences, events, or conditions such as weather or economic conditions. Risk factors may have either favorable or unfavorable impacts on project cost and schedule.

A formal PDT meeting was held with the Galveston District office for the purposes of identifying and assessing risk factors. The meeting (conducted 18 June 2013) included capable and qualified representatives from multiple project team disciplines and functions, including project management, cost engineering, design, environmental compliance, and real estate

The initial formal meetings focused primarily on risk factor identification using brainstorming techniques, but also included some facilitated discussions based on risk factors common to projects of similar scope and geographic location. Additionally, numerous conference calls, informal meetings, and e-mails were conducted and/or traded throughout the risk analysis process on an as-needed basis to further facilitate risk factor identification, market analysis, and risk assessment. The finalization of the risk register, CSRA model, findings, and results occurred 09 January 2014.

4.2 Quantify Risk Factor Impacts

The quantitative impacts (putting it to numbers of cost and time) of risk factors on project plans were analyzed using a combination of professional judgment, empirical data and analytical techniques. Risk factor impacts were quantified using probability distributions (density functions) because risk factors are entered into the Crystal Ball software in the form of probability density functions.

Similar to the identification and assessment process, risk factor quantification involved multiple project team disciplines and functions. However, the quantification process relied more extensively on collaboration between cost engineering and risk analysis team members with lesser inputs from other functions and disciplines. This process used an iterative approach to estimate the following elements of each risk factor:

- Maximum possible value for the risk factor
- Minimum possible value for the risk factor
- Most likely value (the statistical mode), if applicable
- Nature of the probability density function used to approximate risk factor uncertainty
- Mathematical correlations between risk factors
- Affected cost estimate and schedule elements

The resulting product from the PDT discussions is captured within a risk register as presented in Section 6 for both cost and schedule risk concerns. Note that the risk register records the PDT's risk concerns, discussions related to those concerns, and potential impacts to the current cost and schedule estimates. The concerns and discussions support the team's decisions related to event likelihood, impact, and the resulting risk levels for each risk event.

4.3 Analyze Cost Estimate and Schedule Contingency

Contingency is analyzed using the Crystal Ball software, an add-in to the Microsoft Excel format of the cost estimate and schedule. *Monte Carlo* simulations are performed by applying the risk factors (quantified as probability density functions) to the appropriate estimated cost and schedule elements identified by the PDT.

Contingencies are calculated by applying only the moderate and high level risks identified for each option (i.e., low-level risks are typically not considered, but remain within the risk register to serve historical purposes as well as support follow-on risk studies as the project and risks evolve).

For the cost estimate, the contingency is calculated as the difference between the P80 cost forecast and the baseline cost estimate. Each option-specific contingency is then allocated on a civil works feature level based on the dollar-weighted relative risk of each feature as quantified by *Monte Carlo* simulation. Standard deviation is used as the feature-specific measure of risk for contingency allocation purposes. This approach results in a relatively larger portion of all the project feature cost contingency being allocated to features with relatively higher estimated cost uncertainty.

5.0 PROJECT ASSUMPTIONS

The following data sources and assumptions were used in quantifying the costs associated with the BIH, Texas, Channel Improvement Project.

a. Galveston District MII MCACES (Micro-Computer Aided Cost Estimating Software) files were the basis for the cost and schedule risk analyses.

b. The cost comparisons and risk analyses performed and reflected within this report are based on design scope and estimates that are at the feasibility level.

c. Schedules are analyzed for impact to the project cost in terms of both uncaptured escalation (variance from OMB factors and the local market) and unavoidable fixed contract costs, and/or languishing federal administration costs incurred throughout delay. Specific to BIH, the schedule was analyzed only for impacts due to residual fixed costs.

d. Per the CWCCIS Historical State Adjustment Factors in EM 1110-2-1304, State Adjustment Factor for the State of Texas is 0.87, meaning that the average inflation for the project area is assumed to be 13% lower than the national average for inflation. Therefore, it is assumed that the project inflations experienced are similar (or better) to OMB inflation factors for future construction. Thus, the risk analyses accounted for no escalation over and above the national average.

e. Per the data in the estimate, the Job Office Overhead (JOOH) percentage for the Prime Contractor is 15%. Thus, the assumed residual fixed cost rate for this project is 15%. For the P80 schedule, this comprises approximately 15% of the total contingency due to the accrual of residual fixed costs associated with delay.

f. The Cost MCX guidance generally focuses on the eighty-percent level of confidence (P80) for cost contingency calculation. For this risk analysis, the eighty-percent level of confidence (P80) was used. It should be noted that the use of P80 as a decision criteria is a moderately risk averse approach, generally resulting in higher cost contingencies. However, the P80 level of confidence also assumes a small degree of risk that the recommended contingencies may be inadequate to capture actual project costs.

g. Only high and moderate risk level impacts, as identified in the risk register, were considered for the purposes of calculating cost contingency. If model results implied that a moderate risk was in fact a low level risk (or vice versa), then the risk was reclassified (but not removed from the model). Low level risk impacts should be maintained in project management documentation and reviewed at each project milestone to determine if they should be placed on the risk "watch list."

h. Real estate costs and contingencies (25%) were developed and provided by District Real Estate Division. As a result, the PDT did not perform risk identification on Real Estate unless it had a construction cost potential, e.g. PS-1: Project Scope Growth: Relocations (low risk).

i. The Associated Costs were developed and provided by the Port of Brownsville. As a result, the PDT did not perform risk identification on the Associated Costs. The recommended contingency value for construction costs was applied to the Associated Costs in order to capture potential, unidentified risks.

j. Potential weather damages and delays were captured via a recurrence interval of 25-years (4% chance of occurrence in any given year) over three-year project duration, which resulted in 11.5% probability of occurrence (yes-no assumption).

6.0 RESULTS

The cost and schedule risk analysis results are provided in the following sections. In addition to contingency calculation results, sensitivity analyses are presented to provide decision makers with an understanding of variability and the key contributors to the cause of this variability.

6.1 Risk Register

A risk register is a tool commonly used in project planning and risk analysis. The actual risk register is provided in Appendix A. The complete risk register includes low level risks, as well as additional information regarding the nature and impacts of each risk.

It is important to note that a risk register can be an effective tool for managing identified risks throughout the project life cycle. As such, it is generally recommended that risk registers be updated as the designs, cost estimates, and schedule are further refined, especially on large projects with extended schedules. Recommended uses of the risk register going forward include:

- Documenting risk mitigation strategies being pursued in response to the identified risks and their assessment in terms of probability and impact.
- Providing project sponsors, stakeholders, and leadership/management with a documented framework from which risk status can be reported in the context of project controls.
- Communicating risk management issues.
- Providing a mechanism for eliciting feedback and project control input.
- Identifying risk transfer, elimination, or mitigation actions required for implementation of risk management plans.

6.2 Cost Contingency and Sensitivity Analysis

The result of risk or uncertainty analysis is quantification of the cumulative impact of all analyzed risks or uncertainties as compared to probability of occurrence. These results, as applied to the analysis herein, depict the overall project cost at intervals of confidence (probability).

Table 1 provides the construction cost contingencies calculated for the P80 confidence level and rounded to the nearest thousand. The construction cost contingencies for the P5, P50 and P90 confidence levels are also provided for illustrative purposes only.

Cost contingency for the Construction risks (including schedule impacts converted to dollars) was quantified as approximately $42.6 Million at the P80 confidence level (20.4% of the baseline construction cost estimate).

Table 1. Construction Cost Contingency Summary

Base Case Construction Cost Estimate	**209,248,193**	
Confidence Level	**Construction Value ($$)**	**Contingency (%)**
5%	$222,142,395	6.2%
50%	$240,194,321	14.8%
80%	**$251,852,693**	**20.4%**
90%	$256,888,586	22.8%

6.2.1 Sensitivity Analysis

Sensitivity analysis generally ranks the relative impact of each risk/opportunity as a percentage of total cost uncertainty. The Crystal Ball software uses a statistical measure (contribution to variance) that approximates the impact of each risk/opportunity contributing to variability of cost outcomes during *Monte Carlo* simulation.

Key cost drivers identified in the sensitivity analysis can be used to support development of a risk management plan that will facilitate control of risk factors and their potential impacts throughout the project lifecycle. Together with the risk register, sensitivity analysis results can also be used to support development of strategies to eliminate, mitigate, accept or transfer key risks.

6.2.2 Sensitivity Analysis Results

The risks/opportunities considered as key or primary cost drivers and the respective value variance are ranked in order of importance in contribution to variance bar charts. Opportunities that have a potential to reduce project cost and are shown with a negative sign; risks are shown with a positive sign to reflect the potential to increase project cost. A longer bar in the sensitivity analysis chart represents a greater potential impact to project cost.

Figure 1 presents a sensitivity analysis for cost growth risk from the high level cost risks identified in the risk register. Likewise, Figure 2 presents a sensitivity analysis for schedule growth risk from the high level schedule risks identified in the risk register.

Figure 1. Cost Sensitivity Analysis

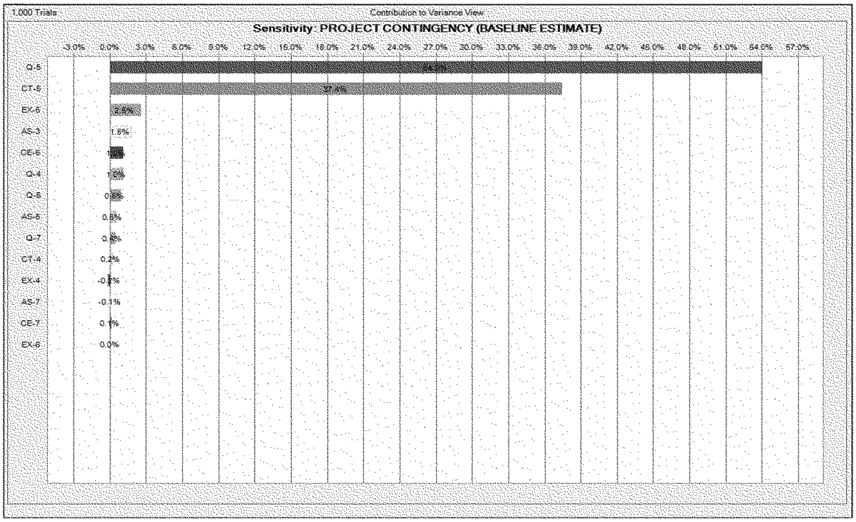

Figure 1. Key		
NO.	CATEGORY	EVENT
AS-3	Contract Acquisition Strategy Risks	Mobilization and Demobilization
AS-6	Contract Acquisition Strategy Risks	Containment Dikes
AS-7	Contract Acquisition Strategy Risks	Shoreline Stabilization
Q-4	Quantities for Current Scope	Hopper Dredging
Q-5	Quantities for Current Scope	Pipeline Dredging
Q-6	Quantities for Current Scope	Containment Dikes
Q-7	Quantities for Current Scope	Shoreline Stabilization
CE-6	Construction Risks	Containment Dikes
CE-7	Construction Risks	Shoreline Stabilization
CT-4	Estimate and Schedule Risks	Hopper Dredging
CT-5	Estimate and Schedule Risks	Pipeline Dredging
EX-4	Programmatic Risks	Hopper Dredging
EX-5	Programmatic Risks	Pipeline Dredging
EX-6	Programmatic Risks	Containment Dikes

6.3 Schedule and Contingency Risk Analysis

The result of risk or uncertainty analysis is quantification of the cumulative impact of all analyzed risks or uncertainties as compared to probability of occurrence. These results, as applied to the analysis herein, depict the overall project duration at intervals of confidence (probability).

Table 2 provides the schedule duration contingencies calculated for the P80 confidence level. The schedule duration contingencies for the P50 and P90 confidence levels are also provided for illustrative purposes.

Schedule duration contingency was quantified as 17.7 months based on the P80 level of confidence. These contingencies were used to calculate the projected residual fixed cost impact of project delays that are included in the Table 1 presentation of total cost contingency. The schedule contingencies were calculated by applying the high level schedule risks identified in the risk register for each option to the durations of critical path and near critical path tasks.

The schedule was not resource loaded and contained open-ended tasks and non-zero lags (gaps in the logic between tasks) that limit the overall utility of the schedule risk analysis. These issues should be considered as limitations in the utility of the schedule contingency data presented. Schedule contingency impacts presented in this analysis are based solely on projected residual fixed costs.

Table 2. Schedule Duration Contingency Summary

Risk Analysis Forecast	Schedule Duration (months)	Contingency[1] (months)
50% Confidence Level		
Project Duration	42.3	13.3
80% Confidence Level		
Project Duration	46.7	17.7
90% Confidence Level		
Project Duration	49.2	20.2

Figure 2. Schedule Sensitivity Analysis

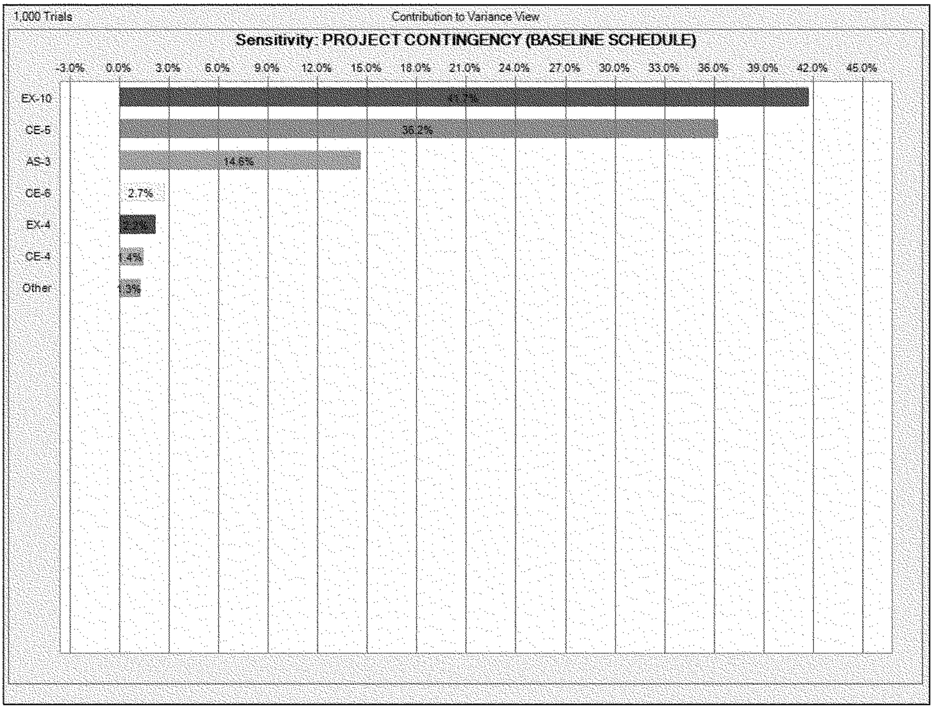

Figure 2. Key		
NO.	CATEGORY	EVENT
AS-3	Contract Acquisition Strategy Risks	Mobilization and Demobilization
CE-4	Construction Risks	Hopper Dredging
CE-5	Construction Risks	Pipeline Dredging
CE-6	Construction Risks	Containment Dikes
EX-4	Programmatic Risks	Hopper Dredging
EX-10	Programmatic Risks	Congressional Funding

7.0 MAJOR FINDINGS/OBSERVATIONS/RECOMMENDATIONS

This section provides a summary of significant risk analysis results that are identified in the preceding sections of the report. Risk analysis results are intended to provide project leadership with contingency information for scheduling, budgeting, and project control purposes, as well as to provide tools to support decision making and risk management as projects progress through planning and implementation. Because of the potential for use of risk analysis results for such diverse purposes, this section also reiterates and highlights important steps, logic, key assumptions, limitations, and decisions to help ensure that the risk analysis results are appropriately interpreted.

7.1 Major Findings/Observations

Project cost and schedule comparison summaries are provided in Table 3 and Table 4 respectively. Additional major findings and observations of the risk analysis are listed below.

The PDT worked through the risk register on 18 Jun 2013, in addition to follow-on e-mails and discussions. That period of time allowed improved project scope definition, investigations, design and cost information, and resulted in reduced risks in certain project areas. The key risk drivers identified through sensitivity analysis suggest a cost contingency of $24.8M and schedule risks adding another potential of $17.8, both at an 80% confidence level.

Cost Risks: From the CSRA, the key or greater Cost Risk items include:

- Q-5: Quantities for Current Scope: Pipeline Dredging – Surveys are required during PED. New surveys may indicate high shoaling (or eroding) areas not previously accounted for in modeling, which increase (or decrease) quantities (required depth) for current scope. Hopper could be used for reach adjacent to entrance channel (with pump-out), which could decrease cost by removing one mobilization and demobilization from project costs. Any changes in quantities due to storms during construction are found in "Programmatic Risks." Any changes in quantities due to storms after construction are handled in OM.
- CT-5: Estimate and Schedule Risks: Pipeline Dredging – On dredging projects, fuel is a major cost driver for equipment. Fuel has fluctuated in FY13, e.g. minimum ($3.09), maximum ($3.64), and average ($3.30). An upswing in fuel cost is anticipated.

Moderate risks, when combined, can also become a cost impact.

- EX-5: Programmatic Risks: Pipeline Dredging – There is a potential for weather damages and delays, e.g. tropical depressions or hurricane, should project construction occur during hurricane season, which is anticipated. A recurrence interval of 25-years (4% chance of occurrence in any given year) over three-year project duration was assumed, which resulted in 11.5 probability of occurrence.

- AS-3: Contract Acquisition Strategy Risks: Mobilization and Demobilization – Dredges are limited in quantity. It is unknown how competitive the market will be at time of award. The schedule is organized to encourage dredges working on one contract to finish on time in order to bid on the next contract, which could be recognized as cost savings to the Government via reduction in mobilization and demobilization costs. These potential (but not guaranteed) savings are not included in the estimate.
- CE-6: Construction Risks: Containment Dikes – There is minimal access to placement area sites, only one-way-in and one-way-out accessibility, in most cases. For PA2, access is assumed by water due to low beach access and piping plover wintering season at nine (9) months. Water access may prove difficult should depth of water not be adequate for tug to ground barge near PA.
- Q-4: Quantities for Current Scope: Hopper Dredging – Surveys are required during PED. New surveys may indicate high shoaling (or eroding) areas not previously accounted for in modeling, which increase (or decrease) quantities (required depth) for current scope. Any changes in quantities due to storms during construction are found in "Programmatic Risks." Any changes in quantities due to storms after construction are handled in OM.
- Q-6: Quantities for Current Scope: Containment Dikes – Quantities are neat line. That is, quantities are based on old survey data (one typical section along the edge of work defines the volume), densities are assumed in the areas based on historical practices, and take-offs do not include contingencies. Any changes in quantities due to storms during construction are found in "Programmatic Risks."

Schedule Risks: The high value of schedule risk indicates a significant uncertainty of key risk items, time duration growth that can translate into added costs. Over time, risks increase on those out-year contracts where there is greater potential for change in new scope requirements, uncertain market conditions, and unexpected high inflation. The greatest risks are the following:

- EX-10: Programmatic Risks: Congressional Funding – It is uncertain whether all needed Congressional funding for PED will be made available in a timely manner. Construction is assumed multiple contracts (7) to account for an uneven construction funding stream, i.e. each contract is approximately one (1) year in duration. Delays in funding may result in additional PED expenses as well as escalation in schedule growth. If authorization has already been received, even if the construction funding is delayed, the funding will add the OMB escalation onto the funding request.
- CE-5: Construction Risks: Pipeline Dredging – Project is likely to experience boat traffic issues due to long pipeline lengths and one-way traffic. There is minimal

access to placement area sites, only one-way-in and one-way-out accessibility, in most cases. For estimate purposes and contractor capabilities, no more than three (3) dredges will be underway at any given time. In addition, dredges will be located no less than one (1) mile apart due to Coast Guard regulations; for estimate purposes, the dredges have been strategically spaced at stations so as not to impede dredging workflow.

Moderate risks, when combined, can also become a time and (resulting) cost impact.

- AS-3: Contract Acquisition Strategy Risks: Mobilization and Demobilization – Dredges are limited in quantity. It is unknown how competitive the market will be at time of award. The schedule is organized to encourage dredges working on one contract to finish on time in order to bid on the next contract, which could be recognized as cost savings to the Government via reduction in mobilization and demobilization costs. These potential (but not guaranteed) savings are not included in the estimate.

Table 3. Construction Cost Comparison Summary (Uncertainty Analysis)

Most Likely Cost Estimate	$209,248,193		
Confidence Level	Project Cost	Contingency	Contingency %
5%	**$222,142,395**	**$12,894,203**	**6.16%**
10%	**$225,324,490**	**$16,076,298**	**7.68%**
15%	**$227,523,368**	**$18,275,176**	**8.73%**
20%	**$230,000,579**	**$20,752,386**	**9.92%**
25%	**$231,941,712**	**$22,693,520**	**10.85%**
30%	**$233,802,588**	**$24,554,396**	**11.73%**
35%	**$235,412,364**	**$26,164,171**	**12.50%**
40%	**$237,273,328**	**$28,025,136**	**13.39%**
45%	**$238,994,249**	**$29,746,056**	**14.22%**
50%	**$240,194,321**	**$30,946,128**	**14.79%**
55%	**$241,716,684**	**$32,468,491**	**15.52%**
60%	**$243,453,265**	**$34,205,072**	**16.35%**
65%	**$245,438,471**	**$36,190,278**	**17.30%**
70%	**$247,608,714**	**$38,360,521**	**18.33%**
75%	**$249,514,593**	**$40,266,401**	**19.24%**
80%	**$251,852,693**	**$42,604,500**	**20.36%**
85%	**$254,060,736**	**$44,812,543**	**21.42%**
90%	**$256,888,586**	**$47,640,394**	**22.77%**
95%	**$262,696,263**	**$53,448,070**	**25.54%**

Table 4. Construction Schedule Comparison Summary (Uncertainty Analysis)

Most Likely Schedule Duration	29.0 Months		
Confidence Level	Project Duration	Contingency	Contingency %
5%	34.8 Months	5.8 Months	20.01%
10%	36.1 Months	7.1 Months	24.59%
15%	37.2 Months	8.2 Months	28.13%
20%	38.0 Months	9.0 Months	31.17%
25%	39.0 Months	10.0 Months	34.45%
30%	39.7 Months	10.7 Months	36.98%
35%	40.3 Months	11.3 Months	39.08%
40%	40.9 Months	11.9 Months	41.12%
45%	41.6 Months	12.6 Months	43.57%
50%	42.3 Months	13.3 Months	45.75%
55%	42.8 Months	13.8 Months	47.68%
60%	43.4 Months	14.4 Months	49.74%
65%	44.3 Months	15.3 Months	52.76%
70%	45.1 Months	16.1 Months	55.47%
75%	45.9 Months	16.9 Months	58.22%
80%	46.7 Months	17.7 Months	60.93%
85%	47.9 Months	18.9 Months	65.23%
90%	49.2 Months	20.2 Months	69.57%
95%	51.7 Months	22.7 Months	78.45%

7.2 Recommendations

Risk Management is an all-encompassing, iterative, and life-cycle process of project management. The Project Management Institute's (PMI) *A Guide to the Project Management Body of Knowledge (PMBOK® Guide), 4th edition*, states that "project risk management includes the processes concerned with conducting risk management planning, identification, analysis, responses, and monitoring and control on a project." Risk identification and analysis are processes within the knowledge area of risk management. Its outputs pertinent to this effort include the risk register, risk quantification (risk analysis model), contingency report, and the sensitivity analysis.

The intended use of these outputs is implementation by the project leadership with respect to risk responses (such as mitigation) and risk monitoring and control. In short, the effectiveness of the project risk management effort requires that the proactive management of risks not conclude with the study completed in this report.

The Cost and Schedule Risk Analysis (CSRA) produced by the PDT identifies issues that require the development of subsequent risk response and mitigation plans. This section provides a list of recommendations for continued management of the risks identified and analyzed in this study. Note that this list is not all inclusive and should not substitute a formal risk management and response plan.

The CSRA study serves as a "road map" towards project improvements and reduced risks over time. The PDT must include the recommended cost and schedule contingencies and incorporate risk monitoring and mitigation on those identified risks. Further iterative study and update of the risk analysis throughout the project life-cycle is important in support of remaining within an approved budget and appropriation.

Risk Management: Project leadership should use the outputs created during the risk analysis effort as tools in future risk management processes. The risk register should be updated at each major project milestone. The results of the sensitivity analysis may also be used for response planning strategy and development. These tools should be used in conjunction with regular risk review meetings.

Risk Analysis Updates: Project leadership should review risk items identified in the original risk register and add others, as required, throughout the project life-cycle. Risks should be reviewed for status and reevaluation (using qualitative measures, at a minimum) and placed on risk management watch lists if any risk's likelihood or impact significantly increases. Project leadership should also be mindful of the potential for secondary (new risks created specifically by the response to an original risk) and residual risks (risks that remain and have unintended impact following response).

APPENDIX A

Risk No.	Risk/Opportunity Event	Concerns	PDT Discussions & Conclusions	Project Cost Likelihood*	Project Cost Impact*	Project Cost Risk Level*	Project Schedule Likelihood*	Project Schedule Impact*	Project Schedule Risk Level*
Contract Risks (Internal Risk items are those that are generated, caused, or controlled within the PDT's sphere of influence.)									
PROJECT SCOPE GROWTH									
PS-1	Relocations	potential for scope growth, added features, or changes in quantities; investigations not complete to fully support design assumptions	There is a possibility (but unlikely) inclusion of two (2) pipelines, i.e. current status indicates one (1) pipeline at 70-FT depth (per plans) / 90-FT depth (per Port) and one (1) pipeline at 50-FT depth outside of and parallel to the project footprint. The Real Estate Plan is complete and reports no impact.	Unlikely	Marginal	LOW	Unlikely	Marginal	LOW
PS-2	Environmental Mitigation	change in site conditions	There is a possibility (but unlikely) inclusion of seagress mitigation near channel banks, i.e. current status indicates no environmental impact for 52-FT depth, no widening plan.	Unlikely	Marginal	LOW	Unlikely	Marginal	LOW
PS-3	Mobilization and Demobilization	dredge size and productivity	CEDEP produces an error (or greater unit price) for smaller dredge sizes, likely due to the long haul routes (hopper dredge) and/or pipeline pumps; therefore, the large hopper dredge and/or 30-Inch pipeline are the best (and least-cost) selections. RMS data for W912HY-10-C-0009 reflects EWT at 46.1% (pipeline), which is similar to 50% assumed in CEDEP (complete data not available for W912HY-12-C-0017 and W912HY-11-C-0003). Therefore, no "Project Scope Growth" is anticipated with regard to changes in hopper and/or pipeline assumptions.	Unlikely	Marginal	LOW	Unlikely	Marginal	LOW
PS-4	Hopper Dredging	dredge size and productivity	CEDEP produces an error (or greater unit price) for smaller dredge sizes, likely due to the long haul routes (hopper dredge) and/or pipeline pumps; therefore, the large hopper dredge and/or 30-Inch pipeline are the best (and least-cost) selections. RMS data for W912HY-10-C-0009 reflects EWT at 46.1% (pipeline), which is similar to 50% assumed in CEDEP (complete data not available for W912HY-12-C-0017 and W912HY-11-C-0003). Therefore, no "Project Scope Growth" is anticipated with regard to changes in hopper and/or pipeline assumptions.	Unlikely	Marginal	LOW	Unlikely	Marginal	LOW
PS-5	Pipeline Dredging	dredge size and productivity	CEDEP produces an error (or greater unit price) for smaller dredge sizes, likely due to the long haul routes (hopper dredge) and/or pipeline pumps; therefore, the large hopper dredge and/or 30-Inch pipeline are the best (and least-cost) selections. RMS data for W912HY-10-C-0009 reflects EWT at 46.1% (pipeline), which is similar to 50% assumed in CEDEP (complete data not available for W912HY-12-C-0017 and W912HY-11-C-0003). Therefore, no "Project Scope Growth" is anticipated with regard to changes in hopper and/or pipeline assumptions.	Unlikely	Marginal	LOW	Unlikely	Marginal	LOW
PS-8	Planning, Engineering, & Design	adequate PDT resources	The District feels that there is District support and team development for future efforts.	Very Unlikely	Negligible	LOW	Very Unlikely	Negligible	LOW
PS-9	Construction Management	construction duration expectation	Construction duration (expectation) is less than three (3) years. The estimate choice for assumed equipment establishes the duration. Opportunities may exist within the contract solicitation package or further estimate study to decrease the schedule and resulting costs. Historically, three (3) to five (5) dredges have been available based on market conditions, e.g. SNWW. The construction estimate assumes no more than three (3) large-sized dredges at any given time; however, in most cases, the construction estimate assumes two (2) large-sized dredges at any given time. Hopper with pump-out could be used adjacent to hopper entrance channel. Market study and contract development could result in market opportunities.	Very Unlikely	Negligible	LOW	Very Unlikely	Negligible	LOW
CONTRACT ACQUISITION STRATEGY RISKS									

AS-3	Mobilization and Demobilization	market conditions and competing projects may impact bid competition	Dredges are limited in quantity. It is unknown how competitive the market will be at time of award, but it is anticipated that bid competition will be high. The contract acquisition strategy is not unreasonable based on past projects, e.g. Sabine-Neches Waterway dredging project (employed four (4) pipeline dredges working simultaneously). The max dredges at anytime for proposed project areas is three (3), one (1) being a hopper dredge. The schedule is organized to encourage dredges working on one contract to finish on time in order to bid on the next contract, which could be recognized as cost savings to the Government via reduction in mobilization and demobilization costs. These potential (but not guaranteed) savings are not included in the estimate.	Likely	Marginal	MODERATE	Likely	Marginal	MODERATE
AS-6	Containment Dikes	contracting plan not firmly established; 8a or small business likely due to a requirement for subcontracting; limited bid competition anticipated	Containment dike construction would likely require small business subcontracts (by large dredge company), which would reduce efficiency. In addition, drop outlet structures would likely require a specialized small business company.	Likely	Negligible	LOW	Unlikely	Marginal	LOW
AS-7	Shoreline Stabilization	contracting plan not firmly established; 8a or small business likely due to a requirement for subcontracting; limited bid competition anticipated	Shoreline stabilization construction would likely require small business subcontracts (by large dredge company), which would reduce efficiency.	Likely	Negligible	LOW	Unlikely	Marginal	LOW
AS-9	Construction Management	contracting plan not firmly established; 8a or small business likely due to a requirement for subcontracting; limited bid competition anticipated	Additional contractor oversight is anticipated for small businesses.	Likely	Negligible	LOW	Unlikely	Negligible	LOW
	QUANTITIES FOR CURRENT SCOPE								
Q-4	Hopper Dredging	possibility for changes in quantities	Surveys are required during PED. New surveys may indicate high shoaling (or eroding) areas not previously accounted for in modeling, which increase (or decrease) quantities for current scope. Approved quantity method is to assume independence of "maintenance material" from "new work material." That is, "new work material" quantities are calculated based on existing versus proposed authorized channel depths, i.e. quantities do not include "maintenance material" and the channel is assumed freshly dredged at existing authorized channel depth. "Maintenance material" - including potential quantity increases due to storms prior to start of construction – is handled under OM and no mixing of "maintenance material" and "new work material" is considered during construction. Any changes in quantities due to storms during construction are found in "Programmatic Risks." Any changes in quantities due to storms after construction are handled in OM.	Likely	Marginal	MODERATE	Unlikely	Marginal	LOW
Q-5	Pipeline Dredging	possibility for changes in quantities	Surveys are required during PED. New surveys may indicate high shoaling (or eroding) areas not previously accounted for in modeling, which increase (or decrease) quantities for current scope. Hopper could be used for reach adjacent to entrance channel (with pumpout), which could decrease cost by removing one mobilization and demobilization from project costs. Approved quantity method is to assume independence of "maintenance material" from "new work material." That is, "new work material" quantities are calculated based on existing versus proposed authorized channel depths, i.e. quantities do not include "maintenance material" and the channel is assumed freshly dredged at existing authorized channel depth. "Maintenance material" - including potential quantity increases due to storms prior to start of construction – is handled under OM and no mixing of "maintenance material" and "new work material" is considered during construction. Any changes in quantities due to storms during construction are found in "Programmatic Risks." Any changes in quantities due to storms after construction are handled in OM.	Likely	Significant	HIGH	Unlikely	Marginal	LOW
Q-6	Containment Dikes	possibility for changes in quantities	Quantities do not include contingencies, i.e. quantities are neatline. Densities are assumed. Any changes in quantities due to storms during construction are found in "Programmatic Risks."	Likely	Marginal	MODERATE	Unlikely	Marginal	LOW

Q-7	Shoreline Stabilization	possibility for changes in quantities	Quantities do not include contingencies, i.e. quantities are neatline. Densities are assumed. Any changes in quantities due to storms during construction are found in "Programmatic Risks."	Likely	Negligible	LOW	Unlikely	Marginal	LOW
Q-8	Planning, Engineering, & Design	possibility for changes in quantities	Significant changes in quantities may lead to increased PED expenditures of time and money.	Unlikely	Marginal	LOW	Unlikely	Marginal	LOW
	TECHNICAL RISKS								
TL-4	Hopper Dredging	potential for scope growth, added features, or changes in quantities	Soil characterization is not complete through entire channel reach; material assumed stiff clay due to limited sample data.	Very Unlikely	Significant	LOW	Very Unlikely	Significant	LOW
TL-5	Pipeline Dredging	potential for scope growth, added features, or changes in quantities	Soil characterization is not complete through entire channel reach; material assumed stiff clay due to limited sample data.	Very Unlikely	Significant	LOW	Very Unlikely	Significant	LOW
	LANDS AND DAMAGES RISKS								
LD-8	Planning, Engineering, & Design	easements for placement areas	Easements for all placement areas are with the Port. The District and the Port are in the process of extending the easements (to perpetual). No issues are anticipated with the District or the Port.	Very Unlikely	Negligible	LOW	Very Unlikely	Negligible	LOW
	REGULATORY AND ENVIRONMENTAL RISKS								
RE-4	Hopper Dredging	wildlife windows and/or species protection	Possibility exists for unaccounted for wildlife to be discovered in the area and/or nesting, which may delay project schedule. Unanticipated discoveries could lead to cost increases in order to account for environmental oversight.	Unlikely	Marginal	LOW	Unlikely	Marginal	LOW
RE-5	Pipeline Dredging	wildlife windows and/or species protection	Possibility exists for unaccounted for wildlife to be discovered in the area and/or nesting, which may delay project schedule. Unanticipated discoveries could lead to cost increases in order to account for environmental oversight.	Unlikely	Marginal	LOW	Unlikely	Marginal	LOW
RE-6	Containment Dikes	wildlife windows and/or species protection	Possibility exists for unaccounted wildlife to be discovered in the area and/or nesting, which may delay project schedule. For example, the piping plover (endangered) wintering season is nine (9) months. This impact is only anticipated for PA2 via land access. Estimate assumes access by water. Costs may increase to account for environmental oversight and/or non-violent "bird chasing" techniques, e.g. people, trained hawk-keepers, etc.	Unlikely	Marginal	LOW	Unlikely	Marginal	LOW
RE-7	Shoreline Stabilization	wildlife windows and/or species protection	Possibility exists for unaccounted for wildlife to be discovered in the area and/or nesting, which may delay project schedule. Unanticipated discoveries could lead to cost increases in order to account for environmental oversight.	Unlikely	Marginal	LOW	Unlikely	Marginal	LOW
	CONSTRUCTION RISKS								
CE-4	Hopper Dredging	site accessibility, transportation delays, congestion	Project is likely to experience boat traffic issues due to one-way traffic. For estimate purposes and contractor capabilities, no more than three (3) dredges will be underway at any given time. In addition, dredges will be located no less then one (1) mile apart due to Coast Guard regulations; for estimate purposes, the dredges have been strategically spaced at stations so as not to impede dredging workflow.	Unlikely	Marginal	LOW	Likely	Negligible	LOW
CE-5	Pipeline Dredging	site accessibility, transportation delays, congestion	Project is likely to experience boat traffic issues due to long pipeline lengths and one-way traffic. There is minimal access to placement area sites, only one-way-in and one-way-out accessibility, in most cases. For estimate purposes and contractor capabilities, no more than three (3) dredges will be underway at any given time. In addition, dredges will be located no less than one (1) mile apart due to Coast Guard regulations; for estimate purposes, the dredges have been strategically spaced at stations so as not to impede dredging workflow.	Unlikely	Marginal	LOW	Likely	Significant	HIGH
CE-6	Containment Dikes	site accessibility, transportation delays, congestion	There is minimal access to placement area sites, only one-way-in and one-way-out accessibility, in most cases. For PA2, access is assumed by water due to low beach access and piping plover wintering season at nine (9) months.	Likely	Marginal	MODERATE	Likely	Marginal	MODERATE

CE-7	Shoreline Stabilization	site accessibility, transportation delays, congestion	There is minimal access to placement area sites, only one-way-in and one-way-out accessibility, in most cases. Access is predominately by water.	Likely	Negligible	LOW	Likely	Negligible	LOW
	ESTIMATE AND SCHEDULE RISKS								
CT-3	Mobilization and Demobilization	dredging liability insurance	Liability insurance has historically been high for areas south of Corpus Christi. Costs for mobilization/demobilization take this into account via reviews of historical bid openings.	Likely	Negligible	LOW	Unlikely	Negligible	LOW
CT-4	Hopper Dredging	fuel fluctuations can impact dredging costs	On dredging projects, fuel is a major cost driver for equipment. Fuel has fluctuated in FY13, e.g. minimum ($3.09), maximum ($3.64), and average ($3.30). An upswing in fuel cost is anticipated. CSRA to assume maximum fuel rate of $4.37/GAL, which results in total cost increase (per CEDEP) of $1.3M (hopper) and $21.5M (pipeline); CSRA does not assume a minimum fuel rate. Study should be for time of funding date estimate.	Likely	Negligible	LOW	Unlikely	Negligible	LOW
CT-5	Pipeline Dredging	fuel fluctuations can impact dredging costs	On dredging projects, fuel is a major cost driver for equipment. Fuel has fluctuated in FY13, e.g. minimum ($3.09), maximum ($3.64), and average ($3.30). An upswing in fuel cost is anticipated. CSRA to assume maximum fuel rate of $4.37/GAL, which results in total cost increase (per CEDEP) of $1.3M (hopper) and $21.5M (pipeline); CSRA does not assume a minimum fuel rate. Study should be for time of funding date estimate.	Likely	Significant	HIGH	Unlikely	Negligible	LOW
CT-6	Containment Dikes	settlement period	A settlement period is assumed for "new" placement areas. Since all placement areas "exist" and are only being raised with side-cast material, a settlement period is not assumed in the schedule. Adding a three (3) month settlement period would marginally impact contract schedules should it be determined that side-cast material is unsuitable.	Very Unlikely	Negligible	LOW	Unlikely	Marginal	LOW
	Programmatic Risks	(External Risk Items are those that are generated, caused, or controlled exclusively outside the PDT's sphere of influence.)							
EX-3	Mobilization and Demobilization	political influences, lack of support, obstacles; potential for severe adverse weather	There is a potential for weather damages and delays, e.g. tropical depressions or hurricane, should project construction occur during hurricane season, which is anticipated.	Likely	Negligible	LOW	Likely	Negligible	LOW
EX-4	Hopper Dredging	political influences, lack of support, obstacles; potential for severe adverse weather	There is a potential for weather damages and delays, e.g. tropical depressions or hurricane, should project construction occur during hurricane season, which is anticipated.	Likely	Negligible	LOW	Likely	Marginal	MODERATE
EX-5	Pipeline Dredging	political influences, lack of support, obstacles; potential for severe adverse weather	There is a potential for weather damages and delays, e.g. tropical depressions or hurricane, should project construction occur during hurricane season, which is anticipated.	Likely	Marginal	MODERATE	Likely	Negligible	LOW
EX-6	Containment Dikes	political influences, lack of support, obstacles; potential for severe adverse weather	There is a potential for weather damages and delays, e.g. tropical depressions or hurricane, should project construction occur during hurricane season, which is anticipated.	Likely	Negligible	LOW	Likely	Negligible	LOW
EX-7	Shoreline Stabilization	political influences, lack of support, obstacles; potential for severe adverse weather	There is a potential for weather damages and delays, e.g. tropical depressions or hurricane, should project construction occur during hurricane season, which is anticipated.	Likely	Negligible	LOW	Likely	Negligible	LOW
EX-8	Planning, Engineering, & Design	political influences, lack of support, obstacles; potential for severe adverse weather	There is a potential for weather damages and delays, e.g. tropical depressions or hurricane, should project construction occur during hurricane season, which is anticipated. Damages may result in additional project growth.	Likely	Negligible	LOW	Likely	Negligible	LOW
EX-9	Construction Management	political influences, lack of support, obstacles; potential for severe adverse weather	There is a potential for weather damages and delays, e.g. tropical depressions or hurricane, should project construction occur during hurricane season, which is anticipated. Damages may result in additional project oversight.	Likely	Negligible	LOW	Likely	Negligible	LOW

EX-10	Congressional Funding	funding for PED is uncertain, post feasibility; funding for construction is uncertain, e.g. funding is incremental per FY and can be impacted by budget delays such as continuing resolutions	It is uncertain whether all needed Congressional funding for PED will be made available in a timely manner. Construction is assumed multiple contracts (7) to account for an uneven construction funding stream, i.e. each contract is approximately one (1) year in duration. Delays in funding may result in additional PED expenses as well as escalation in schedule growth. If authorization has already been received, even if the construction funding is delayed, the funding will add the OMB escalation onto the funding request.	Unlikely	Marginal	LOW	Likely	Significant	HIGH
EX-11	Stakeholder Funding	1 sponsor; has adequate funding support for their shares	Costs for deepening between 42 and 45 feet (and mobilization/demobilization and containment dike construction) are cost shared at 25 percent non-Federal and 75 percent Federal; costs for deepening between 45 and 52 feet are cost shared at 50 percent non-Federal and 50 percent Federel. Sponsor feels confident that their budget shares are not a critical constraint and that the Federal shares and funding are a greater concern.	Unlikely	Negligible	LOW	Unlikely	Negligible	LOW

U.S. Army Corps of Engineers
Project : P2-370840 - BRAZOS ISLAND HARBOR, TEXAS CHANNEL IMPROVEMENT PROJECT
********** INDEPENDENT GOVERNMENT ESTIMATE **********
FEASIBILITY STUDY
OCTOBER 2013 PRICE LEVELS

Estimated by USACE SWG EC PS
Designed by USACE SWG EC
Prepared by USACE SWG EC PS
Preparation Date 10/10/2013
Effective Date of Pricing 10/10/2013
Estimated Construction Time 812 Days

Library Properties
Designed by
USACE SWG EC
Estimated by
USACE SWG EC PS
Prepared by
USACE SWG EC PS

Design Document PLANNING STUDY
Document Date 10/10/2013
District USACE SWG
Contact MARTIN REGNER, 409.766.3923
Budget Year 2014
UOM System Original

Direct Costs
LaborCost
EQCost
MatlCost
SubBidCost
CEDEP: MOBS
CEDEP: RATES
PA: MOBS
DROP OUTLET
STONE

Timeline/Currency
Preparation Date 10/10/2013
Escalation Date 10/10/2013
Eff. Pricing Date 10/10/2013
Estimated Duration 812 Day(s)

Currency US dollars
Exchange Rate 1.000000

Costbook CB12EB-b: MII English Cost Book 2012-b

Labor SWG2012: Galveston District Labor Library - 2012

Note: http://www.wdol.gov is the website for current Davis Bacon & Service Labor Rates. Fringes paid to the laborers are taxable. In a non-union job the whole fringes are taxable. In a union job, the vacation pay fringe taxal

Labor Rates
LaborCost1
LaborCost2
LaborCost3
LaborCost4

Equipment EP11R06: MII Equipment 2011 Region 06

06 SOUTHWEST	
Sales Tax	8.10
Working Hours per Year	1,590
Labor Adjustment Factor	0.87
Cost of Money	2.50
Cost of Money Discount	25.00
Tire Recap Cost Factor	1.50
Tire Recap Wear Factor	1.80
Tire Repair Factor	0.15
Equipment Cost Factor	1.00
Standby Depreciation Factor	0.50

Fuel	
Electricity	0.082
Gas	3.420
Diesel Off-Road	3.570
Diesel On-Road	4.000

Shipping Rates	
Over 0 CWT	17.56
Over 240 CWT	16.39
Over 300 CWT	14.76
Over 400 CWT	13.26
Over 500 CWT	7.25
Over 700 CWT	6.67
Over 800 CWT	5.18

Currency in US dollars

Date **Author** **Note**

Project Notes
1/10/2014 1:57:35 PM REGNER

P2-370840 - BRAZOS ISLAND HARBOR, TEXAS CHANNEL IMPROVEMENT PROJECT
FEASIBILITY STUDY

LOCATION AND DESCRIPTION:
Port of Brownsville is located on the south Texas coast near the border of U.S. and Mexico. The study area encompasses the entire Brownsville Ship Channel and surrounding region. The entrance channel is located offshore of Cameron County, Texas, in the Gulf of Mexico, and ends at Port of Brownsville Main Harbor. Brownsville Ship Channel provides deep draft access from the Gulf of Mexico through a jetty entrance channel to Brownsville, and a side channel, authorized to 36-feet, and a shallow draft Fishing Boat Harbor near Port Isabel. The primary purpose of the study is navigation, which consists of enlarging the existing Brownsville Ship Channel by deepening the entrance channel, jetty channel, the lower section of the main channel, the upper section of the main channel, and turning basin.

The MII is developed using October 2013 price levels and the latest labor rates for Galveston District. The estimate is divided into seven (7) contracts. Each contract is organized in accordance with a work breakdown structure. Midpoint dates for the construction contracts are developed in conjunction with the project manager for developing the fully-funded costs. The estimate is prepared in accordance with ER 1110-2-1302 Civil Works Cost Engineering, dated 15 Sep 08. The costs are escalated in accordance with the above Engineering Regulation and EM 1110-2-1304 Civil Works Construction Cost Index System (CWCCIS), dated 31 Mar 2013. All data is input into the Total Project Cost Sheet (TPCS).

Marine fuel price is averaged, locked in at $3.30/gallon (October 2013). Diesel fuel price is locked in at $4.00/gallon (October 2013). There are no impacts to utilities anticipated. There are no Hazardous, Toxic, and Radioactive Wastes anticipated. The Operation and Maintenance estimate is dated October 2013, with an effective pricing date of October 2013. A formal Cost Risk Analyses is performed with the cooperation of the PDT and Cost Engineering Directory of Expertise (DX) of the Walla Walla District (October 2013). The risks are quantified and a cost risk model developed to determine a contingency at 80% Confidence Level (CL). An ATR Certification of Cost Estimate is provided by Walla Walla District.

CONTRACT 01:
This contract is for hopper dredging -17+000 to 00+000 and delivery to New Work Ocean Dredged Material Placement Area (offshore). The stationing listed is located on the Gulf of Mexico side of the jetties (entrance channel) and is unsuitable for a pipeline dredge due to wave action. The approximate duration is seven (7) months.

CONTRACT 02:
This contract is for dike raising and rehabilitation of Placement Area 4B and Placement Area 5A. The approximate duration is 15 months. Associated Costs provided by Department of Engineering Services of the Brownsville Navigation District (21 Oct 2013).

CONTRACT 03:
This contract is for dike raising and rehabilitation of Placement Area 7 and Placement Area 8. The approximate duration is seven (7) months. In addition, this contract is for pipeline dredging 70+000 to 82+000 and 82+000 to 89+500 and delivery to Placement Area 7 and Placement Area 8, respectively. The stationing listed is located in the upper section of the main channel and turning basin. The approximate duration is 10 months. The approximate duration of the total contract is 13 months as dike raising and rehabilitation can occur, in some instances, concurrently with pipeline dredging.

CONTRACT 04:
This contract is for pipeline dredging 25+000 to 50+000 and delivery to Placement Area 5A. The stationing listed is located in the middle section of the main channel. The approximate duration is 16 months.

CONTRACT 05:
This contract is for dike raising and rehabilitation of Placement Area 2. The approximate duration is three (3) months. In addition, this contract is for pipeline dredging 00+000 to 07+000 and delivery to Placement Area 2. The stationing listed is located in the lower section of the main channel near the jetties (entrance channel). The approximate duration is three (3) months.

CONTRACT 06:
This contract is for pipeline dredging 07+000 to 25+000 and delivery to Placement Area 4B. The stationing listed is located in the middle section of the main channel. The approximate duration is 11 months.

CONTRACT 07:
This contract is for dike raising and rehabilitation of Placement Area 5B. The approximate duration is three (3) months. In addition, this contract is for pipeline dredging 50+000 to 70+000 and delivery to Placement Area 5B. The stationing listed is located in the upper section of the main channel near the turning basin. The approximate duration is nine (9) months.

ACCOUNT CODE 12 - NAVIGATION PORTS AND HARBORS:
Dredge quantities are developed by SWG, Engineering Division, General Engineering (EC-EG). One (1) large hopper dredge is to be used for Contract 01 with offshore placement (with an option for the

Date	Author	Note
		Contractor to bid Contract 05 as pump-out to PA 2 based on durations and schedules). The remainder of the channel is to be dredged with 30" pipeline dredges, with the material discharged into various, existing placement areas located along the waterway (PA 2, 4B, 5A, 5B, 7, and 8). Dredging costs are developed using Cost Engineering Dredge Estimating Program (CEDEP). Dredge production rates and losses are reduced to account for Resident Management System (RMS) historical effective working times and stiffer "new work" materials. Cost for mobilization and demobilization are developed using CEDEP, assuming the dredges are based in New Orleans, Louisiana. Dredge estimates are based on standard operation practices for the Galveston District, which assume conventional contracting practices of large business IFBs. For estimation purposes and contractor capabilities (derived from current Sabine-Neches Waterway dredging project, which includes four pipeline dredges working simultaneously), no more than three (3) dredges will be underway at any given time. In addition, dredges will be located no less than one (1) mile apart due to Coast Guard regulations; for estimate purposes, the dredges have been strategically spaced at stations so as not to impede dredging workflow. The cost for Sea Turtle Protection is associated with hopper dredging and includes: 1) cost for two (2) trawlers per hopper; 2) a sea turtle protection device fitted to the hopper; and 3) 24-hour monitoring survey. The cost for raising placement areas is included under this code of account. Part of the cost for raising a placement area includes clearing, grubbing, and stripping the area; seeding the outside of the dikes is not considered. Labor rates and overhead costs are adjusted to reflect Galveston District, Region 6. The placement area dikes are built using 3-CY dragline buckets, with an optimal production rate of 125-CY/HR, respectively. A total of three (3) draglines are working at the same time. For estimate purposes, dike works are lumped by perimeter and training dikes, locations, and bucket sizes. Articulated concrete block is to be placed approximately 22+000 to 34+000. Production assumed at 50-CY/HR in addition to transport of material from Central Texas via railcars, then trucks, then barges, and finally to the site. Material characteristics are provided by SWG, Engineering Division, Geotechnical and Structural Section (EC-ES). <u>ACCOUNT CODE 30 - ENGINEERING AND DESGIN</u>: The cost for this account are developed using the guidelines provided in the TPCS, with the agreement of the cost engineer and the project manager. <u>ACCOUNT CODE 31 - CONSTRUCTION MANAGEMENT</u>: The cost for this account are developed using the guidelines provided in the TPCS, with the agreement of the cost engineer and the project manager.
1/21/2014 8:43:54 AM	PORT	**Analysis of Possible BIH Dock Upgrade Costs due to Deepening of Brownsville Ship Channel** **September 5, 2013; revised October 21, 2013** At the behest of the Galveston District (SWG) of the United States Army Corps of Engineers (USACE), the Department of Engineering Services of the Brownsville Navigation District (BND), d.b.a. Port of Brownsville, has performed an analysis of the possible costs to upgrade the existing BND docks that would be within the area of the Brownsville Ship Channel to be deepened from the current authorized depth of 42 feet to the Tentatively Selected Plan (TSP) new depth of 52 feet. On an email from Ms. Katie Williams to Brenda Hayden dated 7/23/2013, the following assumptions were indicated: I looked at what I included in the docks and this is what I have. I assumed the AmFELS dock would be deepened to 51' and the Liquid Dock, Oil Dock 3, 4, & 5, Dock 15, BC Dock, and Oil Dock 1 & 2 would be deepened to 49'. In addition, the BND recently opened bids on the new Cargo Dock 16, to be located at Stations 80+500 to 81+100 of the Brownsville Ship Channel. The project was bid with two alternatives: a 42 ft. deep dock and a 50 ft. deep dock. As shown in the attached tabulation, the low bid for the shallow dock was $20,924,230.00, and the low bid for the deep dock was $24,938,687.00, for a difference of $4,014,457.00. After discussing the probable upgrade costs with the dock's design engineer, our estimation is that the upgrade costs could be between 150% to 250% of the difference in cost if the dock was to be built deep. That gave us a range of $6 Million to $9 Million, which I chose to average to $7.5 Million for estimating purposes. For the 600 feet of proposed dock, the $7.5 Million upgrade estimate resulted in an estimated cost per foot of $12,500 to deepen the dock in the future from 42 ft. to 50 ft. The per-foot cost was applied to each of the affected docks, based on the following TSP deepening plan, as approved in the TSP Milestone meeting: Ship Channel Segment **From Sta. To Sta.** Deepen to 54 feet -17+000 0+000 Deepen to 52 feet 0+000 84+200 Keep at 42 feet 84+200 86+000 Keep at 36 feet 86+000 End The results were then summarized, with the following considerations: □ AmFELS has an area where they are dredging to 70 feet depth, so it is reasonable to assume that no upgrade will be necessary in that area. □ Oil Dock 4 does not exist, as it burned down about 15 years ago, so no upgrade is needed there. Analysis of Possible BIH Dock Upgrade Costs September 5, 2013 due to Deepening of Brownsville Ship

Labor ID: SWG2012 EQ ID: EP11R06 Currency in US dollars TRACES MII Version 4.2

Date **Author** **Note**

Channel Rev. October 21, 2013

The following table is the summary of this analysis. The color-shaded lines are those not needing upgrades.
Deepened to 51' **Approximate Limits Length** (ft) **Upgrade**
From To Cost
AmFELS Quay 72+850 75+300 2,450 Not needed Deepened to 49'
Approximate Limits Length (ft) **Upgrade**
From Sta. To Sta. Cost
Oil Dock 1 85+700 86+000 300 $ 3,750,000
Oil Dock 2 84+980 85+280 300 $ 3,750,000
Oil Dock 3 81+100 81+420 320 $ 4,000,000
Oil Dock 4 Does not exist N/A Not needed
Oil Dock 5 84+100 84+360 260 $ 3,250,000
Bulk Cargo Dock 83+850 84+250 400 $ 5,000,000
Cargo Dock 15 81+400 82+000 600 $ 7,500,000
Cargo Dock 16 80+500 81+100 600 $ 7,500,000
Liquid Cargo Dock 79+260 79+620 360 $ 4,500,000
Totals: 2,140 $ 39,250,000

It must be understood that the scope of this analysis is general and preliminary, and that a more detailed analysis based on detailed design and specific considerations may yield different results.

Mr. Ariel Chavez II, P.E. / R.P.L.S.
Director of Engineering Services
Port of Brownsville
956/592-3973 (Cel) - 956/831-6153 (Fax)

Markup Properties

Direct Cost Markups		**Category**			**Method**		
OVERTIME		Overtime			Overtime		
	Days/Week		*Hours/Shift*	*Shifts/Day*	*1st Shift*	*2nd Shift*	*3rd Shift*
Standard	*5.00*		*8.00*	*1.00*	*8.00*	*0.00*	*0.00*
Actual	*5.00*		*8.00*	*1.00*	*10.00*	*0.00*	*0.00*

Day	*OT Factor*	*Working*	*OT Percent*	*FCCM Percent*
Monday	*1.50*	*Yes*	*10.00*	*(20.00)*
Tuesday	*1.50*	*Yes*		
Wednesday	*1.50*	*Yes*		
Thursday	*1.50*	*Yes*		
Friday	*1.50*	*Yes*		
Saturday	*1.50*	*No*		
Sunday	*2.00*	*No*		

Contractor Markups	**Category**	**Method**
FOOH (Running%)	JOOH	Running %
HOOH (Running%)	Allowance	Running %
PROFIT (Running%)	Profit	Running %
BOND	Bond	Bond Table

Class B, Tiered, 24 months, 1.00% Surcharge

Contract Price	*Bond Rate*
500,000	*15.84*
2,000,000	*9.57*
2,500,000	*7.59*
2,500,000	*6.93*
100,000,000,000	*6.34*

Owner Markups	**Category**	**Method**
CONTINGENCY	Contingency	Running %

Labor ID: SWG2012 EQ ID: EP11R06 Currency in US dollars TRACES MII Version 4.2

********** INDEPENDENT GOVERNMENT ESTIMATE **********

Description	Quantity	UOM	DirectCost	SubCMU	CostToPrime	PrimeCMU	ProjectCost
Project Cost Summary Report			171,970,183	3,258,607	175,228,790	5,157,583	180,386,373
01 CONTRACT 01	1.00	LS	13,886,802	38,445	13,925,247	68,844	13,994,091
01 01 NON-FED/FED COSTS	1.00	LS	13,886,802	38,445	13,925,247	68,844	13,994,091
01 01 12 NAVIGATION PORTS AND HARBORS	1.00	LS	13,886,802	38,445	13,925,247	68,844	13,994,091
02 CONTRACT 02	1.00	LS	44,114,806	1,657,285	45,772,091	2,618,965	48,391,056
02 01 NON-FED/FED COSTS	1.00	LS	44,114,806	1,657,285	45,772,091	2,618,965	48,391,056
02 01 12 NAVIGATION PORTS AND HARBORS	1.00	LS	44,114,806	1,657,285	45,772,091	2,618,965	48,391,056
03 CONTRACT 03	1.00	LS	19,667,060	818,835	20,485,895	1,293,985	21,779,880
03 01 NON-FED/FED COSTS	1.00	LS	19,667,060	818,835	20,485,895	1,293,985	21,779,880
03 01 12 NAVIGATION PORTS AND HARBORS	1.00	LS	19,667,060	818,835	20,485,895	1,293,985	21,779,880
04 CONTRACT 04	1.00	LS	37,210,494	0	37,210,494	0	37,210,494
04 01 NON-FED/FED COSTS	1.00	LS	37,210,494	0	37,210,494	0	37,210,494
04 01 12 NAVIGATION PORTS AND HARBORS	1.00	LS	37,210,494	0	37,210,494	0	37,210,494
05 CONTRACT 05	1.00	LS	6,734,897	342,646	7,077,543	541,475	7,619,017
05 01 NON-FED/FED COSTS	1.00	LS	6,734,897	342,646	7,077,543	541,475	7,619,017
05 01 12 NAVIGATION PORTS AND HARBORS	1.00	LS	6,734,897	342,646	7,077,543	541,475	7,619,017
06 CONTRACT 06	1.00	LS	29,307,250	0	29,307,250	0	29,307,250
06 01 NON-FED/FED COSTS	1.00	LS	29,307,250	0	29,307,250	0	29,307,250
06 01 12 NAVIGATION PORTS AND HARBORS	1.00	LS	29,307,250	0	29,307,250	0	29,307,250
07 CONTRACT 07	1.00	LS	21,048,876	401,395	21,450,271	634,314	22,084,585
07 01 NON-FED/FED COSTS	1.00	LS	21,048,876	401,395	21,450,271	634,314	22,084,585
07 01 12 NAVIGATION PORTS AND HARBORS	1.00	LS	21,048,876	401,395	21,450,271	634,314	22,084,585

Currency in US dollars

2/10/2014

--- NEW WORK ---
P2-370840 - BRAZOS ISLAND HARBOR, TEXAS, CHANNEL IMPROVEMENT PROJECT
FEASIBILITY STUDY
OCTOBER 2013 PRICE LEVELS
CONTRACT CALENDAR

CONTRACT	DESCRIPTION	DURATION (month)	DESIGN MIDPOINT	START DATE	MIDPOINT	END DATE
1	Dredge: ODMDS	7	Oct-16 (2017Q1)	Oct-17 (2018Q1)	Jan-18 (2018Q2)	Apr-18 (2018Q3)
2	Dike: PA 5A, PA 4B	15	Oct-16 (2017Q1)	Oct-17 (2018Q1)	May-18 (2018Q3)	Dec-18 (2019Q1)
	Associated Costs	12		Jan-19 (2019Q2)	Jun-19 (2019Q3)	Dec-19 (2020Q1)
3	Dike: PA 8, PA 7 Dredge: 8, 7	13	Oct-16 (2017Q1)	Oct-17 (2018Q1)	Apr-18 (2018Q3)	Oct-18 (2019Q1)
4	Dredge: 5A	16	Feb-17 (2017Q2)	Feb-18 (2018Q2)	Sep-18 (2018Q4)	May-19 (2019Q3)
5	Dike: PA 2 Dredge: 2	6	Feb-17 (2017Q2)	Feb-18 (2018Q2)	May-18 (2018Q3)	Jul-18 (2018Q4)
6	Dredge: 4B	11	Jan-18 (2018Q2)	Jan-19 (2019Q2)	Jun-19 (2019Q3)	Nov-19 (2020Q1)
7	Dike: 5B Dredge: 5B	12	Mar-18 (2018Q2)	Mar-19 (2019Q2)	Aug-19 (2019Q4)	Feb-20 (2020Q2)

--- NEW WORK ---
P2-370840 - BRAZOS ISLAND HARBOR, TEXAS, CHANNEL IMPROVEMENT PROJECT
FEASIBILITY STUDY
OCTOBER 2013 PRICE LEVELS
VISUAL CALENDAR

			FY 2018 - YEAR 1												FY 2019 - YEAR 2												FY 2020 - YEAR 3											
NO.	DESCRIPTION	DURATION	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
CONT 1	Dredge for ODMDS	6.30	OS	OS	OS	OS	OS	OS	OS																													
CONT 2	PA 5A	3.60	5A	5A	5A	5A																																
	PA 4B	10.90					4B	4B	4B	4B	4B	4B	4B	4B	4B	4B	4B																					
	ASSOCIATED	12.00																A	A	A	A	A	A	A	A	A	A	A	A									
CONT 3	PA 8	1.40	8	8																																		
	PA 7	4.40			7	7	7	7	7																													
	Dredge for PA 8	3.02				8	8	8	8																													
	Dredge for PA 7	5.84								7	7	7	7	7	7																							
CONT 4	Dredge for PA 5A	15.94					5A	5A	5A	5A	5A	5A	5A	5A	5A	5A	5A	5A	5A	5A	5A	5A																
CONT 5	PA 2	2.40					2	2	2																													
	Dredge for PA 2	2.93								2	2	2																										
CONT 6	Dredge for PA 4B	10.84																4B	4B	4B	4B	4B	4B	4B	4B	4B	4B	4B	4B	4B								
CONT 7	PA 5B	2.80																		5B	5B	5B																
	Dredge for PA 5B	8.92																					5B	5B	5B	5B	5B	5B	5B	5B	5B							

10/16/2013
10:53 AM

--- NEW WORK TSP ---
BRAZOS ISLAND HARBOR, TEXAS CHANNEL IMPROVEMENT PROJECT
FEASIBILITY STUDY
OCTOBER 2013 PRICE LEVEL
50 YEAR O&M COST

	DREDGE	DEWATERING	LEVEES	TOTAL
YEAR 1				0
YEAR 2	7,175,110			7,175,110
YEAR 3	7,175,110			7,175,110
YEAR 4	21,930,458	4,065,631		25,996,089
YEAR 5	20,685,272	2,201,686		22,886,958
YEAR 6	13,541,421	1,014,656		14,556,077
YEAR 7	5,586,841	954,651		6,541,492
YEAR 8	29,105,568	4,065,631		33,171,199
YEAR 9	12,876,788			12,876,788
YEAR 10	7,808,484	2,201,686	3,170,350	13,180,520
YEAR 11	7,175,110			7,175,110
YEAR 12	35,471,879	5,080,287	2,141,095	42,693,261
YEAR 13				0
YEAR 14	18,463,629	954,651		19,418,280
YEAR 15	14,983,594	2,201,686		17,185,280
YEAR 16	21,930,458	4,065,631		25,996,089
YEAR 17	7,175,110			7,175,110
YEAR 18	19,243,099	1,014,656		20,257,755
YEAR 19				0
YEAR 20	36,914,052	6,267,317	3,170,350	46,351,719
YEAR 21	12,761,951	954,651		13,716,602
YEAR 22				0
YEAR 23	12,876,788			12,876,788
YEAR 24	35,471,879	5,080,287	2,141,095	42,693,261
YEAR 25	7,808,484	2,201,686	8,509,145	18,519,315
YEAR 26	7,175,110			7,175,110
YEAR 27	12,876,788			12,876,788
YEAR 28	27,517,299	5,020,282		32,537,581
YEAR 29	7,175,110			7,175,110
YEAR 30	21,349,905	3,216,342	3,170,350	27,736,597
YEAR 31				0
YEAR 32	34,807,246	4,065,631		38,872,877
YEAR 33	7,175,110			7,175,110
YEAR 34				0
YEAR 35	20,570,435	3,156,337		23,726,772
YEAR 36	41,173,557	5,080,287	2,141,095	48,394,939
YEAR 37				0
YEAR 38	7,175,110			7,175,110
YEAR 39	7,175,110			7,175,110
YEAR 40	29,738,942	6,267,317	3,170,350	39,176,609
YEAR 41	12,876,788			12,876,788
YEAR 42	19,128,262	1,969,307		21,097,569
YEAR 43				0
YEAR 44	29,105,568	4,065,631		33,171,199
YEAR 45	20,685,272	2,201,686		22,886,958
YEAR 46				0
YEAR 47	7,175,110			7,175,110
YEAR 48	35,471,879	5,080,287	2,141,095	42,693,261
YEAR 49	5,586,841	954,651		6,541,492
YEAR 50	20,685,272	2,201,686	12,690,025	35,576,983
TOTAL O&M:	$730,785,799	$85,604,237	$42,444,950	$858,834,986

Brazos Island Harbor, Texas Channel Improvement Project

Appendix C
Real Estate

May 2014

May 2014

APPENDIX C

REAL ESTATE PLAN

BRAZOS ISLAND HARBOR
CHANNEL IMPROVEMENT PROJECT
CAMERON COUNTY, TEXAS

1. **Statement of Purpose:** This report is intended to supplement the integrated feasibility study-environmental assessment for channel improvements of the Brazos Island Harbor (BIH), Texas deep-draft navigation channel. This study is being conducted in order to help determine if there is a Federal interest in making channel improvements to the existing BIH.

The Real Estate Plan is tentative in nature; it is for planning purposes only and both the final real property acquisition lines and the real estate cost estimates provided are subject to change even after approval of this report.

2. **Project Authorization:** The Congress (Senate and/or House Committees) authorized the US Army Corps of Engineers (USACE) to conduct a study of BIH, Texas to determine whether the project should be modified in any way, particularly with a view to widening and deepening the existing channels, pursuant to a resolution of the Committee on Public Works, U.S. House of Representatives, dated May 5, 1966. The current Project dimensions were authorized by the Water Resources Development Act of 1986 (Section 201, Public Law 99-662). The Feasibility Cost Sharing Agreement for the feasibility study was signed on June 28, 2006, with the Brownsville Navigation District (BND), who is the non-federal sponsor (NFS) on this Project.

3. **Project Location & Description:** The BIH Channel is a navigational channel located in Cameron County, Texas, approximately three miles from the Texas and Mexico border. The BIH currently provides for 42-foot deep navigation on the inland portion of the channel and a 44-foot depth in the offshore entrance channel.

This plan will address the deepening of the main stem of the BIH Channel, which is currently 42 feet deep, 250-300 feet wide, and approximately 19.4 miles in length. The project area includes upland placement areas (PAs), as well as Ocean Dredge Material Disposal Sites (ODMDSs) and a nearshore feeder berm. There are 10 PAs available for the placement of dredged material from the BIH Project; two existing ODMDSs and one nearshore feeder berm, totaling 1,015 acres, can be used for the Entrance Channel. Seven upland PAs for containment of material, totaling 2,817 acres, can be used for the Main Channel (PAs 2, 4A, 4B, SA, 5B, 7, and 8), as shown on Exhibit "A". The three PAs for material from the Entrance Channel are within the navigable waters of the U.S. and are available to the Federal Government by navigation servitude, are all dispersive, and by their nature have unlimited capacity. The seven upland PAs are provided through a 50-year easement from the NFS to the U.S. Government, which was signed in January 1994.

The Recommended Plan is to deepen the offshore portion of the channel from the existing 44 foot depth to the new 54 foot depth and the inland portion of the channel from the existing 42 foot depth to the new 52 foot depth, with no widening of the main channel.

4. <u>Real Estate Requirements:</u> The offshore portion of the BIH Channel will be dredged to a depth of 54 feet. This dredging will occur from Station -17+000 to Station 0+000. From Station 0+000 to Station 84+200 dredging will be to a depth of 52 feet. New work dredged material, and all maintenance material for this reach of the Project, will be placed in the existing PAs.

The NFS is required to have fee title excluding minerals to the PAs utilized for this project (Engineering Regulation (ER) 405-1-12; 12-9). As previously mentioned, seven of the existing PAs are provided through a 50-year easement from the NFS to the U.S. Government issued on January 26, 1994.

BIH is a commercial navigation project in which the Federal Government has the responsibility of operating and maintaining the project after construction. Government responsibilities include, but are not limited to, dredging of the Federal project channel, assuring placement area capacity, and protecting the Government for environmental liabilities.

Maintenance dredging of the Federal Project channel is a 100% Federal responsibility and is accomplished through Federal dredging contracts. Perpetual easements conveyed to the Federal Government are needed to assure all project placement areas, which are built for the purpose of supporting the Federal navigation project, are available to the Government as often and for as long as they are needed to support the project. The Government is also responsible for managing the navigation project to assure sufficient placement area capacity exists to meet the needs of the Federal navigation project now and in the future.

Perpetual easements allow the Government to better restrict/control non-federal use, maximum quantities placed by non-federal interests, and remove any potential for interference with federal dredge contractors. Finally, the Government has certain Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) liabilities already as an operator and transporter of materials put into the placement area. Perpetual easements provide the property interest necessary for the Government to issue outgrants to non-federal users that will require testing and approval of non-federal dredged materials prior to placement into the Federal project placement areas, thus protecting the Government from additional CERCLA liability.

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Based upon the above requirements to the non-standard perpetual easement estate, easement language below has been drafted for use in this project and submitted for approval in this report.

"Non-Standard Perpetual Dredged Material Placement Easement"

A perpetual and assignable right and easement on, over, and across (the land described in Schedule A) (Tracts Nos. ________________, ________________, and ________________), for the location, construction, operation, maintenance and patrol of a dredged material disposal facility, including the right to borrow and/or deposit fill, spoil and dredged material thereon, the right to move, store and remove equipment and supplies, and the right to perform any other work necessary and incident to said facility, together with the right to trim, cut, fell, and remove therefrom all trees, underbrush, obstructions, and any vegetation, structures, or obstacles within the limits of the easement; reserving, however, to the landowners, their heirs and assigns, all such rights and privileges as may be used without interfering with or abridging the rights and easement hereby acquired; subject, however, to existing easements for public roads and highways, public utilities, railroads and pipelines.

5. <u>Borrow Material:</u> The proposed Project does not require any borrow material.

6. <u>Access/Staging Area:</u> All of the proposed work will be performed within the existing right-of-way of the BIH Project. Access for construction will be by barge from the channel and existing access corridors will be utilized. All land that will be crossed is owned by the NFS and is available for this project.

7. <u>Recreation Features:</u> There are no recreation features for the proposed Project.

8. <u>Induced Flooding:</u> There will be no induced flooding by virtue of the construction of the proposed Project.

9. <u>Mitigation:</u> Section 6.0 of the main report states: "No environmental mitigation will be required for the Recommended Plan."

10. <u>Federally-Owned Land & Existing Federal Project:</u> There is no federally owned land within the project area. The NFS will not receive LERRD credit for lands made available for the Project by the Corps of Engineers or lands previously credited as a LERRD for a previous project with Federal funds participation.

11. <u>Non-Federal Sponsor Owned Land:</u> The Brownsville Navigation District owns all land required for the proposed Project, as shown on Exhibit A. The easement for the PAs is currently a 50-year easement and must be converted/extended to a perpetual easement. In order to credit the NFS for the administrative fees to complete this transaction, the NFS must furnish proper documentation.

12. <u>Navigation Servitude:</u> Navigation servitude is the dominant right of the Government under the Commerce Clause of the U.S. Constitution (U.S. CONST. Art. I, §8, cl.3) to use, control and regulate the navigable waters of the United States and the submerged lands hereunder for various commerce-related purposes including navigation and flood control. In tidal areas, the servitude extends to all lands below the mean high water mark. In non-tidal areas, the servitude extends to all lands within the bed and banks of a navigable stream that lie below the ordinary high water mark. United States v. Cress, 243 U.S. 316, 37 S.Ct. 380, 61 L.Ed. 746 (1917), Kaiser Aetna v. United States, 444 U.S. 164, 100 S.Ct. 383, 62 L.Ed.2d 332 (1979). The Government's rights under the navigation servitude exist irrespective of the ownership of the banks and bed of a stream below the ordinary high water mark and irrespective of western water rights under prior appropriation doctrine.

The channel itself, the two existing ODMDSs, and the nearshore feeder berm are within the navigable waters of the United States and are available to the Federal Government via navigation servitude.

13. **Public Law 91-646 Relocation Assistance:** There are no persons or businesses that will need to be relocated due to project implementation.

14. **Assessment of Non-Federal Sponsor Land Acquisition Capabilities:** Should land acquisition become necessary during the PED phase, a Capability Assessment and Risk Notification of the NFS's capabilities has been completed and is attached as Exhibit **"B".**

15. **Baseline Cost Estimate for Real Estate:** The cost estimate below reflects the estimated Federal cost for the proposed Project. These costs include team meetings, mapping of Project and administrative costs. The estimated federal real estate costs for the proposed Project are $11,250.00. The estimated non-federal real estate costs for the proposed Project are $5,000.00.

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May 2014

BRAZOS ISLAND HARBOR, TX
CHANNEL IMPROVEMENT PROJECT
Real Estate Federal Cost Estimate

REAL ESTATE COST ESTIMATE FOR PROJECT IMPLEMENTATION					
BRAZOS ISLAND HARBOR, TX- CHANNEL IMPROVEMENT PROJECT					
CAMERON COUNTY, TEXAS					
ACCOUNT	DESCRIPTION	ESTIMATE		CONTINGENCIES	
		TOTAL	MITIGATION	TOTAL	MITIGATION
0102	Acquisitions (Review RE Planning Documents & Mapping)	$2,000.00		$500.00	
0103	Condemnations				
0104	In-Lease				
0105	Appraisals				
0106	Real Estate PL 91-646 Relocation Assistance				
0107	Temporary Permits/Licenses/R.O.W.				
0108	Audits				
0109	Encroachments and Trespass				
0110	Disposals				
0111	Real Property Accountability				
0112	Project Related Administration	$2,000.00		$500.00	
0113	Facility/Utility Relocations				
0114	Withdrawals (Public Domains)				
0115	Real Estate Payments				
011501	Payments by Sponsor (Land & Improvements)				
011502	Payments by Sponsor (PL 91-646)				
011503	Payments by Sponsor (Damages)				
02	Planning by Non Federal Sponsor				
02-0117	LERRD Crediting (Technical, Appraisal, and	$5,000.00		$1,250.00	
	Total Admin & Payments (FED COSTS)	$9,000.00			
	Total Contingencies (FED COSTS)			$2,250.00	
	GRAND TOTAL FED COSTS	$11,250.00			

May 2014

BRAZOS ISLAND HARBOR, TX
CHANNEL IMPROVEMENT PROJECT
Real Estate Non-Federal Cost Estimate

REAL EST ATE COST ESTIMATE FOR PROJECT IMPLEMENTATION					
BRAZOS ISLAND HARBOR, TX- CHANNEL IMPROVEMENT PROJECT					
CAMERON COUNTY, TEXAS					
ACCOUNT	DESCRIPTION	ESTIMATE		CONTINGENCIES	
		TOTAL	MITIGATION	TOTAL	MITIGATION
0102	Acquisitions				
0103	Condemnations				
0104	In-Lease				
0105	Appraisals				
0106	Real Estate PL 91-646 Relocation Assistance				
0107	Temporary Permits/Licenses/R.O.W.				
0108	Audits				
0109	Encroachments and Trespass				
0110	Disposals				
0111	Real Property Accountability				
0112	Project Related Administration	$2,500.00		$625.00	
0113	Facility /Utility Relocations				
0114	Withdrawals (Public Domains)				
0115	Real Estate Payments				
011501	Payments by Sponsor (Land)				
011502	Payments by Sponsor (PL 91-646)				
011503	Payments by Sponsor (Damages)				
02	Planning by Non Federal Sponsor				
02-0117	LERRD Crediting	$1,500.00		$375.00	
	Total Admin & Payments (NON-FED COSTS)	$4,000.00			
	Total Contingencies (NON-FED COSTS)			$1,000.00	
	GRAND TOTAL NON-FED COSTS	**$5,000.00**			

16. **Acquisition Schedule:** There are no new lands needed for this project, however a perpetual easement shall be conveyed to the Government for all PAs owned by the NFS. The conveyance of the perpetual easements shall be completed within (12) twelve months from the signing of the PPA.

17. **Minerals:** The NFS owns fee, less and except minerals, for the 9 upland confined PAs for this project. According to Section 2.3.10 of the main report, there is mineral activity near the proposed project and currently there is no anticipated affect to construction, operation, or maintenance of the project. The 9 upland confined PAs for this project have been in continual use since 1994 and mineral activities have never posed a problem or interfered with surface disposal. We believe that the potential risks to the government associated with possible mineral extraction activities are sufficiently mitigated. The majority of mineral extraction activities currently taking place in this area are accomplished utilizing Horizontal Directional Drilling (HDD) techniques, which allow for the extraction of sub-surface minerals from locations horizontally removed from the drilling site. These techniques typically involve extracting sub-surface minerals at depths greater than 1000 feet below the surface and over a quarter mile distant from the drilling site. The potential risks to the government associated with the NFS not owning the mineral rights are sufficiently mitigated and there is no anticipated affect to construction, operation, or maintenance of the project because of nearby mineral activity. Accordingly, the additional cost and time associated with the NFS acquiring the mineral rights far outweigh the risks to the government

18. **Facilities/Utilities/Pipeline Relocations & Removals:** Two pipelines located within or near the proposed Project area were identified and investigated. The first pipeline located near the project area is a 4-inch gas gathering pipeline that runs parallel to the channel. This pipeline does not cross the main channel or any of the PAs, where the proposed dredging will take place; therefore it will not be affected by this Project. The second pipeline is a 10-inch refined products pipeline (-7 5 feet MLL W) located in the vicinity of Station 80+000 approximately 2.5 miles northeast of Brownsville, Cameron County, Texas. This pipeline was originally authorized under Department of the Army (DA) Regulatory Permit 14114(05) and is also covered by USACE Consent No. DACW64-9-06-03, which was issued by Galveston District Real Estate Division in October 2005.The channel deepening will not impact this pipeline; therefore, it does not require removal or relocation.

19. **HTRW or Other Environmental Contaminants:** Section 2.3.8 of the main report states, "The assessment of existing Hazardous, Toxic and Radioactive Waste Concerns (HTRW) conditions was conducted in general accordance with procedures described in the USACE Engineer Regulation (ER) 1165-2-132 - Water Resource Policies and Authorities Hazardous, Toxic, and Radioactive Waste Guidance for Civil Works Projects (USACE, 1992). The assessment aims to identify the existence of, and potential for, HTRW contaminations on lands in the project area, or external contamination, which could impact or be impacted by the project."

Section 7.8 of the main report continues by stating, "Potential HTRW impacts would be similar for both the No Action and Recommended Plan. Based on current sediment and water quality analysis, no sites in the study area are causing regulatory threshold exceedances in channel sediments at this time. No sites on the National Priorities List were identified along the Main Channel, and recent chemical analyses of sediments in the channel indicate no cause for concern for the Main, Jetty, or Entrance Channels. No change to this status quo is anticipated in the FWOP condition.

The Recommended Plan is not expected to induce changes in land use or industrial practices that would increase the occurrence or impact of HTRW sites in the project area. Future releases from known sites in the study area (see Section 2.3.8) may impact the channel, regardless of channel deepening activities. However, no evidence exists that demonstrates a known contaminant migration pathway from these sites to the channel. Therefore, no impacts are expected due to the presence of HTRW sites in the study area."

20. Landowner Opposition: There is no known opposition to the Project. Public input was solicited via a public scoping meeting held in 2007. The attendees were overwhelmingly in favor of the Project because of the economic benefits it would apparently generate.

21. Zoning: There are no special zoning ordinances proposed to be enacted m connection with this Project.

EXHIBIT A


Legend
Project PA NAD 83 SPSC
USAGE
FEEDER BERM
ODMDS
INLAND PLACEMENT AREAS
NOT TO BE USED
BND Prop Boundary
N
W
E
S
BIH PLACEMENT AREAS
Channel Improvement Project
Cameron Co. TX
0 1 2 4 6 8
Miles
PREPARED BY:
REAL ESTATE DIVISION
DATE: 20 AUG 13
Sheets 1 of 1
US Army Corps
of Engineers
Galveston District

ASSESSMENT OF NON-FEDERAL SPONSOR'S REAL ESTATE ACQUISITION CAPABILITY

Brownsville Navigation District (Port of Brownsville) Brazos Island Harbor, TX Channel Improvement Project Cameron County, Texas

I. Legal Authority

a. Does the Sponsor have the legal authority to acquire and hold title to real property for project purposes? Yes.

b. Does the Sponsor have the power of eminent domain for this project? Yes.

c. Does the Sponsor have "quick-take" authority for this project? Yes.

d. Are there any of the lands/interests in land required for the project outside the Sponsor's political boundary? No.

e. Are any of the lands/interests in land required for the project owned by an entity whose property the Sponsor cannot condemn? No.

II. Human Resource Requirements

a. Will the Sponsor's in-house staff require training to become familiar with the real estate requirements of Federal projects including PL 91-646, as amended? Training should not be needed, as no additional land is to be acquired.

b. If the answer to II.a. is "Yes", has a reasonable plan been developed to provide such training? N/A

c. Does the Sponsor's in-house staff have sufficient real estate acquisition experience to meet its responsibilities for the project? Yes.

d. Is the Sponsor's projected in-house staffing level sufficient considering its other workload, if any, and the project schedule? Yes.

e. Can the Sponsor obtain contractor support, if required, in a timely fashion? Yes.

f. Will the sponsor likely request USACE assistance in acquiring real estate? No.

EXHIBIT B

III. Other Project Variables

a. Will the Sponsor's staff be located within reasonable proximity to the project site? Yes.

b. Has the Sponsor approved the project/real estate schedule/milestones? Yes.

IV. Overall Assessment

a. Has the Sponsor performed satisfactorily on other USACE projects? Yes.

b. With regard to this project, the Sponsor is anticipated to be: Fully Capable

V. Coordination

a. Has this assessment been coordinated with the Sponsor? Yes.

b. Does the Sponsor concur with this assessment? Yes.

Prepared by:

Kimberly Jackson 8-12-13
Senior Realty Specialist
Tulsa District Corps of Engineers

Reviewed by:

Rhonda Sallee
Chief, Acquisition & Realty Svcs. Branch
Tulsa District Corps of Engineers

Brazos Island Harbor, Texas Channel Improvement Project

Appendix D

Public Coordination:

1) Scoping
2) Comments on Draft IFR-EA

July 2014

Appendix D

Public Coordination
Brazos Island Harbor
Channel Improvement Project
Cameron County, Texas

U.S. Army Corps of Engineers, Galveston District
2000 Fort Point Road
Galveston, Texas 77550

July 2014

Appendix D
Public Coordination
Brazos Island Harbor Channel Improvement Project
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PDF Page

PUBLIC SCOPING MEETING
JANUARY 31, 2007

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

Notice of Public Scoping Meeting

Brazos Island Harbor (Brownsville Ship Channel)
Feasibility Study

Introduction
This Notice provides a summary of the problems and opportunities associated with a proposed channel modification project to the Brownsville Ship Channel (also known as Brazos Island Harbor) (Figure 1) and requests public input to the study.

Study Background and General Description
Brazos Island Harbor is a Federally-authorized deep-draft navigation project. The study area encompasses the navigation channel and surrounding region. The proposed study area is located in Brownsville, Cameron County, Texas.

The proposed project consists of enlarging the existing Brownsville Ship Channel by deepening the entrance and jetty channel, the lower section of the main channel and the upper section of the main channel including turning basin. In addition, widening alternatives will be considered.

Study Process and Status
The general study process involves a reconnaissance phase and a feasibility phase. The reconnaissance phase has been completed. The one-year reconnaissance phase consisted of analyses necessary to determine whether future planning was economically justified and environmentally acceptable. The reconnaissance study evaluated a deepening and widening plan and concluded that there was a Federal interest in the proposed project and recommended a more detailed (feasibility-level) review of the project. The feasibility study began in June 2006 and will determine the most cost-effective alternative for improving the channel while protecting the Nation's environment. The product of the feasibility phase is a report that presents a recommendation to the Congress that the solution be implemented.

Public Participation
The Galveston District is soliciting input through a public scoping meeting in order to address problems and opportunities associated with channel modifications to the Brownsville Ship Channel. Specifically, public input is requested concerning:

1) Economic development opportunities
2) Operational constraints associated with the Brownsville Ship Channel
3) Problems associated with current dredged material placement practices
4) Opportunities for environmental restoration
5) Any other project-related concerns the public may have

This notice serves as an invitation to the public to attend. The public will be provided an opportunity to express comments in person or in writing. Written comments need to be received on or before March 2, 2007.

-2-

Meeting Location: Mary Yturria Education Center
(Historic Brownsville Museum),
641 E. Madison, Brownsville, Texas,

Time and Date: 7:00 pm (Registration begins at 6:30 p.m.)
January 31, 2007

All interested parties are invited to provide input into this study so that all concerns can be addressed. If you need additional information, please contact the Environmental Lead, Ms. Natalie Rund by telephone at (409) 766-6384 or by e-mail at natalie.a.rund@swg02.usace.army.com.

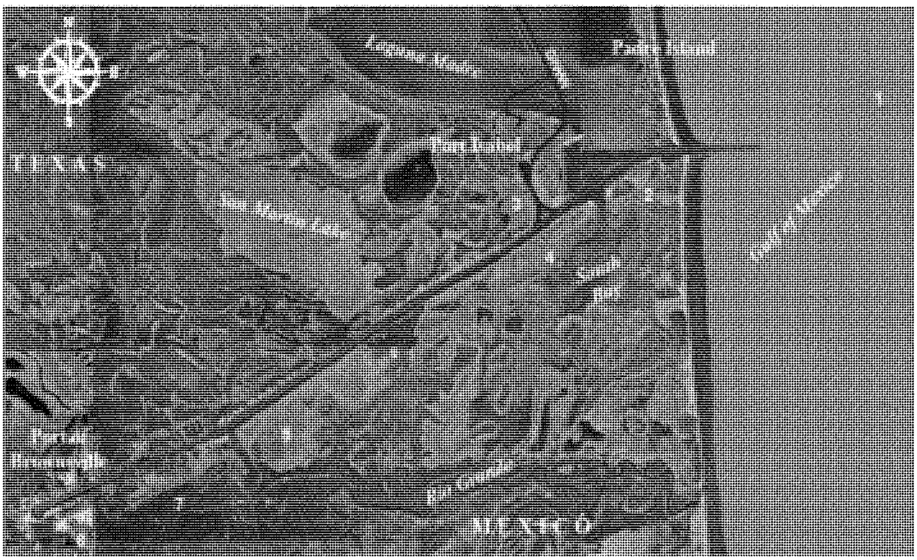


Figure 1. Vicinity Map

BROWNSVILLE NAVIGATION DISTRICT
BRAZOS ISLAND HARBOR
PORT DEEPENING FEASIBILITY STUDY

Historic Brownsville Museum
641 E. Madison
Brownsville, Texas

January 31, 2007

BE IT REMEMBERED that on the 31st day of January, 2007, the following proceedings were held at the Historic Brownsville Museum, 641 E. Madison, Brownsville, Cameron County, Texas.

MR. ARAMBULA: Good evening. Welcome. My name is Martin Arambula, chairman for the Brownsville Navigation District, and we welcome you to the public forum that we're having here being conducted by the U.S. Army Corps of Engineers.

I would like to first welcome all of the folks, the stevedores and the leassees that lease at the Port of Brownsville, community members. And to my right here I have the commissioners from the Port of Brownsville, Mr. Carlos Masso. We have Commissioner Peter Zavaletta next to him, and Commissioner Luigi Cristiano, Commissioner Roy De Los Santos.

I would like to turn it over now to Colonel Weston, who is going to be conducting the majority of this program here, and without further adieu, Colonel Weston. Thank you, sir. Thanks for being here.

COLONEL WESTON: Good evening, ladies and gentlemen, and thank you, Mr. Arambula. I'm pleased to be here tonight. I'm Colonel Dave Weston, District Engineer of the Galveston District Corps of Engineers.

I welcome you to tonight's public meeting concerning the Brazos Island Harbor Feasibility Study. For the record, let me state that this public scoping meeting is being convened at 7:12 p.m., on January 31st, 2007, at the Mary Yturria Education Center, also known as the Historic Brownsville Museum in Brownsville, Cameron County, Texas.

The Corps of Engineers and the Brownsville Navigation District are conducting a study to determine the economic, engineering, and environmental feasibility of improvements to the Brownsville Ship Channel. The feasibility study began in June 2006 and will determine the most cost-effective alternative for improving the navigation while protecting the nation's environment.

The main purpose of this meeting tonight is to ask you, the public, if you have any suggestions regarding alternatives that should be considered, specific studies that should be conducted, or know of any significant environmental issues that need to be addressed during our study process. We are specifically seeking input concerning, but not limited to, the economic development opportunities; operational constraints associated with the Brownsville Ship Channel; problems associated with current dredged material placement practices; significant environmental issues or concerns; and any other concerns you may have with the proposed channel improvement project.

Before I discuss tonight's ground rules, I would like to introduce the following individuals: First of all, representing Congressman Ortiz' office, we have Ms. Denise Blanchard; and Joel Munguia.

Representing county judges and county commissioners, we have Commissioner John Wood and Commissioner David Garza.

And representing the Brownsville Navigation District Board of Directors, we have Carlos Masso, Luigi Cristiano, Roy De Los Santos, we have Martin Arambula, Donna Eymard, and Peter Zavaletta.

Additionally, I would like to introduce those that are sitting with me at the head table. You've already met Mr. Arambula with the Brownsville Navigation District. We also have Mr. Hector Lopez, the director of engineering. He's the director of engineering with the Brownsville Navigation District; and Mr. Carl Anderson of the Corps of Engineers, Galveston District. Carl is our project manager for the Brazos Island Harbor Project.

I hope that all of you had an opportunity to read the announcements of the public meeting. There were over 240 copies distributed to individuals, agencies, organizations, and news media believed to have an interest in these proceedings.

A copy of the public notice and a project overview are also available at the registration table. Please feel free to take additional copies and share with family and friends. The public notice, mailing list, and a list of those present will be made a part of the record of this meeting. A recorder is here and will transcribe these proceedings, and a copy of the official meeting record will be posted on our website. The specific website address will be provided later in this meeting by Mr. Anderson.

I hope everyone has filled out an attendance card. If not, I ask that you do so now. If you could raise your hand, we'll have someone bring you a card, if you haven't done so when you came into the building. The attendance card is used to record the participants in this public meeting and to inform you of your desire to make an oral statement and/or present written material. If you indicated on the attendance card that you want to make an oral statement, you will be given the opportunity to do so.

I would like to emphasize that the

purpose of the public meeting is to provide you, the public, an opportunity to present your views, opinions, and recommendations concerning the Brazos Island Harbor Feasibility Study. Your comments help the Corps of Engineers and the Brownsville Navigation District identify environmental concerns and study efforts and meet the National Environmental Policy Act requirements for preparing an environmental impact statement. Since our primary purpose tonight is to listen and learn, we will not be responding to your questions and concerns this evening. However, every effort will be made to address the concerns and issues identified during the feasibility study process. This will not be your only opportunity to express your comments. There will be additional opportunities for the public to express their views in other meetings in the future.

Let me discuss the format for tonight's meeting. First, Mr. Hector Lopez of the Brownsville Navigation District will present an overview of the Brownsville Ship Channel and the interests of the Brownsville Navigation District in this study.

Next, Mr. Carl Anderson from the Corps of Engineers will provide an overview of the feasibility study process.

Following these presentations, I will open the floor for public comments. I will first recognize those federal and state officials that have requested to make a statement, followed by city and county officials who desire to speak, then the federal and state resources agencies will present their comments, if they desire.

And, finally, I will recognize each individual from the registration cards that have indicated that they wish to make a statement. Again, since our main purpose is to listen and learn, we will not be addressing any questions or concerns this evening. We're interested in hearing what you have to say. Everyone who has indicated a desire to comment will have the opportunity to do so. Is there anyone who needs to turn in a card? If so, would you please raise your hand? Thank you.

I would ask that we give all speakers the courtesy of not making comments during their presentation. All individuals have an equal right to be heard and you will have the opportunity to speak in turn. At this time, I would request that all cell phones be turned off to avoid disturbing the speakers and the audience.

I would like to now call on Mr. Hector

Lopez, who will give his presentation.

MR. LOPEZ: Thank you, Colonel Weston.

Commissioners, elected officials, distinguished guests, ladies and gentlemen, good afternoon.

I will try to make my presentation brief. I have several slides with a lot of information, some of them include some tabulations, and I will try to highlight those points. I'm not going to go into detail through every one.

The purpose of my presentation today just to quickly give you an overview of the Port operations, some of the most recent cargo statistics, some general research from the economic impact study conducted by Dr. John Martin last year, and some considerations for this project.

Generally, you can say that the planning of the Port of Brownsville began back in 1888 with the construction of the South Jetties. The Ship channel, which is, approximately, 17 1/2 miles long was constructed during the period of about 1934 to 1938. In 1966, it was deepened to 36 feet and draft, with the idea to bring tankers and bulk carriers with a draft of up to 32 feet carrying, approximately, 23,000 dead weight tons of cargo. It wasn't until

1986 which authorization was given to expand the channel to its current dimensions, that is currently a 42 foot draft for most of the channel, until you get to our 1,200 foot turning basin, which is a draft limitation of 36 feet. Basically, the design ship for this vessel was a 775 feet long vessel with a 106 foot wide beam fully drafted to 38 feet, being able to carry 43,000 dead weight tons.

As you all know, from the faces that I see in the audience this afternoon, most of our operations are conducted at the turning basin. We have several cargo docks, oil docks, a bulk cargo facility and a grain elevator facility. We're also home to one of the largest shipyards in Texas, the Campo Lanco facility. We currently have several private dismantlers working on dismantling ships; plenty of warehouse space; patios, yards for the cargo, and, of course, we also have the assistance of our sister company, the BRG for rail movement of the cargo.

In general, you can say that the Port is primarily a port covering both dry and liquid cargo handling. Principal imports include steel products, petroleum products, grain, ore and minerals, chemicals. Interesting to note that in 2002 we were considered the second largest in-transit by volume port in the United States. And in-transit, basically, refers that most of the commodities coming through the cargo do not remain in the immediate area.

Over the period of the last five years, the Port has averaged about 4.4 million metric tons per year, basically, ranging from about four million to 5.2 million in the last two recent years.

Percentagewise, most of our commodities, or 85 percent of our commodities is attributed to steel and petroleum products, or minerals. Vegetable oils, grains, and other commodities make up the remaining 15 percent.

In terms of the way that that cargo comes into the port, basically vessel and barge, 64 percent of our total tonnage comes through vessel. The remaining 36 percent is attributed to either intracoastal or ocean going barges.

Over the period of 2003 to 2005, an average of about 350 vessels have made port -- have made call at the Port of Brownsville. It's interesting to note that about 49 vessels on the average, or 12 percent of those vessels, have had a deep draft, or what I consider 35 feet or more. Those vessels account for 26 percent of the total tonnage, vessel tonnage, at the port, thus giving significance to the need for deep draft. In terms of commodities for those draft ranges -- and it's hard to see on the slide. I apologize for that yellow coloring there -- but, mainly ores, aggregates, iron & steel, and petroleum products account for most of the deep draft vessels.

Last year, Dr. John Martin, from Martin & Associates conducted an economic impact study for our seaport activities. His basic model was, basically, to measure the impacts in four categories, jobs, employee earnings, business revenue, and state and local taxes. Without going too much detail into this very exhaustive report prepared by Dr. Martin, he basically summarized the impacts in this table, and according to Dr. Martin, over 38,000 jobs, which includes both direct, induced, indirect and related jobs are related to -- in some way to the marine cargo activities at the Port of Brownsville, as well as the offshore and rig repair facilities. Of that, just by looking at the direct impacts, over 140 million dollars in personal incomes were generated through salaries for that -- for the year of 2005. What that means as far as state and local taxes? He has estimated that over 44 million dollars a year are generated as a result of direct, induced, and indirect taxes.

In his report, he mentioned three highlights. Thirty-eight thous -- as I just mentioned awhile ago, 38,000 jobs in Texas are in some way related to the cargo moving via the marine facilities and the shipyard repair.

Over 2.8 billion dollars in economic activity was generated in the state of Texas as a result of the marine cargo and the shipyard repair activities at the port.

And in addition to the 44 million dollars of state and local taxes, over 130 million of state and local taxes were created by -- due to economic activity of the related users. The related users are those facilities that utilize our commodities at other places, for example, steel mill industries or other manufacturers that utilize our commodities.

Some of the opportunities to be seen by deepening the port, of course, would be in the better utilization of vessels, in terms of the loaded tonnage. A larger vessel with more tonnage results in a reduction in the shipping costs for that commodity.

Also, in addition to the shippers and

consignees, it means that you have less vessels traveling back and forth to bring a certain specific volume of commodity to your company.

As far as the ship and oil rig repair operations, the deepening would really mean that they would be able to handle and repair larger offshore rigs currently operating in the Gulf of Mexico. You can think of this as -- this opportunity as a loss if we were not able to provide that service, because those offshore rigs that are currently working in the Gulf of Mexico would not be able to be serviced in the Port of Brownsville.

Dr. Martin further concluded that over 2005, the average cost per ton at the Port of Brownsville was, roughly, around $23. He estimates that if we were to go to 48 feet, basically, a Panamax fully loaded drafted vessel to 45 feet with a dead weight tonnage of about 75,000 tons would cost around 17. That, in itself, it's economic benefits to shippers, the consignees, and the users. He's estimated that the annual benefits would be in the order of 31 million dollars extra.

As far as the shipyard's impacts of not being able to service those rigs presently in the Gulf of Mexico, it will result, basically, in you can say a loss of over, perhaps, potentially, over 3,000 additional jobs, revenues in personal incomes over 138 million dollars, and losses in state and local taxes over, approximately, another 49 million dollars per year.

Why deepen the -- why deepen the channel? Well, obviously, it will provide benefits associated with transportation costs and savings to our customers. It would also provide additional leverage for our local ship and oil rig manufacturer to create more jobs and more revenues for the region.

Currently, we're mainly handling what we consider Handimax vessels or not fully drafted Panamax vessels. One of those Panamax vessels could come loaded to their full draft and be able to provide additional incentives to the Port of Brownsville, especially in the steel slab commodity. Obviously, it would -- we need to continue to maintain an increased commercial traffic through the region. It will result in investments in the region's infrastructure, and it will be -- it will result in economic growth and prosperity, which is something that we need to continue to work forward to create economic activity.

That, basically, presents my --

concludes my presentation, and let me introduce Mr. Carl Anderson with the Corps of Engineers. He will delineate a little bit more about the tasks and the process in which this feasibility study is conducted.

Thank you.

MR. ANDERSON: The existing channel is -- we have about 2 1/2 miles coming in out of the Gulf, we call the entrance channel, through the Jetties, and you have an inland portion, which comes from the entrance channel all the way down through the landlock area about 15 miles. We have a turning basin here, all of this is at 42 feet, and then at the end of the channel is a 1,200 foot wide turning basin, which is 36 feet deep.

The channel has a long history. In the early sixties, the channel was constructed to 36 feet. In 1986, it was authorized to go to 42 feet, and now we're looking to go deeper. So, roughly, on every 20 year cycle we're looking at deepening channels because of the -- the economics involved with the Port activities.

Began back in 1880, when the channel -- the Brownsville Channel was originally authorized to construct two jetties. The jetties were started and never completed because they ran out of funds. But the Rivers and Harbors Act of 1880 authorized it for 10 feet. In 1919 it was authorized to go to 18 feet. In 1930, and then amended again in 1960, to go to 36 feet, and that was the initial construction through the land area; and then Water Resources Development Act, 1986 authorized it to go to 42 feet, which is its present configuration today.

Maintaining the channel is paid for by federal funds. All the berthing areas are the responsibility of the Brownsville Navigation District to maintain.

Transportation efficiency. Some of the activities of the Brownsville Channel include construction of offshore rigs, and there's beginning to be more and more of these as the cost of oil keeps going up; ship repair and ship dismantlement; Steel Fabrication; a lot of bulk terminals; and a lot of steel and ore minerals being offloaded and then either truck or rail to other parts of the country or to Northern Mexico. Larger ships would allow additional cargo to be brought into the Port and at a cheaper cost.

What we want to look at is the possibility of deepening the channel all the way from the Gulf of Mexico all the way to the final turning basin. We are looking at going a maximum of 48 feet in depth, and that would increase the size of the ships that could call on the Port, and resulting in more cost savings because we could bring in more tonnage with a single ship. Also widening the channel. A lot of ship makers are now going wider to get additional cargo because of the draft limitations on some of the ports. Widening would also allow for larger oil drilling rigs to be constructed and repaired here in Brownsville.

We have one offshore disposal area out in the Gulf, and that's mainly used when we dredge and maintain the entrance channel, and then there are eight upland placement areas along both sides of the channel where the material will be placed for the new construction and also the maintenance of the new project.

How does a project evolve? Well, first, the local sponsor decides they need a project. They go to their congressman, who gets an approval -- gives us an approval to investigate whether there's an interest and a benefit of reconfiguring the channel. This is a two phase planning process. The initial phase is the recon study done by the Corps of Engineers, and out of that either a determination that there is no federal interest in pursuing changing of the channel, or there is an interest and a benefit to the nation in pursuing a deepening, widening. If that is determined, then we do what we call a feasability study, which we are just initiating, and the environmental impact statement on what those changes would be. Once that's determined, then we go back to Congress for authorization and funding, and then we would go into detail design, construction, and then operation and maintenance of that facility.

This project was begun with the reconnaissance phase, and that was completed in February 2004. In June of 2006, the Corps of Engineers and the Brownsville Navigation District signed a feasability cost sharing agreement to initiate the feasability study. During this study, the Port and the federal government share equally in the cost of that study.

And that brings us to January 31st, and that's what you're doing here right now, having the first public scoping meeting. There will be three public meetings during the feasability study phase.

The results of the reconnaissance phase was that there was a navigation, ecosystem restoration and shoreline erosion abatement potentials that were economically feasible. And it is in the federal interest to conduct more detailed investigations, that's the feasibility study, for this project.

The feasibility phase would develop and evaluate alternative plans to address problems and opportunities identified by the sponsor and the public. We don't know what it's going to look like yet, but we need input from you all as to what some of the concerns are, what are some of the benefits, and the effects on this area a new channel would have. Then we determine whether there is an economic justification for the project, that the cost of the project is outweighed by the benefits.

The study will also include a preparation of the final feasibility report, which is submitted up to Washington and then on to Congress, and an environmental impact statement. It's estimated it would take 48 months to complete the feasibility study process. The estimate cost is, approximately, 6.8 million dollars. As I said before, it's equally cost shared.

The steps in the feasibility study. Specify the problems -- bigger ships, wider ships --

and opportunities, and this is done by the sponsor, the federal, state, and local concerns, and the public. Once we determine what those problems and opportunities are, we go into forecast and analyze the various conditions relative to those concerns, then we would formulate alternative plans on how to resolve these problems and how to maximize the opportunities. Then we evaluate the economics, the environmental, and other effects that each plan would have on -- for the project. We would compare alternative plans and their efforts, and then we would select a recommended plan for development.

Now what we look at during this phase are engineering concerns, environmental concerns, and social and economic concerns.

Some of the engineering issues. Channel design optimization. Where we can get the most ships in safely, berth them, unload them, and get them back out. We will conduct a ship simulation study, which we will configure a channel on a computer model. The Port pilots will participate. They will actually navigate ships through the various alternatives, and we'll determine what hazards, what opportunities we have to better make the channel more safe, easy to operate. That will also determine if we need to widen in certain areas.

We'll have to figure the quantity of dredge material that will need to be disposed of, the new maintenance shoaling rates, how often the channel will have to be maintained once it is constructed, and any new berthing area requirements. The deeper channel is going to require deeper berthing areas.

We will develop a long-term dredged material management plan. We'll do a geotechnical investigation for placement areas, see how high we need to raise the levees, if the ground under the levees will sustain the height. It may be necessary to purchase additional land areas for new placement areas. And we also look at utility relocation requirements, pipelines, electrical lines, water, and that sort of thing that may be in the way of deepening.

We will do hydrodynamic modeling. This will be a computerized model. We will look at the various depths and the changes it may have on salinity. Currents. We'll look at the sediment quality, the new material that will be taken out. We also look at what impacts a new channel may have on the endangered species in this area; the marine resources. We'll look at shoreline erosion. Maybe the various alternatives would exacerbate some of the erosion problems and we would either rule out that alternative or have some kind of a structure that would keep the shoreline from eroding.

We also look at beneficial uses of dredge material. Can we create some shallow habitat for sea grasses. And we're also looking at dust abatement, which is a -- has been a problem in this area, and the Port has already initiated taking care of that and is going to increase their efforts in reducing the dust problems.

Social and economic issues. The overall impacts, the economic impacts to the area, whether they be positive or negative. Projected impacts on commerce. When we bring it in cheaper, that means we pay for it cheaper at the local stores. We'll also do a culture resources investigation. Is there any historic shipwrecks or historic previous civilizations that we may be disturbing. And we also look at the project effects on human quality of life. The Port is a big contributor to jobs in this area. Bringing in more commerce would bring in more jobs and maybe attract additional jobs to this area.

The entire process is an open process. We have nothing to hide. We identify the stakeholders and urge participation. And you, as the public, are definitely the stakeholder, because you will benefit from any cost savings that should result from a new project. We do intensive state and federal resource agency involvement, and we will have working groups on various environmental issues, and we will also have public, as well, involved in those working groups to determine the best effort that we can do to minimize the impacts, or actually enhance the environment in this area.

Again, I would like to say it's all public input. We do encourage your comments. You can speak tonight and it will be recorded. You can write down comments and hand them to us to be included in the official record, or you can send in your written comments to Colonel Weston at the address here, or you can also submit comments on the Internet by going to our web address here. You can click -- when you get to here, you can click on projects, the project listings, and then Brazos Island Harbor. That will bring up a comment screen, and when you send that comment, it comes directly to me. And that will be recorded and made part of the public record and your comments will be considered.

I'm now going to turn the meeting back

over to Colonel Weston.

COLONEL WESTON: Okay. Thank you, Hector and Carl for your comments and your presentations. What we'll do now is begin our comment period, and we'll start off with federal, state, and local representatives first, followed by the general public. We have numerous folks here who want to make comments. I would ask you to hold your comments to no more than three minutes, so you have to be clear and concise, you know, state your issues or your concerns or your -- whatever you want to say about the project in a concise manner so that we can keep moving forward, and so that everyone has the opportunity to speak and say what they have to say this evening.

First of all, I would like to start off with Ms. Denise Blanchard, representing Congressman Ortiz' office.

MS. DENISE BLANCHARD: Thank you very much. Colonel Weston, on behalf of Congressman Ortiz, we thank you so much for being here for this scoping meeting. We know how important this is. And, of course, Chairman Arambula, thank you for the opportunity to be here to address the Corps of Engineers, and Hector, thank you for your great presentation; and Mr. Anderson, thank you for helping to make this very understandable, very simplistic and very understandable.

As I was listening to your presentation, what was so interesting is that I keep thinking about the leaders back in 1880, or back in the 1930's, who were probably sitting here trying to do the same thing, but had they not moved forward and pushed forward for those projects, we probably would not be sitting here trying to deepen our own channel here. And so we thank the men that have gone before us, men and women that have gone before us, to have made the Port of Brownsville possible, but we must continue the work, and we just want to thank you so much for being here.

Congressman Ortiz, as you know, is in Washington, has asked me to read remarks on his behalf on the Brownsville Navigation District's widening and deepening program, January 31, 2007.

Since the authorization of the reconnaissance study in July of 2000, the federal government has played a big role in assisting the Port of Brownsville's expansion and growth into one of the premiere ports in the nation. The reconnaissance study was originally authorized because the future economic demands dictate that the Port of Brownsville would need to be improved in order to meet the transportation and trade needs of the region and cross border trade with Mexico.

For the past two years, the Congress has approved appropriations for the Corps of Engineers' feasibility study, further showing support for this important project. Although the word of reauthorization has been stalled in Congress for many years now, the Brownsville Navigation District widening and deepening project continues to gather support.

Why? Over 2 1/2 million deep draft tons pass yearly through the Port of Brownsville, Texas. Forty percent representing cargo bound ore coming from Mexico. Mexico is a stone's throw from Brownsville across the Rio Grande River. If total yearly deep draft commerce at Brownsville is about 2.5 million tons, then almost 40 percent, 940,000 tons is Mexican trade. And if such a situation is not unique in the world, certainly it is rare. Port of Brownsville offers an excellent strategic location for security and economic concerns.

The summary of impacts generated by the Port of Brownsville. From October 2006 study that looked at the local and regional economic impacts of the Port of Brownsville, the economic impacts generated by the marine cargo terminals and ship repair oil rig maintenance operations are summarized in Exhibit E-2 -- and I believe, Mr. Lopez, it's pretty much what you were indicating about the great economic value, so I will skip over that -- but, basically, specifically, the vessel and cargo activity at the marine, cargo facilities and ship repair, oil rig maintenance operations, generated the following impacts in the State of Texas in 2005.

Thirty-eight thousand, four hundred and twenty-eight jobs in Texas are in some way related to the cargo moving via the marine terminals and activity at the ship and rig repair yard. Of the 38,428 jobs, 4,695 direct jobs are generated by the marine cargo and vessel activity and ship and rig repair operations. Of the 4,695 direct jobs, marine cargo activity supports 2,671 direct jobs, while the ship and rig maintenance and repair operations generate 2,024 direct jobs. As a result of local and regional purchases by those 4,695 individuals holding the direct jobs, an additional 2,446 induced jobs are supported in the regional economy. Three thousand, four hundred and thirty-seven indirect jobs were supported by 182.2 million dollars of local purchases by businesses supplying services to the marine terminals, and by businesses dependant upon the Port of Brownsville for the shipment and receipt of cargo, and on the ship and rig repair operations.

In addition to the direct, induced, and indirect job impacts, 27,851 jobs in Texas are related to the cargo moving over the marine terminals at the Port. It is to be emphasized that a large share of the imported steel cargo moving via the Port is destined for Mexico, and these related jobs are not included in the analysis. The jobs are considered to be related to activities in the marine terminals at the Port of Brownsville, but the degree of dependance on the marine terminals is difficult to quantify and should not be considered as dependant on the Port, as are the direct, induced, and indirect jobs. If the marine terminals were not available to these organizations, they would suffer an economic penalty over the longer term. Such a penalty would vary from loss of employment opportunities in some cases to an increase in total transportation cost in other cases, which could, in turn, result in unemployment reductions.

In 2005 marine cargo activity at the marine terminals at the Port of Brownsville and the ship and rig repair operations generated a total of 2.8 billion dollars of total economic activity in the state of Texas. Of the 2.8 billion dollars, 515.7 million in direct business revenue received by the firms directly depended upon the Port and providing maritime services and inland transportation services to the cargo handled at the marine terminals and the vessels calling the Port, as well as ship and rig repair and maintenance services. An additional 182.2 million dollars is used for local purchases. That's in our own economy. The remaining 2.1 billion dollars represents the value of the output to the State of Texas that is created due to the cargo moving via the Port of Brownsville marine terminals. This includes the value added at each stage of producing an export cargo, as well as the value added at each stage of production for the firms using imported raw materials and immediate products that flow via the marine terminals, and are consumed within the state. The majority of these user impacts are associated with the imported steel products receipts.

Marine activity supported nearly 2.0 billion dollars of total personal wage and salary income and local consumption expenditures for Texas residents. This includes 486.6 million dollars of direct, indirect, and induced and local consumption expenditures, while the rate remaining, 1.4 billion, was received by the related port users. The 4,695 direct job holders received 140.8 million dollars of direct wages and salary income. A total of 44.2 million of state and local tax revenue was generated by maritime and ship and rig maintenance and repair activity at the Port of Brownsville. In addition, 129.6 million of state and local taxes were created due to economic activity of the related users of the cargo moving via the marine terminals.

This economic activity is clearly a trend we want to continue for Brownsville and South Texas. The widening and deepening channel will assist the port in becoming one of the premiere ports in the nation. The continued funding for the feasibility study and future construction is necessary to make sure that the future needs of the port of traffic and trade are met.

These are the comments for Congressman Ortiz, and just know that you will have always Congressman Ortiz' full support. Thank you very much for your time.

COLONEL WESTON: Thank you. Okay, next we have -- I would like to ask Ms. Brenda Watson, who is representing the State Senator Eddie Lucio's office.

MS. WATSON: Good evening. It's a pleasure to be here. Senator Lucio is in Austin this evening and asked me to come and read a letter off on his behalf.

He says, "I'm pleased to support the enlargening and deepening of the Brazos Island Harbor, Brownsville Ship Channel, which is currently being considered by a feasibility study initiated by United States Corps of Engineers. Increasing the depth and width of Brownsville Ship Channel and turning basin would increase the economic potential of the Brownsville Navigation District, including the economies in and around Brownsville and Northern Mexico.

Our port is considered a major international port that supports an area that is growing exponentially. We must broaden our infrastructure if we are to attract additional economic revenues and raise our standards to meet the challenge of the 21st Century.

I wholeheartedly support this project and look forward to its implementation in the near future." And it's signed Senator Lucio. Thank you.

COLONEL WESTON: Thank you. Next I would like to call on Councilman David Garza, or Commissioner David Garza.

MR. GARZA: Good evening, Colonel Weston, Mr. Anderson, Hector, and Mr. Arambula. It's a pleasure to be here to represent our judge, County Judge Carlos Cascos, who could not be here this evening. Judge Cascos is in Austin today at a meeting and will be there for the rest of the week. On behalf of the Cameron County Commissioners Court and the Judge's office, we welcome you to Cameron County, and we want to extend to you a message, and the message is we strongly support, as a Commissioner's Court and County Judge, the efforts by the Brownsville Navigation District to deepen and enlargen the channel.

We feel that the economic benefits to the residents of this county, to this part of the state of Texas, and to the United States would be tremendous. The potential that exists for us here, having four modes of transportation, is unbelievable. What is going to occur in the next seven years in the Panama Canal could have a very great impact to our navigation district here in Brownsville.

We believe that seven years from now,

when the big large ships can come through that canal, we can be the first to benefit on the Texas coast to move product from Brownsville throughout the whole United States at a much reduced cost for all people, and provide the jobs locally for our economy here. We know that, environmentally, when we work with you, good things happen. We have excellent projects that we've been working on in which we've partnered with the Army Corps of Engineers, the Brownsville Navigation District, and in one particular project, the Bahia Grande Restoration Project, over 60 partners wanting to make things happen for us.

It's been through the help of both of you up here tonight, both groups, that this was able to occur, and we know that what started out as a small dust abatement project for Cameron County Commissioners Court has ended up in a great restoration project for the United States, but, most importantly, for our area in South Texas. The benefits of what we can do together are of unlimited potential. We just hope that we will be allowed to work with you in partner to be able to bring this project to fruition.

Again, on behalf of the Commissioners Court and the County Judge, we support it strongly and we look forward to doing anything we can. We have already implemented an RMA in Cameron County, which involves a regional mobility authority that is looking at thoroughfares for product movement and mobility throughout the whole county in connecting us to interstate highways. Many projects are on the table today as we speak, some of which are already in the drawing phases, or the drawing board phases.

We have projects that lead to the Port of Brownsville, that will hopefully lead to an interstate in Harlingen and go on to Corpus, and, you know, all that mobility will do nothing more but enhance and help, make sure that this project of the deepening and enlarging of the channel will be the most beneficial thing we can do for our area, the largest economic engine that we can provide, and, of course, the most jobs for our local folks.

Thank you, and good evening.

COLONEL WESTON: Thank you. Next I would like to invite County Commissioner John Wood to come forward.

MR. WOOD: Colonel, gentlemen, my name is John Wood. It's a priv -- I really appreciate the opportunity to be here before you this afternoon -- this evening.

It's a very important project that we're looking at right now. Having been in Brownsville since 1970, I've been involved in lots of things, but one of the things that we've all been involved in in our area is the Port of Brownsville, because of the economic development it provides, because of the jobs, because of it being a real focal point in our area. I've seen things come and go through the Port. I've seen cotton go through the Port, leave our area when cotton was king in the Valley. I've seen citrus shipped to Europe through the Port of Brownsville; fruit juices come into the Port of Brownsville, go out of the Port of Brownsville on vessels.

I've seen all sorts of commodities come in, including -- well, if I remember back in the early eighties, when Ixtoc Uno, the oil well in the Campeche -- Bay of Campeche was going crazy and exploding and everything, and the Port of Brownsville served as the focal point at that time for bringing Barite into the area. It would be offloaded as a raw ore, minerals. It would be ground by three different grinding companies we had here in Brownsville, packaged back up and shipped down into Mexico to help control that oil well.

Lots of things have happened here and

lots of history combines the Port of Brownsville with our entire area. It's not just a Brownsville project. As Commissioner Garza mentioned, the entire county supports it. He came over here tonight, and his area is actually in San Benito. Our commissioner from Harlingen supports it. The commissioner that actually has the Port of Brownsville in her precinct is in Austin, also, with the county judge, learning some things, getting oriented, otherwise, she would be here tonight telling you of the importance that the Port of Brownsville is to our entire area, and not just to Brownsville, not just to Cameron County, to the Rio Grande Valley as a whole, and especially to Northern Mexico where a tremendous amount of our commodities that come in go into Mexico. A lot of the steel. I've seen all sorts of steel come and go. It's interesting to see it come in in one form, go to Mexico, to Monterrey, and come back and be shipped out in another form, maybe into the same country it came from, but because of economic abilities in Mexico and in our area to be able to handle the vessels and the cargo, it's efficient for companies to send it through our port.

I want you to really feel like the way we do who live here, the Port of Brownsville is very important to us. I can look at it and I say, you know, it's a berthing place for new drilling rigs, offshore drilling rigs, from AmFELS. It's also -- it's also a cemetery for naval vessels, for other vessels that come into the port to be dismantled, to be scrapped out, for that steel to go someplace else to be regenerated into something new.

We've seen all of this happen all these years. We're looking forward to the ship channel being deepened and widened, because we know that this is one of the greatest economic tools that we have to work with, and it does bring jobs, it brings families together, it brings what we need to our growing area.

A couple of prepared comments that I'll also leave with you.

"On behalf of Cameron County, I would like to offer my strong support for the initiation of the Brownsville Navigation District's efforts to widen and deepen the Brownsville Ship Channel. I believe that this project is a step in the right direction and would be a critical component for the economic vitality of this community for many years to come. As many of us know, the Port of Brownsville is the engine that fuels our economy and we depend greatly on the jobs and industry that come to the

Port.

I look forward with much anticipation to the commencement and results of the feasibility study and remain optimistic that the study will enable the Port of Brownsville to move forward on this important project.

If there's anything that Cameron County can do, that I can do, that Commissioner Garza or the County Judge can do, or the other two commissioners, all we need is to know what it is that we can do to help this project along.

We appreciate you being here. Thank you very much."

COLONEL WESTON: Next I would ask Ms. Angela Burton to come forward from the Brownsville Chamber of Commerce.

MS. BURTON: Good evening. My name is Angela Burton, and I am president and CEO of the Brownsville Chamber of Commerce. The Chamber was founded in 1937. The Brownsville Chamber of Commerce is the community's leading membership driven advocate and champion for business. It's primary objective is to create a climate of growth and success in our community.

I would also like to take the

opportunity to tell you that I have Christian Edordo Perez and Isidro Botello Flores from the Matamoros' Chamber who have come here in support of this, and they are right there. They are from the Chamber in Matamoros.

I have to tell you, sir, that I'm very happy that you're here, mostly because I can tell that the process is moving along, but I've got be honest with you, you're making me nervous. I spent 21 years in the military and I've been in front of people like this, and you know what I'm talking about. It makes you nervous. So, please, if you start firing questions off at me, know that it might make me a little nervous.

My testimony, I -- you know, I started off with a long testimony. I even e-mailed it to Donna last night, and then as the day grew on, it got shorter, and shorter, and shorter, and shorter. And then Denise pretty much -- really Solomon Ortiz stole my -- my speech, so I'm just going to say these things.

Both of the Chambers -- and I'm representing both of the Chambers -- know the improvements to the region -- to the Brownsville Ship Channel will create a climate of growth and economic success in our region. This is also reflected in the economic impact study written by Martin & Associates, and I'm sure you guys are all very aware of that.

Additionally, the Chambers believe the modification will address safety issues. Brazos Island Harbor has a high level of seafaring traffic that would be made safer through these efforts. Sometimes when I imagine -- you know, we're under construction, and sometimes the lanes get a little narrow, and I would imagine that probably happens to seagoing vessels, as well.

Lastly, the modification would potentially restore habitat. Ecotourism is a growing industry in the area, and the potential for restoration of habitat will contribute to an increasing economic generator for the area, so that's also important to us.

The Brownsville Chamber of Commerce and the Matamoros Chamber represents more than 2,000 members interested in the region's economic vitality. This testimony reflects the support of our members, and our board of directors, in the Port of Brownsville's effort to make improvement to the Brownsville Ship Channel. We have submitted a joint written testimony between the two chambers.

Thank you for your time.

COLONEL WESTON: Thank you, Ms. Burton. Okay. I would like Mr. Mike Gonzalez from the Brownsville Convention and Visitors Bureau to come forward.

MR. GONZALEZ: Good evening, gentlemen. I bring you greetings from the board of the Brownsville Convention and Visitors Bureau. The mission of the Brownsville Convention and Visitors Bureau is to promote Brownsville as a tourist destination to the benefit -- the economic benefit of Brownsville. My funding comes from hotel/motel lodging tax, occupancy tax. One good way to -- and I'm sure you're going to hear, and you've heard that Brownsville is booming. If you haven't, I'm telling you it's booming. Just to give you an idea, last year we ended the year with about an eight percent increase -- and I'm talking about 2005, year before last -- with an annual increase -- average increase of eight percent in hotel occupancy tax. This year I'm very happy to report to you that we have increased that by 13 percent over that, an average. In fact, November -- October and November came in at a 20 percent increase. Add that -- and that's about five percent over the state average of about eight percent increase in hotel occupancy tax.

Sixty percent of those hotel occupants are directly or indirectly in business because of the Port of Brownsville. Their business -- I'm sorry, they're business customers, they're business visitors, business -- men and women doing business, and due to a large part because of the Port of Brownsville.

The Port of Brownsville is very important to all of us. I think -- I am very pleased to see Matamoros here, people representing Harlingen. In fact, there was -- I know this for a fact, there was a video produced by the McAllen Chamber of Commerce that we saw that was sent to Germany, and in that video they had pictures of the Port of Brownsville and they called it the McAllen -- Port of McAllen. I haven't forgiven them for that, but, you know, it works to make us proud of what we have here, and we're all very very aware of what we have.

So I'm here to talk to you and bring you a short message of hearty support for the Brazos Island Harbor deep draft navigation project from my board and staff of the Brownsville Convention and Visitors Bureau.

And thank you very much for the

opportunity to address you all and be here tonight. Thank you.

COLONEL WESTON: Thank you. Next I would like Mr. Dewey Cashwell for the Town of South Padre Island to come forward, please. I know he was on the way. Is he here yet? Not here yet? We'll come back to him. How about Ms. Kate Ball from the Town of South Padre Island? Is she here yet? Not here yet? Okay. Then we'll go to Mr. C.Y. Ho from Keppel AmFELS, Incorporated.

MR. HO: I'm C.Y. Ho, president and CEO of Keppel AmFELS. Thank you for this opportunity to speak to you Colonel Weston, Chairman Martin Arambula, Mr. Hector Lopez, and Mr. Carl Anderson.

I'm very encouraged today to see that the finding from the reconnaissance study recommend further feasibility study, further study to develop this depending and widening project for the channel. I was very encouraged because during the last few years that I've been president of the Keppel AmFELS, it was sad that I had to actually turn away a few very big jobs. Physically where the customer preferred this yard here over other to bring it here, and we have to just say, "Sorry, we cannot bring you in." And other than those few big projects which we know for sure that were bound to have come and we have turned away, there were actually many other projects potentially that would have come here, except for the fact that it is quite well-known to the rig community about the constraints that we have in bringing the rigs up here.

Actually, Keppel AmFELS has very good facilities and very well equipped, and we can actually accommodate all the largest rigs that are operating in the world. The only constraint is actually -- we are actually limited by the size of the vessels that can move up the channel. So -- and this, of course, the limitation become about because of the constraint of the water depth and the width of the channel.

So just to give you some indication, right now the channel with a 250 feet width is a tremendous constraint, because in the -- currently in the world today, I will say that about for the semisubmersibles, about 30 percent of the semsubmersibles today have width over 250 feet, and so -- and some of them go to as much as 335 feet. So for any vessels beyond 250, we won't be able to bring them in. Now considering that there are about 200 semisubmersibles in the world today, about 30 percent will translate to about 60 rigs, and each rig, if it comes in here, we have a revenue of -- direct revenue for the contract value of about 20 to 40 million dollars. Some could be more, but everything is about 20 to 40 million.

So you can -- certainly the impact directly to Keppel AmFELS is very high, but certainly the impact to the community will be very great, as well. Right now, currently, in fact, we employ about -- close to 3,000 people right now, because the yard is very busy. I'm sure with the widening, we can see a 20 to 30 percent growth. I'm quite confident to say that.

Now the other development is that with the shortage of oil and gas in the shallow waters, more and more explorations are going to deeper waters. And so besides the rigs today, there are more rig owners wanting to enlarge their rigs, so we're probably going to see more larger and larger rigs. So in some of the old rigs, the owners would actually want to enlarge.

Now the small rigs, if we want to convert to larger rigs we cannot do it, because after the conversion they'll be too large to go out the channel. They cannot go out, so the reverse is true, as well.

So I am very glad that this widening project, as well as the deepening -- now widening is a more important constraint, because I can see that more rigs are constrained by the width, but the deepening will also certainly help us to bring in more rigs, because some of the rigs have propellers which are deeper than 42 feet, and they represent a constraint.

So overall, in short, I'm just -- just to add on our support, strong support, for this deepening and widening project, and I'm very encouraged, and I hope that this place will be a very place with more yards than Keppel AmFELS.

COLONEL WESTON: Next I would ask Mr. John Shergold, Propeller Club of United States to come forward.

MR. SHERGOLD: Honorable Commission, Colonel, thank you very much for being -- and I want to thank Commissioner Arambula for inviting me here tonight. My name is John Shergold and I'm the president of the Brownsville Chapter of the Propeller Club, and probably you all know and a lot of people in this room know, we're here to facilitate good relations with the maritime industry, and a lot of our members are here tonight, and it's been exciting for me. I'm a North Texas boy who came down here on a Greyhound bus about 14, 12 years ago. I thought I was in Raymondville, Texas. I got off the bus, and they said, "No, son, you need to get down to Brownsville. That's where you're heading to." So it's been an adventure down here for me for many years, and it's been an honor for me to get to know this community like I have, and I'm here tonight to, basically, speak on my behalf as to some of the concerns that I have concerning the Port, and I would like to go ahead and read my prepared statement, please.

It's a great pleasure to be in front of this committee tonight to share my concern as to the negative impact that will and is occurring due to the shoaling issues and the lack of depth of our ship channel. With great interest I watched your presentation, and a lot of the issues that you presented tonight are right on point with what I think my concerns are.

I'm the president of the Propeller Club of the United States for the Brownsville/Port Isabel Chapter, and many of our members have businesses and shipping interests at our local port. I am very concerned about the inability to service steel ships at dock number 15, due to the fact that the entry to the ship channel is less than 42 feet sometimes, which is the minimum requirement for ships of that displacement to pass through. I was really happy, I was really excited to hear what you all have proposed tonight, because it looks like that you're going well over 48, even up to 52 feet, and, you know, I'm really learning about this process, and so it's really important for our community to get these big ships in here. And if we can't the big ships in here, they will go somewhere else, and I know that Chairman Arambula has worked tirelessly, as well as Commissioner Masso at the Port and the other commissioners to accomplish that task, and I want to congratulate you all for it.

However, I want to go into another concern I have I would like to share; especially, I'm glad the Colonel is here. We have somebody with senior officer rank, so I'm glad you're here, sir.

It is imperative that the U.S. Corps of Engineers provide our area on the South Texas Coast to dredging ship, just as dispatched a year ago, namely the U.S. Wheeler, dispatched from New Orleans. You all, I am so proud to let you -- everybody know here that my father-in-law, or my suegro, as they say in

Spanish, married a girl here from Brownsville, so she's teaching me good Spanish, but, anyway, my father-in-law served on the U.S. Wheeler for many years, Colonel, and also I want to let the rest of the board members know that, and I've gotten a lot of experience from asking him questions about what could happen if -- what could we do better, as far as the dredging operations. He likes to tell me, "John, I'm just an Indian. I'm not one of those chiefs." So -- so you know what, if we listen to the Indians and not the chiefs, we probably learn a lot more, and this is what I've learned.

In fact, my father-in-law served on this ship, the Wheeler, for many years. Of paramount importance, it is vital, in my opinion, that our newly elected Congress -- and I believe that Ms. Blanchard was here and she just had to leave unfortunately a minute ago -- but it's of paramount importance, in my opinion, that our newly elected Congress be petitioned to provide more resources, such as additional funding for ships dedicated to dredging operations. And, Colonel, it's no fault of yours. You can only do so much with the materials you have, and I congratulate you for the job you do with the lack of resources that I know that you don't have at your disposal. I know you can't say that publicly, but I can, because I'm just a private citizen; or I'm a private, as you might want to say.

Twenty years ago there were at least 15 ships dedicated to dredging operations. Twenty years ago there were at least 15 ships assigned nationwide under the command of the Corps, however, today only three or four ships are on assignment, and that's around the United States.

The Wheeler stands today idle in New Orleans ready for an assignment. While private shipping companies have gained favor to conduct dredging operations under our current executive branch of government in Washington, D.C. Although there are good arguments to be made concerning privatization of government duties, I believe that this policy has led to the situation that our port, like so many others, face today because our federal government has a responsibility to maintain the navigatability of our waterways and hopefully with the good efforts of local congressmen, such as Congressman Ortiz and the newly elected Congress, progress can be made to restore the Corps of Engineers dredging fleet.

I just think it's so important that

everybody in this room today and the public understands that those dredges are vital to getting that sludge and all of that material out of our ports. Every time we have a storm like -- I've learned this from Chairman Arambula -- every time we have a storm that comes in, we've got more debris, more stuff that gets in there and jams up these ports. The Wheeler -- in my opinion, the U.S. Government ought to go ahead and fund these dredging operations, restore the dredging fleet as it was 20 years ago. I have nothing against private industry, however, I think sometimes the government can and in some situations, very limited sometimes situations, can do a better job in assisting and making sure these waterways are clear.

With that, I appreciate it, I hope that we can get the funding that's necessary to restore the dredging fleet that it once was, and I hope that this -- what I've said tonight may have shed a little bit of light on one of the problems I see that needs to be fixed in order to make our port a world class organization.

Thank you very much.

COLONEL WESTON: Thank you. Okay. Next I would like to have A. Glenn Simpson, from A. Glenn Simpson & Associates.

MR. SIMPSON: Hi there. My name is Glenn Simpson. I'm originally from Florida, served on the South Florida Water Management Board and participated in the Everglades Restoration Project. I have a lot of experience with large ecosystem projects, as this one truly is.

The economics of this project speaks for itself. I mean, the only concern I would have maybe there is some conservatism used in the numbers projecting growth in this area, because from everything I see, this area is really exploding, far beyond what has been projected. That just multiplies the economic advantage of doing this port.

I'm here because I've been asked to represent a couple of friends, neighbors, that are concerned about the ongoing maintenance and being able to make sure that that's considered up front, as to how this can be designed and managed to where it will minimize any impacts and ongoing problems. I understand there are some inflows that are flowing into the existing channel that are causing some issues that perhaps could be addressed.

There are many ways to do this, and it sounds like the plan to go ahead with the design and engineering phase is the appropriate time to really take a look at how to solve some of these problems that perhaps will even enhance some of the existing restoration projects that are going on. Installing things such as stilling basins, detention areas, spreader swells, to try to control the inflows and manage and keep the velocity down so that there's -- reduce the siltation back into the channel is something that would be -- be very important to consider in this design.

The design to improve the hydro period and title flushing to some of the adjacent ecosystems is critical. I think that that is something that would be taken care of in this design phase and the economic phase.

One thing I would like to suggest to the Navigation District that we found very helpful in working on major restoration projects, and that's establishing knowledgeable peer review committee to participate in the engineering design and construction phase to make sure that there's some unity in the way that -- the intent of the district is carried out, and to bring in a few knowledgeable people to -- as peers of those that are doing the designing, and the construction, to make sure that this project is built to where you don't look like we had to in Florida and say, "Gee, what have we done", you know, 50 years later, and then spend millions and millions of dollars trying to correct that.

So those are my comments. I'm really glad to see this project is going forward, and it sounds like that everybody is working hand-in-hand and I think it will be a very successful thing.

Thank you.

COLONEL WESTON: Thank you, Mr. Simpson. Next, I would like Mr. Anthony Reisinger.

MR. REISINGER: Hi. My name is Anthony Reisinger, and I'm a student at the University of Texas at Brownsville, and I just wanted to voice my concerns on the widening of the ship channel and hope that you will pay attention to the negative impacts that the deposition of the dredge spoil has created. Areas where you all -- I guess you call them berthing areas, where you take out the sediments and lay them out, don't have vegetation because there is some sort of physical or chemical component to them that doesn't allow vegetation to grow, and that creates, as everyone knows, dust problems in the area. And I think that increasing the size of these dredge spoil areas, and also making new dredge spoil sites will increase the amount of dust that is blown in the area and could potentially cause economical impacts to the areas because of the dust blowing in there and could disrupt transportation and various other things, and I would also hope that in the creation of new dredge spoil sites -- or deposition sites, that you take into account the ecological impacts, as well.

And that's all I wanted to say.

COLONEL WESTON: Thank you very much. Next Mr. Dewey Cashwell from the Town of South Padre Island, the city manager.

MR. CASHWELL: Good evening, gentlemen. Thanks for the opportunity to speak. This is, obviously, a wonderful project. I know you've heard a number of folks speak in favor of it. It's critical to the economy of Texas, it's critical to the economy of the United States, and it's certainly important to this area. We support it, as well, on South Padre Island, and I'm here to tell you that we want what you don't want, and that's what you're taking out. You're going to be dredging that channel, you're going to get that sand, and you're going to want to do something with it, and we're suggesting to you, imploring you, in fact, to please make provision to work with us, as you have so many wonderful times in the past, to place that sand on the beaches of South Padre Island.

I'm here to tell you that the need is extremely critical. Our beaches on South Padre Island took serious damage in 2005. One would not expect that, since we didn't get a direct hit from a hurricane, but we certainly got some high tides, and the devastation to our beaches, particularly on the north end of the Island, about four miles up form where this channel is, has been tremendous.

We anticipated a dredge and a participatory experience with you all to pump that sound up earlier, then we kind of did a little roller coaster ride on that, and now, unfortunately, it looks like we're going to be disappointed that it is not going to occur this time. I'm sorry that's the case. I hope you can find a way to perhaps change that scenario, but, if not, we ask, sincerely, that you please consider this subject within the context of all such future dredges, and I'm here also to tell you that the Island of South Padre, and the town and it's people are ready to step up to the plate and do their fair share, whatever it takes, in terms of cost and in terms of effort and energy to make that happen.

So, please consider our beaches. They, too, are a huge part of the economy of this area and the economy of Texas. I think if you'll check the records, you'll find that Commissioner Jerry Patterson, General Land Office Commissioner for the State of Texas, has made it his highest priority to seek a permanent and ready source of sand to apply on the beaches that are needing to be renourished in Texas, and I can tell you we're at the top of the list.

So please consider that, and thank you for your time.

COLONEL WESTON: Ms. Kate Ball from South Padre, is she here? Okay.

MS. BALL: Good evening. My name is Kate Ball. I'm the city planner for the town of South Padre Island, and I am here, also, to encourage you to use -- beneficial use of the dredge material on the -- on the town's beaches. We've partnered in the past, and the nineties were very good years for the town. The last several years there have been some hiccups there, and we strongly implore you to please consider the town for that beach quality sand.

Thank you.

COLONEL WESTON: Okay. We've gone through our list of cards. Is there anyone else who wishes to speak that didn't get a chance to put a card in. Okay, sir, go ahead.

MR. BARRERA: My name is Dagoberto Barrera. I'm really in support of this organization, and the project itself, but I would also like to recommend and ask the CEO from AmFELS if we go 80/20, that I understand most of the projects are done that way, 80 percent by the federal government and 20, AmFELS, who is making a lot of money and is growing, and a lot of that money is going out of our United States boundaries, that AmFELS can also contribute money, of course, on that 20 percent.

Thank you very much.

COLONEL WESTON: Thank you. Anyone else?

MS. ZAMORA: Hi. Good evening, Colonel. It's good to see you again. I had the pleasure of meeting him this morning at the county judge's office. My name is Melissa Zamora. I am assistant to County Judge Carlos Cascos. Mr. Arambula, Mr. Lopez, Mr. Anderson, and respective members of the BND, I'm here to reiterate much of what Commissioner Garza and Commissioner Wood has already said, and, of course, Denise Blanchard with Congressman Ortiz' office, so I don't really want to go over the details and the specifics, but just so that you know that we also support, greatly support, the deepening and widening of this channel.

And something that I want to point out is I seem to always find the human aspect to these types of projects, and I used to be an employee of the Town of South Padre Island, and on my way home, I had the pleasure of driving through the Bahia Grande looking at the birds, and driving through the traffic jam right past the Port of Brownsville, and many people used to frown on that, but I don't, because it generally means that there's a great economic impact there for Cameron County. And I liken that to an Atari game known as "Frogger", and you have to drive through and you see all of these people coming out of the Port of Brownsville and they're holding their lunch boxes, and you stop at a gas station and you see that their hands are dirty and their faces are dirty, but it truly means that the Port of Brownsville contributes to a strong work ethic, which is very symbolic to me of the American way of life. So deepening this channel will contribute to that because strong work ethic is very important to Cameron County.

COLONEL WESTON: Thank you. Okay. Is there anyone else who would like to participate?

MR. LERMA: Good evening, gentlemen.

I'm Jorge Lerma with the Brownsville Firefighters Association, and I'm actually here in lieu of our president for our association, Marco Longoria.

I just wanted to mention that we are in big support of this type of a project in reference to providing for more and better paying jobs in that sense, and we always try to support our longshoremen, and anything we can do to support this project to help them out, we're all willing to do that, and to be quite honest with you, I'm here to deliver a letter to the commissioner here, if I may.

And I would like to thank you all for all of your efforts and I appreciate the opportunity to speak. Thank you.

COLONEL WESTON: Okay. Is there anyone else who would like a chance to address the crowd? No one?

Okay. I thank all of you for your participation. I would like to remind you if you desire to submit a written statement for inclusion in the record, whether you made an oral statement tonight or chose not to, you can take your statement to the registration table in the foyer to the rear, or you can send your written comments to the address identified previously on the screen.

In conclusion, the official record for this action will be open for 30 calendar days. Your written statements received on or before March 2nd, 2007 will be included in the meeting record. That's March 2nd, 2007.

I would like to thank the Brownsville Navigation District for their efforts and assistance in this meeting, and I thank you all for your attendance and the interest that you have shown, and I encourage you to continue as we go down the road on this project to be a part of this study process and keep providing your value added input so that we can make this the best project for this community that we can make it from all the various aspects that we've heard addressed today.

So thank you very much for your attendance, and please drive safely on your way home.

This meeting is officially adjourned.

(The deposition was concluded at 8:35 p.m.)

BROWNSVILLE NAVIGATION DISTRICT
BRAZOS ISLAND HARBOR
PORT DEEPENING FEASIBILITY STUDY

REPORTER'S CERTIFICATION
Taken on 1-31-07

I, GERALD SMITH, Certified Shorthand Reporter in and for the State of Texas, do hereby certify that the above and foregoing contains a true and correct transcription of the proceedings held on January 31, 2007.

Certified to by me this ______ day of______________, 2007.

____
GERALD SMITH, Texas CSR #2305
Expiration Date: 12-31-07
Action Reporting, Firm #13
P. O. Box 4513
McAllen, Texas 78502
(956) 631-1024

SOFIA C. BENAVIDES
CAMERON COUNTY COMMISSIONER
PRECINCT 1

CAMERON COUNTY COURTHOUSE
1100 EAST MONROE STREET
BROWNSVILLE, TEXAS 78520

PHONE: (956) 574-8167
FAX: (956) 544-0820
E-MAIL: **sofia.benavides@co.cameron.tx.us**

January 31, 2007

U.S. Army Corps of Engineers
P.O. Box 1229
Galveston, Texas 77553-1229

Dear Colonel Weston:

On behalf of Cameron County, I would like to offer my strong support today for the initiation of the Brownsville Navigation District's efforts to widen and deepen the Brownsville Ship Channel.

I believe that this project is a step in the right direction and will be a critical component for the economic vitality of this community for many years to come. As many of us know the Port of Brownsville is the engine that fuels our economy and we depend greatly on the jobs and industry that come to the Port.

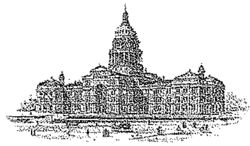
I look forward with much anticipation to the commencement and results of the feasibility study and remain optimistic that the study will enable the Port of Brownsville to move forward on this important project. If there is anything Cameron County can do to help during the feasibility study phase please do not hesitate to contact me.

Sincerest regards,

Sofia C. Benavides

Sofia C. Benavides
Commissioner, Pct. 1

The Senate of The State of Texas



Senator Eddie Lucio, Jr.

January 31, 2007

United States Corps of Engineers

Dear Sir/Madam:

I am pleased to support the enlarging and deepening of the Brazos Island Harbor (Brownsville Ship Channel) which is currently being considered by a feasibility study initiated by the United States Corps of Engineers.

Increasing the depth and width of the Brownsville Ship Channel and Turning Basin would increase the economic potential of the Brownsville Navigation District, including the economies in and around Brownsville and Northern Mexico.

Our Port is considered a major international port that supports an area that is growing exponentially. We must broaden our infrastructure if we are to attract additional economic revenues and raise our standards to meet the challenges of the 21st Century.

The potential restoration of wildlife habitat would protect our native species and provide an environment designed specifically for their needs. It would also generate additional revenues in eco-tourism which is one of the fastest growing sectors of our local economy.

I wholeheartedly support this project and look forward to its implementation in the near future.

Sincerely,

Eddie Lucio, Jr.
State Senator

ELJ/bbw

Committee Membership: Chairman, Committee on Border Affairs ★ State Affairs ★ Natural Resources ★ Sunset Advisory Commission ★ Subcommittee on Infrastructure
P.O. Box 12068 ★ Austin, Texas 78711 ★ 512/463-0127 ★ Fax: 512/463-0061 ★ TDD: 1-800-735-2989
100 E. Cano, Suite 101 ★ Edinburg, Texas 78539 ★ 956/387-0445 ★ Fax: 956/387-0443
P.O. Box 5958 ★ Brownsville, Texas 78523 ★ 956/548-0227 ★ Fax: 956/548-0440

Remarks by Denise Blanchard
On behalf of Congressman Solomon P. Ortiz
On the Brownsville Navigation District's
Widening and Deepening Program

January 31, 2007

Since the authorization of the reconnaissance study in July of 2000, the Federal Government has played a big role in assisting the Port of Brownsville expansion and growth into one of the premier ports in the nation.

The reconnaissance study was originally authorized because the future economic demands dictate that the Port of Brownsville will need to be improved in order to meet the Transportation and Trade needs of the region and cross-border trade with Mexico.

For the past two years, the Congress has approved appropriations for the Corps of Engineers Feasibility Study – further showing support for this important project. Although the WRDA reauthorization has been stalled in Congress for many years now, the Brownsville Navigation District Widening and Deepening Project continues to gather support.

WHY?

Over two and one-half million deep draft tons pass yearly through the Port of Brownsville, TX.

- Forty percent, representing cargo bound for or coming from Mexico.
- Mexico is a stone's throw from Brownsville, across the Rio Grande River.
- If total yearly deep draft commerce at Brownsville is about 2.5 million tons, then almost 40 percent (940 thousand tons) is Mexican trade. And if such a situation is not unique in the world, certainly it is rare.
- Port of Brownsville offers an excellent strategic location for security and economic concerns.

SUMMARY OF IMPACTS GENERATED BY THE PORT OF BROWNSVILLE

From the October 2006 study that looked at the local and regional economic impacts of the Port of Brownsville, the economic impacts generated by the marine cargo terminals and ship repair/oil rig maintenance operations are summarized in Exhibit E-2.

Exhibit E-2
Summary of the Local and Regional Economic Impacts Generated by
The Port of Brownsville
(State of Texas)

	MARINE TERMINALS	SHIPYARD/OIL RIG REPAIR OPERATIONS	TOTAL
JOBS			
DIRECT	2,671	2,024	4,695
INDUCED	1,539	906	2,446
INDIRECT	1,895	1,542	3,437
RELATED JOBS	27,851	NA	27,851
TOTAL	**33,956**	**4,472**	**38,428**
PERSONAL INCOME ($1,000)			
DIRECT	$79,763	$61,043	$140,806
RE-SPENDING/CONSUMPTION	$137,231	$61,550	$198,781
INDIRECT	$93,074	$53,974	$147,048
RELATED INCOME	$1,439,494	NA	$1,439,494
TOTAL	**$1,749,562**	**$176,567**	**$1,926,129**
ECONOMIC VALUE ($1,000)			
DIRECT REVENUE	$306,775	$208,935	$515,710
LOCAL PURCHASES	$111,232	$70,933	$182,165
RELATED OUTPUT	$2,081,676	NA	$2,081,676
TOTAL	**$2,499,684**	**$279,867**	**$2,779,551**
STATE & LOCAL TAXES ($1,000)			
DIRECT, INDUCED AND INDIRECT	$27,906	$16,244	$44,150
RELATED STATE AND LOCAL TAXES	$129,554	NA	$129,554
TOTALS	**$157,461**	**$16,244**	**$173,705**

TOTALS MAY NOT ADD DUE TO ROUNDING

Specifically, the vessel and cargo activity at the marine cargo facilities and ship repair/oil rig maintenance operations generated the following impacts in the State of Texas in 2005:

***38,428 jobs** in Texas are in some way related to the cargo moving via the marine terminals and activity at the ship and rig repair yards. Of the 38,428 jobs:*

- **4,695 direct jobs** are generated by the marine cargo and vessel activity and ship and rig repair operations. Of the 4,695 direct jobs, marine cargo activity supports 2,671 direct jobs, while the ship and rig maintenance and repair operations generate 2,024 direct jobs.

- As the result of local and regional purchases by those 4,695 individuals holding the direct jobs, an additional **2,446 induced jobs** are supported in the regional economy.

- **3,437 indirect jobs** were supported by $182.2 million of local purchases by businesses supplying services at the marine terminals and by businesses dependent upon the Port of Brownsville for the shipment and receipt of cargo and on the ship and rig repair operations.

- In addition to the direct, induced and indirect job impacts, 27,851 jobs in Texas are related to the cargo moving over the marine terminals at the

Port. It is to be emphasized that a large share of the imported steel cargo moving via the Port is destined for Mexico, and these related jobs are not included in the analysis. The jobs are considered to be **related** to activities at the marine terminals at the Port of Brownsville, but the degree of dependence on the marine terminals is difficult to quantify and should not be considered as dependent on the port as are the direct, induced and indirect jobs. If the marine terminals were not available to these organizations, they would suffer an economic penalty over the longer term. Such a penalty would vary from loss of employment opportunities in some cases to an increase in total transportation costs in other cases, which could, in turn, result in employment reductions.

In 2005, marine cargo activity at the marine terminals at the Port of Brownsville and the ship and rig repair operations generated a total of $2.8 billion of total economic activity in the State of Texas.

- Of the $2.8 billion, $515.7 million is the direct business revenue received by the firms directly dependent upon the Port and providing maritime services and inland transportation services to the cargo handled at the marine terminals and the vessels calling the port, as well as ship and rig repair and maintenance services. An additional $182.2 million is used for local purchases. The remaining $2.1 billion represents the value of the output to the State of Texas that is created due to the cargo moving via the Port of Brownsville marine terminals. This includes the value added at each stage of producing an export cargo, as well as the value added at each stage of production for the firms using imported raw materials and intermediate products that flow via the marine terminals and are consumed within the state. The majority of these user impacts are associated with the imported steel products receipts.

- Marine activity supported nearly $2.0 billion of total personal wage and salary income and local consumption expenditures for Texas residents. This includes $486.6 million of direct, indirect, induced and local consumption expenditures, while the remaining $1.4 billion was received by the related port users. The 4,695 direct job holders received $140.8 million of direct wage and salary income.

A total of $44.2 million of state and local tax revenue was generated by maritime and ship and rig maintenance and repair activity at the Port of Brownsville. In addition, $129.6 million of state and local taxes were created due to the economic activity of the related users of the cargo moving via the marine terminals.

This economic activity is clearly a trend we want to continue for Brownsville and South Texas. The Widening and Deepening Project will assist the Port in becoming one of the premier ports in our nation. The continued funding for the feasibility study and future construction is necessary to make sure that the future needs of Port traffic and trade are met.

Brownsville Firefighters Association
Local 970 of the
International Association of Firefighters
Marco Longoria-President

To: Mr. Martin Arambula-Chairperson
Port of Brownsville Navigation District
Board of Commissioners

From: Marco Longoria-President
B.F.F.A. L-970

Date: 01-26-07

Re: Deepening of ship channel
Port of Brownsville

Dear Mr. Arambula,

First of all allow me to congratulate you and the board of commissioners at the Port Brownsville for the job you do. It takes a team of intelligent, hard working group of people like yourselves to make our great Port of Brownsville what it is now.

Mr. Arambula, as per our conversation a few days ago, I would like to reduce my thoughts to writing. You have expressed your interest in deepening the ship channel at the Port of Brownsville. I feel that a project of that magnitude would bring nothing but prosperity to our great Port. A deeper channel would attract bigger and more ships to this area. In turn, industry at the Port of Brownsville would experience an increase in traffic of various forms. As a labor group advocate, I support the idea with enthusiasm. That sort of increase would only mean more job opportunities for our community and a definite increase of job openings for our union brothers of the International Longshoremen Association. It would be a win-win situation for industry, labor, and economic development as a whole. I ask you to call on myself and the Brownsville Firefighters for any help that we may be able to provide. Again thank you and congratulations on a job well done.

Sincerely,

Marco C. Ly

Marco A. Longoria
(956) 639-0713

CARLOS H. CASCOS, CPA
COUNTY JUDGE

1100 E. MONROE STREET
BROWNSVILLE, TEXAS
78520

COUNTY COURTHOUSE
(956) 544-0830 FAX: (956) 544-0801
1-866-544-0830

January 31, 2007

U.S. Army Corps of Engineers
P.O. Box 1229
Galveston, Texas 77553-1229

Dear Colonel Weston:

On behalf of Cameron County, I would like to offer my strong support today for the initiation of the Brownsville Navigation District's efforts to widen and deepen the Brownsville Ship Channel.

I believe that this project is a step in the right direction and will be a critical component for the economic vitality of this community for many years to come. As many of us know, the Port of Brownsville is the engine that fuels our economy, and we depend greatly on the jobs and industry that come to the Port.

I look forward with much anticipation to the commencement and results of the feasibility study and remain optimistic that the study will enable the Port of Brownsville to move forward on this important project. If there is anything Cameron County can do to help during the feasibility study phase, please do not hesitate to contact me.

Sincerest regards,

Melissa A. Zamora for Carlos H. Cascos

Carlos H. Cascos, C.P.A.
County Judge

BROWNSVILLE ECONOMIC DEVELOPMENT COUNCIL
On the Border, By the Sea

January 31, 2007

RE: Brazos Island Harbor Feasibility Study

Department of the Army, Galveston District
Corps of Engineers
P.O. Box 1229
Galveston, Texas 77553-1229

To whom it may concern:

The key to economic success of this region is in the ability to increase and maintain commercial traffic through our different ports of entry. Brownsville needs to maintain the essential lifelines that help move goods through this region and in the process, provide jobs and support for our human capital.

One of those lifelines is the Port of Brownsville and the Brazos Island Harbor, also known as the Brownsville Ship Channel.

Such a resource is vital in our efforts to protect and cultivate commerce. The Channel is part of an integral piece of the engine that drives our local economy and contributes significantly to a region of nearly 1 million people.

The BEDC advocates for continued investment in the region's infrastructure – such as the Brownsville Ship Channel – to stimulate economic growth and prosperity. Every time a ship comes into our Channel, thousands of direct and ancillary jobs are created throughout the region. The Port is not only a reliable transportation and distribution center for goods, it is an incubator for employment, investment and fresh money.

The BEDC supports investing in the region's infrastructure needs to build and move Brownsville forward.

Thank you for your time and attention to this matter.

Sincerely,

Jason Hilts
President and CEO
Brownsville Economic Development Council
301 Mexico Blvd., Ste. F-1 (ITEC Campus)
Brownsville, Texas 78520

JOHN WOOD
CAMERON COUNTY COMMISSIONER
PRECINCT 2

CAMERON COUNTY COURTHOUSE
1100 E. MONROE ST.
BROWNSVILLE, TEXAS 78520

PHONE: (956) 983-5091
FAX: (956) 983-5090
E-MAIL: **jwood@co.cameron.tx.us**

January 31, 2007

U.S. Army Corps of Engineers
P.O. Box 1229
Galveston, Texas 77553-1229

Dear Colonel Weston:

On behalf of Cameron County, I would like to offer my strong support today for the initiation of the Brownsville Navigation District's efforts to widen and deepen the Brownsville Ship Channel.

I believe that this project is a step in the right direction and will be a critical component for the economic vitality of this community for many years to come. As many of us know the Port of Brownsville is the engine that fuels our economy and we depend greatly on the jobs and industry that come to the Port.

I look forward with much anticipation to the commencement and results of the feasibility study and remain optimistic that the study will enable the Port of Brownsville to move forward on this important project. If there is anything Cameron County can do to help during the feasibility study phase please do not hesitate to contact me.

Sincerest regards,

John Wood

John Wood
Commissioner, Pct. 2

The Chamber
Brownsville, Texas

January 31, 2007

Department of the Army
Galveston District Corps of Engineers
P.O. Box 1229
Galveston, TX 77553-1229

Re: Letter of Support for Improvements to Brazos Island Harbor

To Whom It May Concern:

The success of U.S. international trade depends on a viable and safe navigation system as well as the intermodal infrastructure to handle the efficient movement of cargo into and out of our ports. In fact, according the American Association of Port Authorities, in the next twenty years international trade, of which 95% by volume enters through the nation's ports, is expected to double. As the world's leading trading nation, the country's economic future depends on the quality of our port infrastructure and our ability to deliver goods on time and cost-effectively.

Trends in international trade, which show higher trade volumes and more concentrated infrastructure demand, has placed greater stress on the nation's surface and maritime transportation system than ever experienced before. At international gateways such as ports, and throughout inland corridors, significant infrastructure improvements are needed to handle the increased flow of goods.

Ports have responded to our fast-paced economy by investing $1.5 billion per year to keep up with demand. They have spent nearly $21 billion since 1946 to construct and maintain landside terminal facilities, dredge berths, and contribute to channel improvement cost-sharing programs.

One of the critical transportation infrastructure investments for the nation is maintaining our water highways — the navigation channels that lead into and out of harbors. Each year several hundred million yards of sand, gravel and silt must be removed from waterways and harbors to improve navigation safety and allow for waterborne trade.

In addition to regular maintenance dredging, improvements to navigation channels are needed to accommodate the larger vessels coming on line each year. A report prepared by Martin Associates for the Port of Brownsville states, if the channel depth was increased to 48 ft. and widened to 350 ft. it would result in the deployment of Panamax vessels replacing handymax vessels used to transport steel slab. Handymax vessels carry about 40,000 tons of slab while the Panamax vessels typically carry between 70,000-75,000 tons of slab. This would result in a substantial savings.

Brownsville Chamber of Commerce
1600 University Blvd. • Brownsville, Texas 78520 • (956) 542-4341 • Fax (956) 504-3348
email: info@brownsvillechamber.com • www.brownsvillechamber.com

Leading Businesses.
Leading Communities.™

The Brownsville Chamber of Commerce joined by the Matamoros Chamber of Commerce know that improvements to the Brownsville Ship Channel will create a climate of growth and economic success in our region. This is reflected in the Economic Impact study written by Martin Associates for the Port of Brownsville.

Additionally, both Chambers believe the modification will address safety issues. Brazos Island Harbor has a high level of sea faring traffic that would be made safer through these efforts.

Lastly, the modification would potentially restore habitat. Eco-tourism is a growing industry in this area and the potential restoration of habitat will contribute to this environmentally sensitive environment and increasing economic generator for the area.

The Brownsville Chamber of Commerce and the Matamoros Chamber of Commerce represent more than 2,000 members with an interest in the areas economic vitality. This letter reflects the support of our members and our board of directors in the Port of Brownsville's effort to make improvements to the Brownsville Ship Channel.

If you should have any questions, please don't hesitate to contact us.

Sincerely,

Angela R. Burton
President/CEO
Brownsville Chamber of Commerce

Sincerely,

Abraham Rodriguez Padron
Director General
CANACO/SERVYTUR

Dix Agency Brownsville, LP

January 30, 2007

Department of the Army
Galveston District, Corps of Engineers
P. O. Box 1229
Galveston, Tx. 77553-1229

Ref: Brazos Island Harbor Feasibility Study

To Whom It May Concern:

Dix Agency has been a ship agent in the Port of Brownsville since 1947. Obviously, the three generations of family ownership have seen many changes, most notably the surrounding industry and its capacity to consume goods and raw materials. The appetite for this consumption has to be satisfied with supply of higher volumes of goods. The most cost effective way to do this is by delivering them in larger vessels saving many thousands of dollars in freight charges on each voyage. The reduction of freight charges insures that Brownsville remains a competitive and viable U.S. Gulf Port.

Presently, the Brownsville Ship Channel is authorized to 42 feet of depth. Increasing the authorized depth should not cause any operational problems or constraints. Vessels not needing the additional water depth should have an easier transit and those that will take advantage of the deeper water would not have any more difficulty than those presently using the maximum depth. In short, there has not been a safety issue raised at the present depth and I cannot expect one at the deeper depth.

Although I do not pretend to be an expert in the environmental affects of the dredging, living in Brownsville and working at the Port for 45 years has given me some first hand knowledge of the area. During this period the ship channel has been deepened twice and maintenance dredging performed numerous times. The existing placement sites for dredged material appear to be functioning very well with slight environmental deterioration. Being an outdoorsman, I can say that fish, birds, and other wildlife flourish in and along the ship channel. The restoration of the Bahia Grande is an excellent example of how the Port can work at improving the environment.

Dix Agency Brownsville, LP 5500 R.L. Ostos Road Brownsville, Texas 78521
Phone: (956)-831-2783 Fax: (956)-831-7712
E-mail: dixbroagy@dixshipping.com

January 30, 2007

Department of the Army
Galveston District, Corps of Engineers

Page no. 2

It is my opinion that the citizens of the United States need a deep water port in this region. It will enable the oil industry to take maximum advantage of oil production to the east making the U.S. less dependent on foreign supply. It will allow the area to grow its commerce with Mexico and other foreign countries.

Sincerely,

Robert A. Ostos

DAVID A. GARZA
CAMERON COUNTY COMMISSIONER
PRECINCT 3

26945 FM 510
1 ½ MILE EAST BAYVIEW ROAD
P.O. BOX 182
SAN BENITO, TEXAS 78586

CAMERON COUNTY WAREHOUSE
(956) 361-8209
FAX: (956) 361-8211
E-MAIL: **DAGarza@co.cameron.tx.us**

January 31, 2007

U.S. Army Corps of Engineers
P.O. Box 1229
Galveston, Texas 77553-1229

Dear Colonel Weston:

On behalf of Cameron County, I would like to offer my strong support today for the initiation of the Brownsville Navigation District's efforts to widen and deepen the Brownsville Ship Channel.

I believe that this project is a step in the right direction and will be a critical component for the economic vitality of this community for many years to come. As many of us know the Port of Brownsville is the engine that fuels our economy and we depend greatly on the jobs and industry that come to the Port.

I look forward with much anticipation to the commencement and results of the feasibility study and remain optimistic that the study will enable the Port of Brownsville to move forward on this important project. If there is anything Cameron County can do to help during the feasibility study phase please do not hesitate to contact me.

Sincerest regards,

David A. Garza
Cameron County Commissioner, Pct. 3

FEB 0 6 2007

ADMIRAL STEAMSHIP AGENCY

January 30, 2007

Department of the Army
Galveston District, Corps of Engineers
P. O. Box 1229
Galveston, Tx. 77553-1229

Ref: Brazos Island Harbor Feasibility Study

To Whom It May Concern:

Admiral Steamship Agency are ship's agents in the Port of Brownsville. Over the years we have seen many changes, most notably the surrounding industry and its capacity to consume goods and raw materials. The appetite for this consumption has to be satisfied with supply of higher volumes of goods. The most cost effective way to do this is by delivering them in larger vessels saving many thousands of dollars in freight charges on each voyage. The reduction of freight charges insures that Brownsville remains a competitive and viable U.S. Gulf Port.

Presently, the Brownsville Ship Channel is authorized to 42 feet of depth. Increasing the authorized depth should not cause any operational problems or constraints. Vessels not needing the additional water depth should have an easier transit and those that will take advantage of the deeper water would not have any more difficulty than those presently using the maximum depth. In short, there has not been a safety issue raised at the present depth and we do not expect one at the deeper depth.

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It is our opinion that the citizens of the United States need a deep water port in this region. It will enable the oil industry to take maximum advantage of oil production to the east making the U.S. less dependent on foreign supply. It will allow the area to grow its commerce with Mexico and other foreign countries.

Sincerely,

Admiral Steamship Agency

Danny Rodriguez

DR/mej

2993 North Indiana Ave. · Ste #4 · Brownsville, Texas 78526
Off: (956) 831-4435 · Fax: (956) 831-4490 · TLX: 6733285 ·Cable: Admiral

FEB 0 6 2007

Multiport

BIEHL & CO., L.P.

Est. 1905

www.biehlco.com

2993 N. Indiana Ave., Ste. #4 · Brownsville , TX 78526 · biehlbrv@biehlco.com · Tel: (956) 831-3224 · Fax: (956) 831-4490

January 30, 2007

Department of the Army
Galveston District, Corps of Engineers
P. O. Box 1229
Galveston, Tx. 77553-1229

Ref: Brazos Island Harbor Feasibility Study

To Whom It May Concern:

Biehl & Co., L.P. has been a ship agent in the Port of Brownsville since 1987. Over the years our company has observed many changes, most notably the surrounding industry and its capacity to consume goods and raw materials. The appetite for this consumption has to be satisfied with supply of higher volumes of goods. The most cost effective way to do this is by delivering them in larger vessels saving many thousands of dollars in freight charges on each voyage. The reduction of freight charges insures that Brownsville remains a competitive and viable U.S. Gulf Port.

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Although we do not pretend to be an expert in the environmental affects of the dredging, working at the Port over the years has given us some first hand knowledge of the area. During this period the ship channel has been deepened twice and maintenance dredging performed numerous times. The existing placement sites for dredged materials appear to be functioning very well with slight environmental deterioration. Being environmentally conscious, we have seen that fish, birds, and other wildlife flourish in and along the ship channel. The restoration of the Bahia Grande is an excellent example of how the Port can work at improving the environment.

It is our opinion that the citizens of the United States need a deep water port in this region. It will enable the oil industry to take maximum advantage of oil production to the east making the U.S. less dependent on foreign supply. It will allow the area to grow its commerce with Mexico and other foreign countries.

Sincerely,

Biehl & Co., L.P.

Richard S Ludwig

Richard S. Ludwig

RSL/mej

BIEHL & CO., L.P.

January 31, 2007

Department of the Army
Galveston District
Corps of Engineers
P. O. Box 1229
Galveston, TX 77553-1229

Re: Brazos Island Harbor Feasibility Study

To Whom It May Concern:

Biehl & Co., L.P. has been in business as a shipping agent for over 100 years and in the Port of Brownsville since 1987. Over the years, this company has seen many changes within the industry, most notably the increase of the ship's DWT, when it comes to tankers/bulk carriers. We all know that the transportation by seas is the most cost effective way to transport commodities or semi-finished goods.

Presently, the Brownsville Ship Channel is authorized to 42 feet of depth. Increasing the authorized depth should not cause any operational problems or constraints. Vessels not needing the additional water depth should have an easier transit and those that will take advantage of the deeper water would not have any more difficulty than those presently using the maximum depth. In short, there has not been a safety issue raised at the present depth and we cannot expect one at the deeper depth.

During the past years, the ship channel has been dredged twice and maintenance dredging has been performed numerous times. It seems that all the sites for the dredging material are functioning well and I do not know of any environmental deterrents. I am of the firm opinion that the Port of Brownsville has to be a deep water port especially in order for the Rio Grande Valley region to prosper in the future.

Sincerely,

BIEHL & CO., L.P.

John Springer

JS:pw

5200 Hollister • Houston, Texas 77040 • (713) 690-7200 • Telex 149183 • FAX: (713) 895-3153
e-mail: biehlhou@biehlco.com

HODGE & SHERGOLD, L.L.P.

KIP VAN JOHNSON HODGE, P.C. ATTORNEYS AT LAW AND MEDIATION SERVICES JOHN "ROCA" SHERGOLD, ESQ.

1534 EAST 6TH STREET, SUITE 105
BROWNSVILLE, TEXAS 78520
PH. 956-548-9100
FAX 956-548-9102

January 31, 2007

To Whom It May Concern:

It is with great pleasure to write this letter to share my concern as to the negative impact that will and is occurring due to shoaling issues and the lack of depth of our ship channel.

I am the President of the Propeller Club of the United States for the Brownsville-Port Isabel Chapter and many of our members have businesses and shipping interests at our local Port. I am very concerned about the inability to service steel ships at Dock No. 15 due to the fact that the entry at the ship channel is less than 42 feet which is the minimum requirement for ships of that displacement to pass through.

It is imperative that the U.S. Corp of Engineers provide our area on the South Texas Coast a dredging ship such as was dispatched a year ago, namely the *U.S. Wheeler*, dispatched from New Orleans. In fact, my father in law Arturo Villarreal served on this ship for many years. Of paramount importance, it is vital in my opinion that our newly elected Congress be petitioned to provide more resources such as additional funding for ships dedicated to dredging operations. Twenty years ago there were at least 15 ships assigned nation wide under the command of the Corp, however, today, three or four ships are on assignment. The *Wheeler* stands idle today in New Orleans waiting for an assignment, while private shipping companies have gained favor to conduct dredging operations under our current executive branch of government in Washington, D.C.

Although, there are good arguments to be made concerning privatization of government duties, I believe that this policy has led to the situation that our Port like so many others face today because our Federal Government has a responsibility to maintain the navigability of our waterways and hopefully with the good efforts of our local Congressman Ortiz and the newly elected Congress progress can be made to restore the Corp. of Engineer's dredging fleet.

Best Regards,

John 'roca' Shergold

RESPONSE TO COMMENTS
ON
DRAFT INTEGRATED FEASIBILITY REPORT
AND
ENVIRONMENTAL ASSESSMENT

May 2014

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

December 2, 2013

DEPARTMENT OF DEFENSE

Department of the Army; Corps of Engineers

Notice of Availability for the Environmental Assessment, Draft Integrated Feasibility Report, Brazos Island Harbor Channel Improvement Project, Cameron County, Texas

AGENCY: Department of the Army, U.S. Army Corps of Engineers, Department of Defense; Texas Commission on Environmental Quality

ACTION: Notice of Availability and Joint Public Notice

SUMMARY: The U.S. Army Corps of Engineers (USACE), Galveston District announces the release of the Draft Integrated Feasibilility Report and Environmental Assessment (DIFR-EA), and their public comment periods, for the Brazos Island Harbor Channel Improvement Project, Cameron County, Texas. The non-Federal sponsor for the proposed project is the Brownsville Navigation District.

PURPOSE: This public notice is to inform interested parties that the USACE, Galveston District (the District) has prepared a Draft EA in accordance with the National Environmental Policy Act (NEPA), Public Law 91-190, and regulations for implementing the Procedural Provisions of the NEPA, 40 Code of Federal Regulations 1500-1508. This notice is being distributed to interested State, Federal, and local agencies, private organizations, and individuals in order to assist in collecting facts and recommendations concerning the Tentatively Selected Plan (TSP) of channel improvements to deepen the existing authorized 42-foot mean lower low water (MLLW) channel to 52 feet MLLW and extend the offshore portion of the channel 4,000 feet (0.8 mile) farther into the Gulf of Mexico.

COMMENT PERIOD: The USACE, Galveston District will be accepting written public comments on the DIFR-EA from December 6, 2013 through January 7, 2014. Comments on the DIFR-EA must be postmarked by January 7, 2014.

SUBMISSION OF PUBLIC COMMENTS: Persons desiring to express their views or provide information to be considered in evaluating the impact of this work and the future maintenance operations are requested to mail their comments to:

District Engineer
U.S. Army Engineer District, Galveston
ATTN: CESWG-PE-PR
P.O. Box 1229
Galveston, Texas 77553-1229

PROJECT LOCATION: The Brazos Island Harbor (BIH) project is located on the Gulf of Mexico coast about 3 miles north of the United States-Mexico border and east of the City of Brownsville, in Cameron County, Texas. The existing BIH project includes the Entrance and Jetty Channels which extend about 2.4 miles into the Gulf of Mexico, and the Main Channel which terminates at the Port of Brownsville Turning Basin about 17 miles inland from the Gulf of Mexico.

PROJECT DESCRIPTION: Channel deepening would improve the navigation efficiency of deep draft vessels and offshore oil rigs using the channel to access the Port of Brownsville. The 52 by 250-foot TSP would extend the Entrance Channel 4,000 feet farther into the Gulf of Mexico to reach the natural Gulf depth corresponding to the deepening project. The Entrance and Jetty Channels from Stations -17+000 to 0+000 would be deepened to 54 feet MLLW. This depth includes an additional two feet to accommodate for the effects of offshore waves on ship movements. From Station 0+000 to 84+200, the Main Channel would be deepened to a depth of 52 feet MLLW. From Station 84+200 to 86+000, the existing channel is 42 feet deep and no deepening is proposed. The channel would be maintained at the existing depth of 36 feet MLLW from Station 86+000 to the end of the Turning Basin at 89+500, as ships will have been light-loaded or unloaded before entering. No channel widening is proposed and channel side slopes would remain the same as the existing project. The actual dredging depth would be up to 4 feet deeper in the Entrance and Jetty Channels due to 2 feet of advance maintenance (AM) and 2 feet of allowable overdepth (AO), and up to 3 feet deeper in the Main Channel due to 2 feet of AM and 1 foot of AO. No improvements are proposed for the existing jetties. If the project is authorized, it is estimated that the 29-month long construction period could be finished and the project completed by 2021.

The TSP would generate approximately 14.1 million cubic yards (MCY) of new work material from initial construction and approximately 61.7 MCY of maintenance material over the 50-year period of analysis. Maintenance dredging quantities would increase approximately 14.1 percent over the existing project. New work and maintenance material would be distributed among the existing New Work Ocean Dredged Material Disposal Site (ODMDS), a nearshore Feeder Berm and existing upland, confined placement areas (PAs) 2, 4A, 4B, 5A, 5B, 7 and 8. The new work material would consist primarily of clay with minor amounts of sand, silty sand and clayey sand, and maintenance material would consist of silt and clay sediments from the Main Channel and primarily sandy sediment from the Entrance/Jetty Channels and the first 11,000 feet of the Main Channel. Maintenance material from the Entrance and Jetty Channels may be placed in the Maintenance ODMDS if the nearshore Feeder Berm is unavailable.

None of the existing ODMDS and upland PAs would need to be expanded and no new ODMDS or upland PAs would be needed. Construction to raise upland PA containment dikes to heights needed to accommodate new work and maintenance quantities would be done within the footprints of the existing PAs. New work sediments would be stockpiled within the PAs and later used to raise PA dikes incrementally as needed to contain maintenance material for the 50-year period of analysis. Final elevations of the PA dikes would range from a total elevation of 17 feet NAVD 88 around PA 5A to a total elevation of 38 feet around PA 7. Armoring of the exterior toe of the PA 4A and 4B dikes on the side facing the channel would be implemented to prevent erosion from Station 22+000 to 33+800. Maintenance material from the Entrance and Jetty Channels and the first 11,000 feet of the Main Channel would generally be placed in the nearshore Feeder Berm. Sediment removed by maintenance dredging would therefore be regularly placed back into the littoral system, available for cross-shore and longshore sediment transport to the beaches of South Padre Island.

STATE WATER QUALITY CERTIFICATION: TCEQ water quality certification is required. The TCEQ is reviewing the proposed project under Section 401 of the Clean Water Act and in accordance with Title 31, Texas Administrative Code Section 279.1-13 to determine if the work would comply with State water quality standards. By virtue of an agreement between the USACE and TCEQ, this public notice is also issued for the purpose of advising all known interested persons that TCEQ's decision on water quality certification is pending. Any comments concerning this work may be submitted to the Texas Commission on Environmental Quality, Attention: Water Quality Division, MC-150, P.O. Box 13087, Austin, Texas 78711-3087. The public comment period extends 30 days from the date of publication of this notice. A copy of the public notice with a description of work is made available for review in the TCEQ's Austin office.

The TCEQ may conduct a public meeting to consider all comments concerning water quality if requested in writing. A request for a public meeting must contain the following information: the name, mailing address, and telephone number of the person making the request; a brief description of the interest of the requester, or of persons represented by the requester; and a brief description of how the project would adversely affect such interest.

COMPLIANCE WITH OTHER LAWS AND REGULATIONS:

Endangered Species Act. Coordination with the U.S. Fish and Wildlife Service (USFWS) regarding potential endangered species impacts has been concluded and conservation measures recommended by USFWS will be adopted to prevent potential impacts to threatened and endangered species that may occur in the study area. Consultation with the National Marine Fisheries Service (NMFS) is underway regarding potential adverse impacts from new work construction by hopper dredges to four species of threatened and endangered swimming sea turtles (green, Kemp's ridley, loggerhead and hawksbill). Reasonable and prudent measures, developed in consultation with the NMFS, will be adopted to reduce potential impacts to these species.

Essential Fish Habitat: This notice initiates Essential Fish Habitat consultation requirements of the Magnuson-Stevens Fishery Conservation and Management Act. Our initial determination is that the proposed action will not have a substantial adverse impact on Essential Fish Habitat or federally-managed fisheries in the Gulf of Mexico. Our final determination relative to project impacts and the need for mitigation measures is subject to review by and coordination with the NMFS.

Texas Council on Environmental Quality (TCEQ) Water Quality Certification: The proposed dredged material placement plan will also be evaluated with regard to the requirements of Section 404(b)(1) of the Clean Water Act. Water quality certification has been requested from the Texas Commission on Environmental Quality (TCEQ).

Air Quality: Cameron County is currently designated as in attainment or unclassifiable with National Ambient Air Quality Standards. New work and maintenance dredging would result in minor short-term effects and would not result in a significant effect on regional air quality.

Other Agency Coordination: USACE has evaluated the proposed TSP for consistency with the Texas coastal management program, and concluded that the TSP is fully consistent to the maximum extent practicable with the enforceable policies of the Texas program. No impacts to historic properties have been identified, and potential unanticipated impacts to historic properties during construction and operation will be addressed in accordance with the terms of the Historic Properties Programmatic Agreement. A determination of "no effect" is currently being coordinated with the State Historic Preservation Officer.

The following is a partial list of Federal, State, and local agencies with which these activities are being coordinated:

U.S. Environmental Protection Agency, Region 6
U.S. Department of Commerce
U.S. Department of the Interior
Eighth Coast Guard District
Budget and Planning Office, Office of the Governor of Texas
Texas Historical Commission
Texas Parks and Wildlife Department
Texas Commission on Environmental Quality
Texas General Land Office
Texas Water Development Board
Cameron County
Port Isabel-San Benito Navigation District
The City of Brownsville
The City of Port Isabel

EVALUATION FACTORS: The decision whether to proceed with the proposed action will be based on an evaluation of the probable impact of the proposed activity on the public interest. That decision will reflect the national concern for both protection and utilization of important resources as well as public and environmental safety and economic concerns.

ENVIRONMENTAL DOCUMENTATION: The work described in this notice represents a change to the existing project. A preliminary review of the TSP indicates that an Environmental Impact Statement (EIS) is not required. This preliminary determination will be changed if information brought forth in the coordination process is of a significant nature. Based on this determination, a Draft EA has been prepared. The Draft EA assesses potential impacts to the human and natural environment that would result from the proposed project. The document is available online at http://www.swg.usace.army.mil/BusinessWithUs/PlanningEnvironmentalBranch/DocumentsforPublicReview.aspx.

FOR FURTHER INFORMATION CONTACT: Questions about the proposed action and the DIFR-EA may be referred to Ms. Janelle Stokes at (409) 766-3039, or by email at janelle.s.stokes@usace.army.mil and Ms. Carolyn Murphy at (409) 766-3044, or by email at carolyn.e.murphy@usace.army.mil.

Dolan Dunn
Chief, Planning, Environmental
and Regulatory Division
Galveston District

From: John Trevino
To: Stokes, Janelle S SWG
Cc: Gracey Gray; Gregg Easley
Subject: [EXTERNAL] Comment to Draft Integrated Feasibility Report and Environmental Assessment - Brazos Island Harbor Channel Improvement Project, Cameron County, Texas
Date: Friday, January 03, 2014 3:26:29 PM

Ms. Stokes,

I am the reviewer for the TCEQ for the Draft Environmental Assessment (DEA) referenced above. The Corps has requested water quality certification from TCEQ for this action under Section 401 of the Clean Water Act. Before I can complete the water quality certification, I have a comment for you to consider.

1. Appendix G of the DEA indicates that among other areas, seven upland contained placement areas (PA) would be used to store dredged material from this dredging project. All of the upland PAs are existing PAs and located along the Main Channel. The DEA also indicates that the upland PAs are confined with water discharged via controlled spillways to existing outfall canals and drainage ditches. The TCEQ recommends that effluent from an upland contained disposal areas not exceed a Total Suspended Solids (TSS) concentration of 300 milligrams per liter (mg/l). In other dredging projects such as HGNC-09-01 and HGNC-13-01, the Corps added the following statement to the Final EA: "The upland confined placement area will be designed and operated with the goal of achieving an effluent TSS concentration of not more than 300 mg/L". Please verify that this recommendation will be part of the project in the Final EA for the Brazos Island Harbor Channel Improvement Project. 1

I look forward to your response. Please let me know if you have any questions.

Thank you,

John Trevino

Water Quality Division

Texas Commission on Environmental Quality

(512) 239-4600

John Trevino
Texas Commission on Environmental Quality
Water Quality Division
John.Trevino@tceq.texas.gov

RESPONSE TO COMMENTS

Comment No.	Response
1	USACE added the following statement to the FIFR-EA, Appendix G, section II.c(1): "The upland confined placement area will be designed and operated with the goal of achieving an effluent TSS concentration of not more than 300 mg/L".

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Region 6
1445 Ross Avenue, Suite 1200
Dallas, TX 75202-2733

January 7, 2014

Col. Richard P. Pannell
U.S. Army Corps of Engineers
Attn: CESWG-PE-PR
P.O. Box 1229
Galveston, Texas 77553-1229

In accordance with our responsibilities under Section 309 of the Clean Air Act (CAA) and the National Environmental Policy Act (NEPA), the U.S. Environmental Protection Agency (EPA) Region 6 has reviewed the Draft Integrated Feasibility Report and Environmental Assessment (DIFR-EA) titled Brazos Island Harbor Channel Improvement Project. The tentatively selected plan will deepen the existing authorized 42-foot mean lower low water channel to 52-feet, and extend the offshore portion of the channel 4,000 feet farther into the Gulf of Mexico.

- EPA has concerns regarding information presented in Appendix F, Ocean Dredged Material Disposal Site (ODMDS) Analysis. The ODMDS analysis is based on information presented to EPA from the Brazos Island Harbor (BIH) Contaminant Assessment Report (Report). The BIH Report contained errors necessitating major revisions, and therefore, should not be used as the basis for the ODMDS analysis. The Corps of Engineers (COE) advised EPA they are working on final revisions to the BIH Report , but they could not provide an expected completion date. EPA cannot fully assess the adequacy of the ODMDS analysis until we review a final copy of the BIH Report. The text of Appendix F should note the information provided is from a "draft" report. EPA will make an independent assessment as to the suitability of the "new work" dredged material for ocean disposal once we receive the final report. In addition, Appendix F should be updated when the Revised Final BIH Report becomes available. 1

- EPA has concerns over the modeling for the new work and maintenance material. The grain size used in the modeling for the new work and maintenance material is not in agreement with the grain size information presented in Table 5. EPA recommends the maximum percentages for the maintenance material be used in the modeling. It is uncertain how much change in mound height would occur using the correct percentages provided in Table 5. 2

We appreciate the opportunity to provide comments for the Draft EA. Please send the Final EA to my attention. Should you have any questions or concerns regarding this letter, do not hesitate to call me at 214-665-8006, or contact Keith Hayden of my staff, at 214-665-2133 or hayden.keith@epa.gov for assistance.

Sincerely,

Rhonda Smith
Chief, Office of Planning
and Coordination

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

March 4, 2014

Regional Planning and Environmental Center

Ms. Rhonda Smith
Chief, Office of Planning and Coordination
United States Environmental Protection Agency, Region 6
1445 Ross Avenue, Suite 1200
Dallas, Texas 75202-2733

Dear Ms. Smith,

Reference your letter dated January 7, 2014 providing comments on the Draft Integrated Feasibility Report and Environmental Assessment (DIFR-EA) for the Brazos Island Harbor (BIH) Channel Improvement Project. We have reviewed your concerns regarding the adequacy of the draft BIH Contaminant Report and the grain sizes used to model the mounding of new work and maintenance material in the Ocean Dredged Material Disposal Sites. Additional information is provided in response to these concerns.

The revised BIH Contaminant Assessment Report is in final preparation and will be provided to your agency as soon as it is available. All outstanding issues raised by your agency have been addressed, the most notable of which was statistical comparisons between data sets. The test results are now treated and reported as two data sets: (1) maintenance material/maintenance ODMDS/ maintenance reference area; and (2) new work material/new work ODMDS/new work reference area. The BIH sediments show minimal levels of 1
contamination greater than reference sediments, so although the statistical treatments were redone, the conclusion of the report remains unchanged; results of the analysis arrived at the same conclusion, that the sediments were acceptable for ocean placement at the BIH ODMDSs. Appendix F of the BIH DIFR-EA will be revised to note that the information is from a draft report. The revised information will be included in the Site Management and Monitoring Plan which will be developed in consultation with your office during the pre-construction, engineering and design phase of this project.

To evaluate your concerns about grain size and potential mounding heights, a grain size summary for both maintenance and new work material has been compiled (Enclosure - Table 1). The composite grain size distribution for sediments from the maintenance material for approximately 25 years is also included for comparative purposes.

STFate modeling in the DIFR-EA used the composite grain size for maintenance material as the grain size input parameter. When these composite grain size data are compared to the new work material grain size data, the composite grain size data used in the STFate calculations shows equivalent percentages of gravel and sand, with a higher percentage of silt and a lower percentage of clay. Based upon these findings, the mound height calculated by 2
STFate in the report for the new work material can be taken to be representative. For maintenance material, the median (a measure of central tendency) of the grain size analyses

shows that the maintenance material is again virtually identical to the new work material, which would again make the mound height calculated by STFate representative.

Maintenance material does show an outlier in grain size at location B-EC-12-02, which has a percentage of gravel (55.1%) that is atypical of any other maintenance material sample (or any other sample in the entire study area), including the duplicate sample taken at B-EC-12-02Dup. B-EC-12-02 is located in the Entrance Channel where jetty construction has occurred. 2
Using its proximity to current jetties and other possible construction activities, and the dissimilarity to all other samples in the study including its field duplicate -02Dup, we believe -02 is an outlier and not representative of the maintenance material grain size. As such, the outlier grain size data from B-EC-12-02 should not be used to determine the mound height for the project as it is not representative of the majority of the dredge material volume.

We trust this additional information will address your concerns and look forward to working with you on the development of a new Site Management and Monitoring Plan for this project in the near future. The BIH Final Integrated Feasibility Report and Environmental Assessment, which includes your comments and this response, will be sent to your attention. If you have any additional questions or concerns, please contact Janelle Stokes at 409/766-3039 or at janelle.s.stokes@usace.army.mil for assistance.

Sincerely,

Carolyn Murphy

Carolyn Murphy
Unit A Chief, NEPA & Cultural Resources Section

Enclosure

Table 1: Summary of Physical Characterization of Sediment
Dredge Material, Reference and ODMDS for Maintanence and New Work Materials
Brazos Island Harbor, Texas

Dredge Category	Dredge Location	Composite	Physical Parameters				
			Grain Size				
			% Gravel	% Sand	% Silt	% Clay	% Solid
Maintenance	Existing Entrance Channel	B-EC-12-01	7.2	59.8	4.5	28.5	44.5
		B-EC-12-02	55.1	41.5	0.8	2.6	72.8
		B-EC-12-02 Dup	0.4	59.4	16.9	23.3	65.2
		B-EC-12-03	0.0	65.7	9.2	25.1	58.0
	Entrance Channel Extension	B-EC-12-04	0.5	81.7	6.4	11.4	63.1
		min	0.0	41.5	0.8	2.6	44.5
		median	**0.5**	**59.8**	**6.4**	**23.3**	**63.1**
		max	55.1	81.7	16.9	28.5	72.8
	ODMDS/PA	B-EC-12-PA1	0.0	90.8	2.1	7.1	72.9
	Reference Area	B-EC-12-REF	0.0	20.4	15.1	64.5	57.3
New Work	Channel Deepening	B-EC-12-NW	0.5	65.4	7.5	26.6	62.5
	ODMDS/PA	B-EC-12-PANW	0.5	88.0	2.4	9.1	67.9
	Reference Area	B-EC-12-REFNW	0.0	11.2	4.7	84.1	54.1
STFATE (1)			0.0	68.2	21.3	10.4	60.0

Footnotes:

1) STFATE- Assumptions from SAP, 1966 through 2011 historical data

Brazos Island Harbor, Texas Channel Improvement Project

Appendix E
Agency and Tribal Coordination

July 2014

APPENDIX E

AGENCY AND TRIBAL COORDINATION BRAZOS ISLAND HARBOR CHANNEL IMPROVEMENT PROJECT CAMERON COUNTY, TEXAS

U.S. Army Corps of Engineers, Galveston District
2000 Fort Point Road
Galveston, Texas 77550

July 2014

Appendix E
Agency and Tribal Coordination
Brazos Island Harbor Channel Improvement Project
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PDF Page

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

REPLY TO
ATTENTION OF

March 18, 2013

Environmental Section

Mr. Rusty Swafford
National Marine Fisheries Service
Habitat Conservation Division
4700 Avenue U
Galveston, Texas 77551

Dear Mr. Swafford:

This letter is in regard to proposed modification of the Brazos Island Harbor Navigation Project in Cameron County, Texas. The existing project is shown on the enclosed figure. The project is expected to include deepening and possibly widening of the Entrance Channel and Brownsville Ship Channel, to allow larger vessels and offshore oil rigs to more efficiently navigate to the Turning Basin located near Brownsville, Texas.

To facilitate compliance with the requirements of the Magnuson-Stevens Fishery Conservation and Management Act, we are requesting information on essential fish habitat or managed species that may be present in the area of the proposed action.

If you or your staff have any questions regarding this activity, please contact Janelle Stokes at (409) 766-3039 or by email at Janelle.S.Stokes@usace.army.mil.

Sincerely,

Carolyn Murphy

Carolyn Murphy
Chief, Environmental Section

Enclosure

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southeast Regional Office
263 13th Avenue South
St. Petersburg, Florida 33701-5505
http://sero.nmfs.noaa.gov

Southeast Regional Office
263 13th Avenue S
St. Petersburg, Florida 33701-5505

May 22, 2013

Ms. Carolyn Murphy
Environmental Section
Department of the Army, Corps of Engineers
P.O. Box 1229
Galveston, Texas 77553-1229

Dear Ms. Murphy:

The NOAA National Marine Fisheries Service (NMFS) Habitat Conservation Division (HCD) has received your letter dated March 18, 2013, requesting information on Essential Fish Habitat and federally managed fish species that may be present near the proposed Brazos Island Harbor Navigation Project. It is expected the project will include deepening and widening of the Entrance Channel and the Brownsville Ship Channel to allow larger vessels and offshore oil rigs to more efficiently navigate to the Turning Basin located near Brownsville, Texas. The U.S. Army Corps of Engineers (USACE) is preparing an Environmental Assessment which will include EFH information, presumably including the USACE's determination of whether this project may have an adverse effect on essential fish habitat (EFH).

Submerged soft bottom habitats near the project are identified as EFH by the Gulf of Mexico Fishery Management Council (GMFMC) and NMFS for multiple species. A table providing a list of these species is enclosed to assist you in assessing whether the project would have an adverse effect on EFH. Detailed information on federally managed fisheries and their EFH is provided in the 2005 Generic Amendment of the Fishery Management Plans for the Gulf of Mexico prepared by the GMFMC and in the 2009 Amendment 1 to the Consolidated Atlantic Highly Migratory Species Fishery Management Plan prepared by NMFS as required by the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) (P.L. 104 – 297). In addition to being designated as EFH, the open water soft bottom areas that could be impacted provide habitat that supports various economically important marine fishery species, such as spotted seatrout (*Cynoscion nebulosus*), flounder (*Paralichthys spp.*), Atlantic croaker (*Micropogonias undulates*), black drum (*Pogonias cromis*), gulf menhaden (*Brevoortia patronus*), striped mullet (*Mugil cephalus*), and blue crab (*Callinectes sapidus*). Such estuarine dependent organisms serve as prey for other fisheries managed under the Magnuson-Stevens Act by the GMFMC (e.g., red drum, mackerels, snappers, and groupers) and highly migratory species managed by NMFS (e.g., billfishes and sharks).

This project will generate a significant amount of new work dredge material and future work maintenance dredge material over the life of the project. Therefore, NMFS HCD recommends the USACE work with the project's local sponsor to evaluate whether there are nearby opportunities to beneficially utilize any suitable dredge material. Disposal of the dredge material into upland confined placement areas and offshore dredge material disposal sites would remove sediment from the estuary and nearshore systems and waste this valuable natural resource. NMFS HCD views beneficial use and wise regional sediment management as critical components of environmentally acceptable federal projects.

Thank you for contacting us. We look forward to further coordination with the USACE regarding this project. If we may be of further assistance, please contact Ms. Heather Young of our Galveston Facility at (409) 766-3699.

Sincerely,

Virginia M. Fay

Virginia M. Fay
Assistant Regional Administrator
Habitat Conservation Division

Enclosure

Enclosure

Reef Fish that utilize soft bottom Essential Fish Habitat near the Brazos Island Harbor Navigation Project		
Species	**Life Stage**	**Function**
Gray Snapper (*Lutjanus griseus*)	Adults	feeding
Lane Snapper (*Lutjanus synagris*)	Early Juvenile Late Juvenile Adults	growth, feeding growth, feeding growth, feeding

Red Drum that utilize soft bottom Essential Fish Habitat near the Brazos Island Harbor Navigation Project		
Species	**Life Stage**	**Function**
Red Drum (*Sciaenops ocellatus*)	Larval Post Larval Early Juvenile Subadult Adults	growth, feeding growth, feeding growth, feeding growth, feeding feeding

Shrimp that utilize soft bottom Essential Fish Habitat near the Brazos Island Harbor Navigation Project		
Species	**Life Stage**	**Function**
Brown Shrimp (*Farfantepenaeus aztecus*)	Post Larval Early Juvenile Late Juvenile	growth, feeding growth, feeding growth, feeding
White Shrimp (*Litopenaeus setiferus*)	Post Larval Early Juvenile Late Juvenile	growth, feeding growth, feeding growth, feeding
Pink Shrimp (*Farfantepenaeus duorarum*)	Post Larval Early Juvenile Late Juvenile	growth, feeding growth, feeding growth, feeding

EFH information used to create this table was obtained from:

Gulf of Mexico Fishery Management Council. 2004. Final environmental impact statement for the generic amendment to the following fishery management plans of the Gulf of Mexico: Shrimp Fishery of the Gulf of Mexico, United States Waters; Red Drum Fishery of the Gulf of Mexico; Reef Fish Fishery of the Gulf of Mexico; Coastal Migratory Pelagic Resources (Mackerels) in the Gulf of Mexico and South Atlantic; Stone Crab Fishery of the Gulf of Mexico; Spiny Lobster in the Gulf of Mexico and South Atlantic; Coral and Coral Reefs of the Gulf of Mexico. Gulf of Mexico Fishery Management Council. Tampa, FL.

Enclosure

Highly Migratory Species With Essential Fish Habitat near the Brazos Island Harbor Navigation Project	
Species	**Life Stage**
Scalloped Hammerhead (*Sphyrna lewini*)	neonate/young of year juvenile
Blacktip Shark (*Carcharhinus limbatus*)	neonate/young of year juvenile adult
Bull Shark (*Carcharhinus leucas*)	neonate/young of year juvenile
Lemon Shark (*Negaprion brevirostris*)	juvenile
Spinner Shark (*Carcharhinus brevipinna*)	neonate/young of year juvenile
Bonnethead Shark (*Sphyrna tiburo*)	neonate/young of year juvenile adult
Atlantic Sharpnose Shark (*Rhizoprionodon terraenovae*)	neonate/young of year juvenile adult
Finetooth Shark (*Carcharhinus isodon*)	juvenile adult

EFH information used to create this table was obtained from:

NMFS. 2009. Final Amendment 1 to the 2006 Consolidated Atlantic Highly Migratory Species Fishery Management Plan, Essential Fish Habitat. National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Office of Sustainable Fisheries, Highly Migratory Species Management Division, Silver Spring, MD. Public Document. pp. 395.

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

REPLY TO
ATTENTION OF

September 4, 2013

Environmental Section

Ms. Karen McCormick, Chief
Marine and Coastal Protection Section
U.S. Environmental Protection Agency
1445 Ross Avenue, Suite 1200
Region VI, Mail Code 6WQE
Dallas, Texas 75202-2733

Dear Ms. McCormick:

Reference is made to the feasibility study to deepen and widen the Brazos Island Harbor Project in Cameron County, Texas that is being conducted by Galveston District and the Brownsville Navigation District. The study is evaluating deepening the Entrance Channel to a required depth of 54 feet mean low tide (MLT) plus 2 feet of allowable overdepth (AO). The deepening would result in a 5,000 foot extension of the Entrance Channel. The majority of the Entrance Channel could also be widened to a maximum of 350 feet. It is proposed that virgin material from the initial deepening would be placed in the New Work Ocean Dredged Material Disposal Site (ODMDS) that was used for the 42-foot deepening project. This site was designated for construction material from the BIH Entrance Channel with an indefinite period of use. It is anticipated that maintenance material would continue to be placed in the existing Maintenance ODMDS, the existing Berm Site, and at established beach nourishment locations on South Padre Island.

In fulfillment of testing requirements related to ODMDS placement of dredged material, bioassay and bioaccumulation testing of the channel sediments was performed. The initial report was submitted for review on February 25, 2013. After review of the report, your office provided comments via a memo dated March 19, 2013. The report was revised per these comments and observations. Please find the final report of these studies enclosed.

The overall conclusions are that there is nothing in the chemical analyses, Suspended Particulate Phase Bioassays, or Solid Phase Bioassays that would indicate a concern, and that the Limiting Permissible Concentration is met. Also, the dredged material evaluated for bioaccumulation potential is not predicted to be toxic to benthic organisms and is not likely to have an unacceptable adverse effect on survival, growth, or reproduction of aquatic organisms due to bioaccumulation.

Please review the dredged material evaluation to determine suitability for proposed disposal. In accordance with our Regional Implementation Agreement, we would ask that we receive any additional information requests that are necessary to determine compliance with the ocean dumping criteria within 15 days of receipt. This determination of suitability is required prior to the preparation of the draft Site Management Plan for the proposed project. Should you need additional information or have any questions, please call Lisa Finn at (409) 766-3949.

Sincerely,

Andrea Catanzaro

for Carolyn Murphy
Chief, Environmental Section

Enclosure:
Brazos Island Harbor – Entrance Channel
Contaminant Assessment Report

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

December 2, 2013

Environmental Section

SUBJECT: Draft Environmental Assessment for Brazos Island Harbor Channel Improvement Project, Cameron County, Texas

Mr. Mike Jansky
U.S. Environmental Protection Agency
1445 Ross Avenue, Suite 1200
Mail Code 6 ENXP
Dallas, Texas 75202-2733

Dear Mr. Jansky:

Enclosed please find three CD's of the Draft Integrated Feasibility Report and Environmental Assessment for the Brazos Island Harbor Channel Improvement Project, Cameron County, Texas. This draft report is provided for your agency in conformance with the National Environmental Policy Act.

The public comment period closes on January 7, 2014, and we would appreciate receipt of your agency's comments by that date. If you have any questions, please contact Ms. Janelle Stokes at the letterhead address, by telephone at 409-766-3039, or by email at Janelle.S.Stokes@usace.army.mil.

Sincerely,

Carolyn Murphy

Carolyn Murphy
Chief, Environmental Section

Enclosure

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

December 2, 2013

Environmental Section

SUBJECT: Draft Environmental Assessment for Brazos Island Harbor Channel Improvement Project, Cameron County, Texas

Ms. Karen McCormick
Chief, Marine and Coastal Protection Section (WQEC)
U.S. Environmental Protection Agency
1445 Ross Avenue, Suite 1200
Dallas, Texas 75202-2733

Dear Ms. McCormick:

Enclosed please find a CD of the Draft Integrated Feasibility Report and Environmental Assessment (DIFR-EA) for the Brazos Island Harbor Channel Improvement Project, Cameron County, Texas. This draft report is provided for your agency review of the Ocean Dredged Material Disposal Site (ODMDS) analysis, attached as Appendix F to the DIFR-EA in Appendix B, in accordance with Section 102 of the Marine Protection, Research, and Sanctuaries Act. The Tentatively Selected Plan proposes to utilize previously designated New Work and Maintenance ODMDS for dredged material from the Entrance and Jetty Channels. Neither of the existing sites would need to be enlarged and no new ODMDS are proposed. This draft report was prepared in accordance with the National Environmental Policy Act of 1969, as amended, and as implemented by the Council on Environmental Quality (40 CFR Parts 1500-1508).

We understand that preparation and approval of a Site Management and Monitoring Plan will be required before the ODMDS may be used. We plan to begin development of this plan in the Pre-Construction, Engineering and Design Phase and will coordinate with your agency to determine requirements as early as possible in this process.

The public comment period closes on January 7, 2014, and we would appreciate receipt of your agency's comments by that date. If you have any questions, please contact Ms. Janelle Stokes at the letterhead address, by telephone at 409-766-3039, or by email at Janelle.S.Stokes@usace.army.mil.

Sincerely,

Carolyn Murphy

Carolyn Murphy
Chief, Environmental Section

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Region 6
1445 Ross Avenue, Suite 1200
Dallas, TX 75202-2733

January 7, 2014

Col. Richard P. Pannell
U.S. Army Corps of Engineers
Attn: CESWG-PE-PR
P.O. Box 1229
Galveston, Texas 77553-1229

In accordance with our responsibilities under Section 309 of the Clean Air Act (CAA) and the National Environmental Policy Act (NEPA), the U.S. Environmental Protection Agency (EPA) Region 6 has reviewed the Draft Integrated Feasibility Report and Environmental Assessment (DIFR-EA) titled Brazos Island Harbor Channel Improvement Project. The tentatively selected plan will deepen the existing authorized 42-foot mean lower low water channel to 52-feet, and extend the offshore portion of the channel 4,000 feet farther into the Gulf of Mexico.

- EPA has concerns regarding information presented in Appendix F, Ocean Dredged Material Disposal Site (ODMDS) Analysis. The ODMDS analysis is based on information presented to EPA from the Brazos Island Harbor (BIH) Contaminant Assessment Report (Report). The BIH Report contained errors necessitating major revisions, and therefore, should not be used as the basis for the ODMDS analysis. The Corps of Engineers (COE) advised EPA they are working on final revisions to the BIH Report , but they could not provide an expected completion date. EPA cannot fully assess the adequacy of the ODMDS analysis until we review a final copy of the BIH Report. The text of Appendix F should note the information provided is from a "draft" report. EPA will make an independent assessment as to the suitability of the "new work" dredged material for ocean disposal once we receive the final report. In addition, Appendix F should be updated when the Revised Final BIH Report becomes available.

- EPA has concerns over the modeling for the new work and maintenance material. The grain size used in the modeling for the new work and maintenance material is not in agreement with the grain size information presented in Table 5. EPA recommends the maximum percentages for the maintenance material be used in the modeling. It is uncertain how much change in mound height would occur using the correct percentages provided in Table 5.

We appreciate the opportunity to provide comments for the Draft EA. Please send the Final EA to my attention. Should you have any questions or concerns regarding this letter, do not hesitate to call me at 214-665-8006, or contact Keith Hayden of my staff, at 214-665-2133 or hayden.keith@epa.gov for assistance.

Sincerely,

Rhonda Smith

Rhonda Smith
Chief, Office of Planning
and Coordination

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 6
1445 ROSS AVENUE, SUITE 1200
DALLAS TX 75202-2733

June 09, 2014

Carolyn Murphy
Chief, Unit A
NEPA/Cultural Resources Section
Galveston District Corps of Engineers
P. O. Box 1229
Galveston, TX 77553-1229

Dear Ms. Murphy:

This letter is written in regard to your September 4, 2013, request for concurrence on the suitability for ocean disposal of new work material as part of the Brazos Island Harbor (BIH) Channel Improvement Project and of maintenance material from future maintenance dredging projects for the BIH Jetty and Entrance Channels. The *Brazos Island Harbor-Entrance Channel Contaminant Assessment* (herein after "Report") (Section 103 Evaluation) was initially received by the U.S. Environmental Protection Agency (EPA) on February 28, 2013. EPA provided comments via memo dated March 19, 2013. A revised Report was received by EPA on September 6, 2013. The EPA requested additional information on September 10, 2013. A final revised Report, supporting documents, and letter addressing EPA's comments was received on May 2, 2014. EPA requested and received additional information via emails, phone conversations, and letters from May 2 through June 5, 2014. As described in the Appendix F of the December 13, 2014 *Brazos Island Harbor Channel Improvement Project Cameron County, Texas Draft Integrated Feasibility Report and Environmental Assessment* (DIFR-EA) the project consists of deepening the Entrance and Jetty Channels from Stations -17+000 to 0+000 to a required depth of 54 feet mean low lower water (MLLW), plus 2 feet advanced maintenance and 2 feet of allowable overdepth (AO). The deepening would result in a 0.75 mile extension of the Entrance Channel. Dredging is expected to be conducted by mechanical (hopper) dredge. Total volumes to be disposed at the Brazos Island Harbor New Work Ocean Dredged Material Disposal Site (ODMDS) are expected to be approximately 2,066,000 cubic yards. Additionally, an estimated 0.7 million cubic yards of maintenance material from the BIH Entrance and Jetty Channels would continue to be placed in the existing BIH Maintenance ODMDS, the existing nearshore Feeder Berm site, and at established beach nourishment locations on South Padre Island every 1.5 years. Maintenance dredging is expected to be conducted by hopper dredge.

We have completed our review of your Section 103 Evaluation Report (*Brazos Island Harbor-Entrance Channel Contaminant Assessment*, March 2014) and supporting documents and have completed an independent evaluation of the dredged material. EPA concurs with your determination that the proposed dumping at the BIH Maintenance and BIH New Work ODMDSs will comply with the criteria set forth in 40 CFR Part 227. A brief discussion of the compliance of the material with the criteria is provided below.

1. Exclusion Criteria – 40 CFR § 227.13 (b)

New work and maintenance dredged material from BIH Entrance and Jetty Channels does not meet the criteria of paragraph (b) of this section and therefore further testing was required as discussed in the following paragraphs.

2. Water Column and Suspended Phase Determinations – 40 CFR § 227.6(c)(1&2) and 227.27 (a&b)

For these tests, only Cyanide exceeded the Federal Marine Water Quality Criteria (WQC) at all channel stations prior to any dilution. Lab data is reported as total cyanide while the Federal Marine WQC is for free cyanide. Comparing total cyanide values to free cyanide WQC is a very conservative approach.

Bioassays on three appropriate sensitive marine organisms were conducted. The lowest Limiting Permissible Concentration with a required dilution of 1% was met in 100 minutes at the edge of the BIH Maintenance ODMDS and everywhere for a disposal volume of 10,300 cubic yards or less using STFATE water quality modeling. The lowest Limiting Permissible Concentration with a required dilution of 1% was met in 70 minutes at the edge of the BIH New Work ODMDS and everywhere for a disposal volume of 10,300 cubic yards or less using STFATE water quality modeling. Accordingly, it is concluded that the liquid phase of the material is in compliance with 40 CFR § 227.6(c)(1&2) and 227.27 (a&b).

3. Benthic Determinations – 40 CFR § 227.6(c) and 227.27(b)

Solid phase toxicity evaluation: Ten-day tests were conducted on the maintenance and new work sediments using mysids (*Americamysis bahia*), and amphipods (*Leptocheirus plumulosus*). These organisms are appropriate sensitive benthic marine organisms and are good predictors of adverse effects to benthic marine communities. The mysid toxicity was within 10% of the reference and the amphipods toxicity was within 20% of the reference.

Solid phase bioaccumulation evaluation: Twenty-eight day bioaccumulation tests were conducted on maintenance and new work sediments using two appropriate sensitive benthic marine organisms, *Nereis virens* and *Macoma nasuta*. These species are considered to be good representatives of the phylogenetically diverse base of the marine food chain. Tissue concentrations were compared to Food and Drug Administration (FDA) Action Levels. None of the contaminants, for which there are FDA Action Levels, exceed such thresholds in the tissues of organisms exposed to maintenance and new work sediments. Concentrations of contaminants in tissue of organisms exposed to maintenance and new work sediments were then compared to concentrations in tissues of organisms exposed to a reference sediment. Copper was found to be statistically higher in the organisms exposed to maintenance dredged material than the reference material. Nickel was found to be statistically higher in the organisms exposed to maintenance and new work dredged material than the reference material. When the bioaccumulation of contaminants in tissues exposed to dredged material exceeds that exposed to reference sediments, general risk-based evaluations must be conducted to evaluate compliance with

227.13(c)(3). EPA conducted such an evaluation and determined that there is little to no potential for undesirable effects due to bioaccumulation as a result of the presence of individual chemicals or of the solid phase of the dredged material as a whole. Accordingly, it is concluded that the solid phase of the material proposed for disposal meets the ocean disposal criteria at 40 CFR § 227.6(c) and 227.27(b).

Pursuant to MPRSA Section 104(a)(4), ocean disposal permits must be conditioned to assure consistency with approved Site Management and Monitoring Plans (SMMP). The BIH Maintenance ODMDS SMMP was reviewed and revised in 2008. Management and monitoring requirements for the BIH Maintenance ODMDS consists of 1) observance of a 500-foot wide no-discharge zone immediately inside the boundaries of the ODMDS, 2) collection of Dredge Quality Management data (DQM) and 3) pre and post project bathymetric surveys to monitor mounding height and movement of sediment outside the boundary of the ODMDS. The 1992 BIH New Work ODMDS SMMP is out of date and a revised SMMP is under development. It is expected that the revised SMMP will have the same monitoring requirements as the older SMMP in addition to the collection of DQM data.

Should you have any questions regarding this determination or management of the BIH Maintenance or New Work ODMDS, please contact Dr. Jessica Franks at 214-665-8335 or by e-mail at franks.jessica@epa.gov.

Sincerely yours,

Karen McCormick
Chief
Marine and Coastal Section (6WQ-EC)

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

December 2, 2013

Environmental Section

SUBJECT: Draft Environmental Assessment for Brazos Island Harbor Channel Improvement Project, Cameron County, Texas

Mr. Miles Croom
Assistant Regional Administrator
National Marine Fisheries Service
Habitat Conservation Division
263 13th Avenue South
St. Petersburg, Florida 33701-5511

Dear Mr. Croom:

Enclosed please find a CD of the Draft Integrated Feasibility Report and Environmental Assessment (DIFR-EA) for the Brazos Island Harbor Channel Improvement Project, Cameron County, Texas. This draft report is provided for your agency review and concurrence of the evaluation of essential fish habitat (EFH) in accordance with the Magnuson-Stevens Fishery Conservation and Management Act. Sections 2.3.4 and 7.4.2 of the DIFR-EA provide information regarding the existing environment and potential EFH impacts, respectively.

The results of your review are requested by the end of the public comment period, January 7, 2014. I would appreciate your timely review of these documents. If you have any questions, please contact Ms. Janelle Stokes at the letterhead address, by telephone at 409-766-3039, or by email at Janelle.S.Stokes@usace.army.mil.

Sincerely,

Carolyn Murphy

Carolyn Murphy
Chief, Environmental Section

Enclosure

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

December 2, 2013

Environmental Section

SUBJECT: Draft Environmental Assessment for Brazos Island Harbor Channel Improvement Project, Cameron County, Texas

Mr. Rusty Swafford
National Marine Fisheries Service
Habitat Conservation Division
4700 Avenue U
Galveston, Texas 77551-5997

Dear Mr. Swafford:

Enclosed please find a CD of the Draft Integrated Feasibility Report and Environmental Assessment (DIFR-EA) for the Brazos Island Harbor Channel Improvement Project, Cameron County, Texas. This draft report is provided for your agency review and concurrence of the evaluation of essential fish habitat (EFH) in accordance with the Magnuson-Stevens Fishery Conservation and Management Act. Sections 2.3.4 and 7.4.2 of the DIFR-EA provide information regarding the existing environment and potential EFH impacts, respectively.

The results of your review are requested by the end of the public comment period, January 7, 2013. I would appreciate your timely review of these documents. If you have any questions, please contact Ms. Janelle Stokes at the letterhead address, by telephone at 409-766-3039, or by email at Janelle.S.Stokes@usace.army.mil.

Sincerely,

Carolyn Murphy

Carolyn Murphy
Chief, Environmental Section

Enclosure

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

REPLY TO ATTENTION OF

December 2, 2013

Environmental Section

Edith Erfling
Field Supervisor
U.S. Fish and Wildlife Service
Clear Lake Ecological Services Field Office
17629 El Camino Real, Suite 211
Houston, Texas 77058

Dear Ms. Erfling:

Enclosed please find a CD of the Draft Integrated Feasibility Report and Environmental Assessment for the Brazos Island Harbor Channel Improvement Project, Cameron County, Texas. This draft report is provided for your agency in conformance with the National Environmental Policy Act.

The public comment period closes on January 7, 2014, and we would appreciate receipt of your comments by that date. If you have any questions, please contact Ms. Janelle Stokes at the letterhead address, by telephone at 409-766-3039, or by email at Janelle.S.Stokes@usace.army.mil.

Sincerely,

Carolyn Murphy

Carolyn Murphy
Chief, Environmental Section

Enclosure

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

December 2, 2013

Environmental Section

SUBJECT: Draft Environmental Assessment for Brazos Island Harbor Channel Improvement Project, Cameron County, Texas

Ms. Kate Zultner
Texas General Land Office
Coastal Management Program
P.O. Box 12873
Austin, Texas 78701-2873

Dear Ms. Zultner:

Enclosed please find a CD of the Draft Integrated Feasibility Report and Environmental Assessment for the Brazos Island Harbor Channel Improvement Project, Cameron County, Texas. This draft report is provided for your review of the Consistency Determination pursuant to §506.20, Consistency Determination for Federal Agency Activities and Development Projects of the Texas Coastal Management Program.

The public comment period closes on January 7, 2014, and we would appreciate receipt of your comments by that date. If you have any questions, please contact Ms. Janelle Stokes at the letterhead address, by telephone at 409-766-3039, or by email at Janelle.S.Stokes@usace.army.mil.

Sincerely,

Carolyn Murphy

Carolyn Murphy
Chief, Environmental Section

Enclosure

TEXAS GENERAL LAND OFFICE
JERRY PATTERSON, COMMISSIONER

March 10, 2014

Colonel Richard P. Pannell
District Commander
U.S. Army Corps of Engineers, Galveston District
P.O. Box 1229
Galveston, TX 77553-1229

Re: Consistency Determination for the Brazos Island Harbor Channel Improvement Project, Cameron County, Texas
CMP#: 14-1310-F2

Dear Colonel Pannell:

Pursuant to Title 31 Natural Resources and Conservation, Part 16 Coastal Coordination Council rules, the project referenced above has been reviewed for consistency with the Texas Coastal Management Program (CMP).

It has been determined that there are no significant unresolved consistency issues with respect to the project. Therefore, this project is consistent with the CMP goals and policies.

Please note that this letter does not authorize the use of Coastal Public Land. No work may be conducted or structures placed on State-owned land until you have obtained all necessary authorizations, including any required by the General Land Office and the U.S. Army Corps of Engineers.

If you have any questions or concerns, please contact me at (512) 475-3624 or at ray.newby@glo.texas.gov

Sincerely,

Ray Newby, P.G.
Coastal Geologist
Coastal Resources
Texas General Land Office

email cc: Janelle Stokes, USACE

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

December 2, 2013

Environmental Section

SUBJECT: Draft Environmental Assessment for Brazos Island Harbor Channel Improvement Project, Cameron County, Texas

Ms. Susana M. Hildebrande, P.E.
Air Quality Planning Section
Texas Commission on Environmental Quality
P.O. Box 13087, Mail Code 168
Austin, Texas 78711-3087

Dear Ms. Hildebrande:

Enclosed please find a CD of the Draft Integrated Feasibility Report and Environmental Assessment for the Brazos Island Harbor Channel Improvement Project, Cameron County, Texas. This draft report is provided for your agency review of projected air quality impacts of the Tentatively Selected Plan in accordance with the Clean Air Act and the National Environmental Policy Act.

The public comment period closes on January 7, 2014, and we would appreciate receipt of your comments by that date. If you have any questions, please contact Ms. Janelle Stokes at the letterhead address, by telephone at 409-766-3039, or by email at Janelle.S.Stokes@usace.army.mil.

Sincerely,

Carolyn Murphy

Carolyn Murphy
Chief, Environmental Section

Enclosure

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

December 2, 2013

Environmental Section

SUBJECT: Draft Environmental Assessment for Brazos Island Harbor Channel Improvement Project, Cameron County, Texas

Mr. Gregg Easely
Water Quality Team Leader
Texas Commission on Environmental Quality
P.O. Box 13087, Mail Code 150
Austin, Texas 78711-3087

Dear Mr. Easely:

Enclosed please find a CD of the Draft Integrated Feasibility Report and Environmental Assessment (DIFR-EA) for the Brazos Island Harbor Channel Improvement Project, Cameron County, Texas. This draft report is provided for your agency review under Section 401 of the Clean Water Act. The U.S. Army Corp of Engineers is requesting a §401 State Water Quality certification from Texas for this action. The §404(b)(1) Evaluation is provided in Appendix G of the DIFR-EA.

The public comment period closes on January 7, 2014, and we would appreciate receipt of your comments by that date. If you have any questions, please contact Ms. Janelle Stokes at the letterhead address, by telephone at 409-766-3039, or by email at Janelle.S.Stokes@usace.army.mil.

Sincerely,

Carolyn Murphy

Carolyn Murphy
Chief, Environmental Section

Enclosure

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Protecting Texas by Reducing and Preventing Pollution

January 21, 2014

Ms. Janelle Stokes
U.S. Army Corps of Engineers
Galveston District CESWG-PE-PR
P.O. Box 1229
Galveston, Texas 77553-1229

Re: Brazos Island Harbor Channel Improvement Project

Dear Ms. Stokes:

This letter is in response to the U.S. Army Corps of Engineers (Corps) December 2013 Draft Environmental Assessment (DEA) for the Brazos Island Harbor (BIH) Channel Improvement Project, which was provided to the Texas Commission on Environmental Quality (TCEQ) on December 2, 2013. The project is described in the Joint Public Notice issued on December 2, 2013. The channel improvement project is located in the Gulf of Mexico coast about three miles north of the United States-Mexico border and east of the City of Brownsville, in Cameron County, Texas.

As described in the Joint Public Notice, the Tentatively Selected Plan (TSP) would provide channel improvements to the BIH by deepening the existing authorized channel depth of 42-foot mean lower low water (MLLW) to 52 feet MLLW. The TSP would also extend the offshore portion of the channel 4,000 feet farther into the Gulf of Mexico. The proposed work would increase efficient movement of deep draft vessels and offshore oil rigs using the channel to access the Port of Brownsville. The TSP would generate approximately 14.1 million cubic yards (MCY) of new work dredged material from initial construction and approximately 61.7 MCY of maintenance dredged material over the 50 year period of analysis. The dredged material would be distributed among the existing New Work Ocean Dredged Material Disposal Site, a nearshore Feeder Berm, and existing upland, confined placement areas 2, 4A, 4B, 5A, 5B, 7 and 8.

The TCEQ has reviewed the DEA. Based on our evaluation of the information contained in these documents, the TCEQ certifies that there is reasonable assurance that the project will be conducted in a way that will not violate water quality standards.

No review of property rights, location of property lines, nor the distinction between public and private ownership has been made, and this certification may not be used in any way with regard to questions of ownership.

If you require additional information or further assistance, please contact Mr. John Trevino, Water Quality Assessment Section, Water Quality Division (MC-150), by email at John.Trevino@tceq.texas.gov, or by phone at (512) 239-4600.

Sincerely,

David W Galindo

David W. Galindo
Water Quality Division Director
Texas Commission on Environmental Quality

DWG/JT/gg

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

December 2, 2013

Environmental Section

SUBJECT: Draft Environmental Assessment for Brazos Island Harbor Channel Improvement Project, Cameron County, Texas

Ms. Rebecca Hensley
Texas Parks and Wildlife Department
1502 FM 517E
Dickinson, Texas 77539-8687

Dear Ms. Hensley:

Enclosed please find a CD of the Draft Integrated Feasibility Report and Environmental Assessment for the Brazos Island Harbor Channel Improvement Project, Cameron County, Texas. This draft report is provided for your agency's review in conformance with the National Environmental Policy Act.

The public comment period closes on January 7, 2014, and we would appreciate receipt of your comments by that date. If you have any questions, please contact Ms. Janelle Stokes at the letterhead address, by telephone at 409-766-3039, or by email at Janelle.S.Stokes@usace.army.mil.

Sincerely,

Carolyn Murphy

Carolyn Murphy
Chief, Environmental Section

Enclosure

CF:
Randy Blankinship
Texas Parks and Wildlife Department
95 Fish Hatchery Road
Brownsville, Texas 78520

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

November 21, 2013

Environmental Section

SUBJECT: Proposed Programmatic Agreement for the Brazos Island Harbor Channel Improvement Project.

Mr. Jimmy Arterberry
Tribal Historic Preservation Officer
Comanche Nation of Oklahoma
P.O. Box 908
Lawton, OK 73502

Dear Mr. Arterberry:

The U.S. Army Corps of Engineers (USACE) proposes to initiate a Programmatic Agreement (PA) pursuant to 36CFR800.14 (b) for the Brazos Island Harbor (BIH) Channel Improvement Project in Cameron County, Texas. Because effects on historic properties cannot be fully determined prior to approval of the undertaking, we find it necessary to initiate this PA to address the potential effects upon historic properties that may be discovered as a result of construction activities, and to address potential effects during operation and maintenance of the existing and proposed project. A Draft PA is enclosed for your review (Enclosure 1).

The purpose of the project is to improve navigation efficiency within the BIH Channel. As part of a feasibility study of the project, the USACE produced a Draft Integrated Feasibility Report - Environmental Assessment (DIFR-EA) and has conducted archival research and historic properties investigations in compliance with Section 106 of the National Historic Preservation Act. A CD copy of the DIFR-EA is provided with this letter for your review. The feasibility study produced a Tentatively Selected Plan (TSP) (the 52-foot deep by 250-foot wide project) that would include extending and deepening the offshore BIH Entrance Channel and deepening the BIH Jetty Channel and Main Channel. No widening of the existing channel widths is proposed. Dredged material would be placed in existing upland dredged material placement areas, a nearshore feeder berm and offshore dredged material disposal sites.

The Area of Potential Effects (APE) includes all areas to be directly affected by channel dredging and dredged material placement and subsequent maintenance activities. This includes the existing footprint of the BIH channel and the Entrance Channel extension to the proposed depths and the existing dredged material placement areas (New Work Offshore Dredged Material Disposal Sites (ODMDS), Maintenance ODMDS, Feeder Berm, and PAs 2, 4A, 4B, 5A, 5B, 7, and 8). A detailed description of the TSP and the APE is provided in the enclosed "Cultural Resources and Project Summary for the Programmatic Agreement" (Enclosure 2).

Six historic properties investigations have been conducted directly within the project area for both terrestrial and submerged resources. For the present undertaking, the USACE conducted a historic properties investigation of the BIH channel in 2012 and the results of this investigation were coordinated with the Texas State Historic Preservation Officer (SHPO). As a result of this recent investigation and the five previous investigations within the APE, the USACE determined, in consultation with the Texas

SHPO, that no historic properties will be affected by the proposed undertaking. Although, no historic properties have been identified within the APE, there is a potential for unanticipated discovery of cultural materials, particularly as a result of maintenance dredging. Unanticipated discoveries are covered by this PA and the perpetual curation of any cultural materials recovered during the course of construction or maintenance activities will be the responsibility of the Port of Brownsville.

We request your review and comment on the DIFR-EA and draft PA and welcome any comments or concerns you may have regarding the PA. The public comment period for the DIFR-EA report will end on January 7, 2014 and we will need all comments regarding the DIFR-EA or PA in by that date. Thank you for your cooperation in this review process. If you have any questions concerning this project or if we can be of further assistance, please contact John A. Campbell at 409-766-3878.

Sincerely,

Carolyn Murphy

Carolyn Murphy
Chief, Environmental Section

Enclosures

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

November 21, 2013

Environmental Section

SUBJECT: Proposed Programmatic Agreement for the Brazos Island Harbor Channel Improvement Project.

Amie Tah-Bone
Museum Director
Acting NAGPRA Representative
Kiowa Indian Tribe of Oklahoma
P.O. Box 369
Carnegie, OK 73015-0369

Dear Ms. Tah-Bone:

The U.S. Army Corps of Engineers (USACE) proposes to initiate a Programmatic Agreement (PA) pursuant to 36CFR800.14 (b) for the Brazos Island Harbor (BIH) Channel Improvement Project in Cameron County, Texas. Because effects on historic properties cannot be fully determined prior to approval of the undertaking, we find it necessary to initiate this PA to address the potential effects upon historic properties that may be discovered as a result of construction activities, and to address potential effects during operation and maintenance of the existing and proposed project. A Draft PA is enclosed for your review (Enclosure 1).

The purpose of the project is to improve navigation efficiency within the BIH Channel. As part of a feasibility study of the project, the USACE produced a Draft Integrated Feasibility Report - Environmental Assessment (DIFR-EA) and has conducted archival research and historic properties investigations in compliance with Section 106 of the National Historic Preservation Act. A CD copy of the DIFR-EA is provided with this letter for your review. The feasibility study produced a Tentatively Selected Plan (TSP) (the 52-foot deep by 250-foot wide project) that would include extending and deepening the offshore BIH Entrance Channel and deepening the BIH Jetty Channel and Main Channel. No widening of the existing channel widths is proposed. Dredged material would be placed in existing upland dredged material placement areas, a nearshore feeder berm and offshore dredged material disposal sites.

The Area of Potential Effects (APE) includes all areas to be directly affected by channel dredging and dredged material placement and subsequent maintenance activities. This includes the existing footprint of the BIH channel and the Entrance Channel extension to the proposed depths and the existing dredged material placement areas (New Work Offshore Dredged Material Disposal Sites (ODMDS), Maintenance ODMDS, Feeder Berm, and PAs 2, 4A, 4B, 5A, 5B, 7, and 8). A detailed description of the TSP and the APE is provided in the enclosed "Cultural Resources and Project Summary for the Programmatic Agreement" (Enclosure 2).

Six historic properties investigations have been conducted directly within the project area for both terrestrial and submerged resources. For the present undertaking, the USACE conducted a historic properties investigation of the BIH channel in 2012 and the results of this investigation were coordinated with the Texas State Historic Preservation Officer (SHPO). As a result of this recent investigation and the five previous investigations within the APE, the USACE determined, in consultation with the Texas SHPO, that no historic properties will be affected by the proposed undertaking. Although, no historic properties have been identified within the APE, there is a potential for unanticipated discovery of cultural materials, particularly as a result of maintenance dredging. Unanticipated discoveries are covered by this PA and the perpetual curation of any cultural materials recovered during the course of construction or maintenance activities will be the responsibility of the Port of Brownsville.

We request your review and comment on the DIFR-EA and draft PA and welcome any comments or concerns you may have regarding the PA. The public comment period for the DIFR-EA report will end on January 7, 2014 and we will need all comments regarding the DIFR-EA or PA in by that date. Thank you for your cooperation in this review process. If you have any questions concerning this project or if we can be of further assistance, please contact John A. Campbell at 409-766-3878.

Sincerely,

Carolyn Murphy

Carolyn Murphy
Chief, Environmental Section

Enclosures

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

November 21, 2013

Environmental Section

SUBJECT: Proposed Programmatic Agreement for the Brazos Island Harbor Channel Improvement Project.

Holly Houghton
Tribal Historic Preservation Officer
Mescalero Apache Tribe
P.O. Box 227
Mescalero, NM 88340

Dear Ms. Houghton:

The U.S. Army Corps of Engineers (USACE) proposes to initiate a Programmatic Agreement (PA) pursuant to 36CFR800.14 (b) for the Brazos Island Harbor (BIH) Channel Improvement Project in Cameron County, Texas. Because effects on historic properties cannot be fully determined prior to approval of the undertaking, we find it necessary to initiate this PA to address the potential effects upon historic properties that may be discovered as a result of construction activities, and to address potential effects during operation and maintenance of the existing and proposed project. A Draft PA is enclosed for your review (Enclosure 1).

The purpose of the project is to improve navigation efficiency within the BIH Channel. As part of a feasibility study of the project, the USACE produced a Draft Integrated Feasibility Report - Environmental Assessment (DIFR-EA) and has conducted archival research and historic properties investigations in compliance with Section 106 of the National Historic Preservation Act. A CD copy of the DIFR-EA is provided with this letter for your review. The feasibility study produced a Tentatively Selected Plan (TSP) (the 52-foot deep by 250-foot wide project) that would include extending and deepening the offshore BIH Entrance Channel and deepening the BIH Jetty Channel and Main Channel. No widening of the existing channel widths is proposed. Dredged material would be placed in existing upland dredged material placement areas, a nearshore feeder berm and offshore dredged material disposal sites.

The Area of Potential Effects (APE) includes all areas to be directly affected by channel dredging and dredged material placement and subsequent maintenance activities. This includes the existing footprint of the BIH channel and the Entrance Channel extension to the proposed depths and the existing dredged material placement areas (New Work Offshore Dredged Material Disposal Sites (ODMDS), Maintenance ODMDS, Feeder Berm, and PAs 2, 4A, 4B, 5A, 5B, 7, and 8). A detailed description of the TSP and the APE is provided in the enclosed "Cultural Resources and Project Summary for the Programmatic Agreement" (Enclosure 2).

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SHPO, that no historic properties will be affected by the proposed undertaking. Although, no historic properties have been identified within the APE, there is a potential for unanticipated discovery of cultural materials, particularly as a result of maintenance dredging. Unanticipated discoveries are covered by this PA and the perpetual curation of any cultural materials recovered during the course of construction or maintenance activities will be the responsibility of the Port of Brownsville.

We request your review and comment on the DIFR-EA and draft PA and welcome any comments or concerns you may have regarding the PA. The public comment period for the DIFR-EA report will end on January 7, 2014 and we will need all comments regarding the DIFR-EA or PA in by that date. Thank you for your cooperation in this review process. If you have any questions concerning this project or if we can be of further assistance, please contact John A. Campbell at 409-766-3878.

Sincerely,

Carolyn Murphy

Carolyn Murphy
Chief, Environmental Section

Enclosures

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

November 21, 2013

Environmental Section

SUBJECT: Proposed Programmatic Agreement for the Brazos Island Harbor Channel Improvement Project.

Miranda "Nax'ce" Allen
Tonkawa Tribe of Oklahoma
1 Rush Buffalo Road
Tonkawa, OK 74653

Dear Ms. Allen:

The U.S. Army Corps of Engineers (USACE) proposes to initiate a Programmatic Agreement (PA) pursuant to 36CFR800.14 (b) for the Brazos Island Harbor (BIH) Channel Improvement Project in Cameron County, Texas. Because effects on historic properties cannot be fully determined prior to approval of the undertaking, we find it necessary to initiate this PA to address the potential effects upon historic properties that may be discovered as a result of construction activities, and to address potential effects during operation and maintenance of the existing and proposed project. A Draft PA is enclosed for your review (Enclosure 1).

The purpose of the project is to improve navigation efficiency within the BIH Channel. As part of a feasibility study of the project, the USACE produced a Draft Integrated Feasibility Report - Environmental Assessment (DIFR-EA) and has conducted archival research and historic properties investigations in compliance with Section 106 of the National Historic Preservation Act. A CD copy of the DIFR-EA is provided with this letter for your review. The feasibility study produced a Tentatively Selected Plan (TSP) (the 52-foot deep by 250-foot wide project) that would include extending and deepening the offshore BIH Entrance Channel and deepening the BIH Jetty Channel and Main Channel. No widening of the existing channel widths is proposed. Dredged material would be placed in existing upland dredged material placement areas, a nearshore feeder berm and offshore dredged material disposal sites.

The Area of Potential Effects (APE) includes all areas to be directly affected by channel dredging and dredged material placement and subsequent maintenance activities. This includes the existing footprint of the BIH channel and the Entrance Channel extension to the proposed depths and the existing dredged material placement areas (New Work Offshore Dredged Material Disposal Sites (ODMDS), Maintenance ODMDS, Feeder Berm, and PAs 2, 4A, 4B, 5A, 5B, 7, and 8). A detailed description of the TSP and the APE is provided in the enclosed "Cultural Resources and Project Summary for the Programmatic Agreement" (Enclosure 2).

Six historic properties investigations have been conducted directly within the project area for both terrestrial and submerged resources. For the present undertaking, the USACE conducted a historic properties investigation of the BIH channel in 2012 and the results of this investigation were coordinated with the Texas State Historic Preservation Officer (SHPO). As a result of this recent investigation and the five previous investigations within the APE, the USACE determined, in consultation with the Texas SHPO, that no historic properties will be affected by the proposed undertaking. Although, no historic properties have been identified within the APE, there is a potential for unanticipated discovery of cultural materials, particularly as a result of maintenance dredging. Unanticipated discoveries are covered by this PA and the perpetual curation of any cultural materials recovered during the course of construction or maintenance activities will be the responsibility of the Port of Brownsville.

We request your review and comment on the DIFR-EA and draft PA and welcome any comments or concerns you may have regarding the PA. The public comment period for the DIFR-EA report will end on January 7, 2014 and we will need all comments regarding the DIFR-EA or PA in by that date. Thank you for your cooperation in this review process. If you have any questions concerning this project or if we can be of further assistance, please contact John A. Campbell at 409-766-3878.

Sincerely,

Carolyn Murphy

Carolyn Murphy
Chief, Environmental Section

Enclosures

Brazos Island Harbor, Texas Channel Improvement Project

Appendix F
Ocean Dredged Material Disposal Sites Evaluation Report

July 2014

APPENDIX F

OCEAN DREDGED MATERIAL DISPOSAL SITE ANALYSIS
BRAZOS ISLAND HARBOR
CHANNEL IMPROVEMENT PROJECT
CAMERON COUNTY, TEXAS

U.S. Army Corps of Engineers, Galveston District
2000 Fort Point Road
Galveston, Texas 77550

July 2014

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1.0 INTRODUCTION

The U.S. Army Corps of Engineers (USACE) and the Brownsville Navigation District (BND), the non-Federal sponsor, are examining the feasibility of proposed improvements to the existing Brazos Island Harbor (BIH) Navigation Channel. This site analysis report reviews possible environmental impacts associated with the use of Ocean Dredged Material Disposal Sites (ODMDS) designated by the U.S. Environmental Protection Agency (EPA) under Section 102 of the Marine Protection, Research, and Sanctuaries Act of 1972 (MPRSA) (EPA 1990; 1991; 2006).

The BIH Navigation Project is a deep-draft navigation channel located in Cameron County, Texas, approximately 3 miles from the Texas-Mexico border. Due to its close proximity to Mexico, the BIH not only serves coastal towns in the Lower Rio Grande Valley, like Brownsville and Port Isabel, but the waterway also serves communities in northeastern Mexico. It allows 42-foot-deep navigation on the inland portion of the channel and has a 44-foot-deep offshore Entrance Channel. The 17-mile-long Main Channel is generally straight without bridges or other obstructions; the entire channel, which also includes the Entrance and Jetty Channels, is 19.4 miles in length and is operated for one-way traffic only.

The tentatively selected plan (TSP) would deepen (and thus extend) the channel to 54 feet in the Entrance Channel and 52 feet in the Main Channel, while maintaining existing widths. The proposed plan of improvement for the TSP is called the 52-x-250-foot project. The deepening and 0.75-mile Entrance Channel Extension would require the opening of an existing ODMDS for new work (construction) material and additional maintenance material could be placed in the existing Maintenance ODMDS (EPA 1990, 1991, 2006). The period of use for both sites is indefinite. While the preferable placement site for material from a portion of the Main Channel (11+000 to 0+000), the Jetty Channel (0+000 to -6+000), the existing Entrance Channel (-6+000 to -13+000) and the Entrance Channel Extension (-13+000 to -17+000) would be the nearshore Feeder Berm, this site analysis assumes that TSP maintenance material from the Jetty and Entrance channels (-17+000 to 0+000) would be placed in the Maintenance ODMDS. This analysis, therefore, analyzes the greatest amount of material that would be placed at the site.

1.1 HISTORY AND DESCRIPTION OF EXISTING PROJECT

The Rivers and Harbors Acts (RHA) of 1880 and 1881 permitted deepening the natural channel through Brazos Santiago Pass to 10 feet, widening it to 70 feet, and constructing two parallel jetties at the pass. Construction of the south jetty began in 1882 and continued until 1884, when operations were suspended due to a lack of funds. The RHA of 1919 authorized enlarging the channel to 18 feet deep and 400 feet wide through the pass. Two short stone jetties were constructed and some channel dredging was performed.

In 1928, BND was created to govern the Port of Brownsville. As authorized in the RHA of 1930, jetties at the Brazos Santiago Pass were constructed in 1935 in conjunction with the construction of a navigation channel to Port Isabel. More channel improvements were completed in 1936 when the Main Channel to the Brownsville Turning Basin was dug through the Rio Grande deltaic plain to provide a navigation channel and turning basin for the City of Brownsville.

Several subsequent authorizations provided for progressive deepening and widening of the Brownsville channel, and other modifications, with the last project authorization in 1986 bringing it to the current authorized 42 feet deep by 300 feet wide project (USACE, 1988, 1990). The width of some portions of the Brownsville Ship Channel are less than the 300-foot authorized width, and some areas of the Turning Basin Extension are wider to provide for passing zones and safe navigation.

The existing waterway consists of the Entrance Channel in the Gulf of Mexico, Jetty Channel, Main Channel, Turning Basin Extension, and Turning Basin. The Entrance and Jetty channels extend from the east to west for approximately 2.5 miles, from the Gulf of Mexico, through the jetties to the Laguna Madre. The flared North and South Jetties are 6,330 feet long and 5,092 feet long, respectively. They lie 1,200 feet apart, flanking Brazos Santiago Pass, which connects the Gulf with the Laguna Madre. The Main Channel begins at the Laguna Madre and extends westward 17.0 miles to its terminus at the Brownsville Turning Basin. The majority of the inland portion (Main Channel) of the channel is 250 feet wide; however, sections of the Main Channel range from 325 to 400 feet in width (Figure 1 and Table 1).

Table 1: Dimensions of Existing BIH

Channel Reach Constructed Channel	Constructed Depth (feet)	Bottom Width (feet)	Length (miles)
Entrance Channel (Gulf of Mexico to offshore end of jetties)	44	300	1.3
Jetty Channel (Gulf of Mexico to Laguna Madre)	44	300_A	1.1
Main Channel (Laguna Madre to Turning Basin Extension)	42	250_B	15.1
Turning Basin Extension	Transitions from 42 to 36	Transitions from 400 to 325	1.3
Turning Basin	36	Transitions from 325 - 1,200	0.6

Note: A – includes 0.2-mile transition to 400-foot width to Main Channel
B – includes 0.4-mile transition from 400-foot width from Jetty Channel and 3.2-mile transition to 400-foot width to Turning Basin

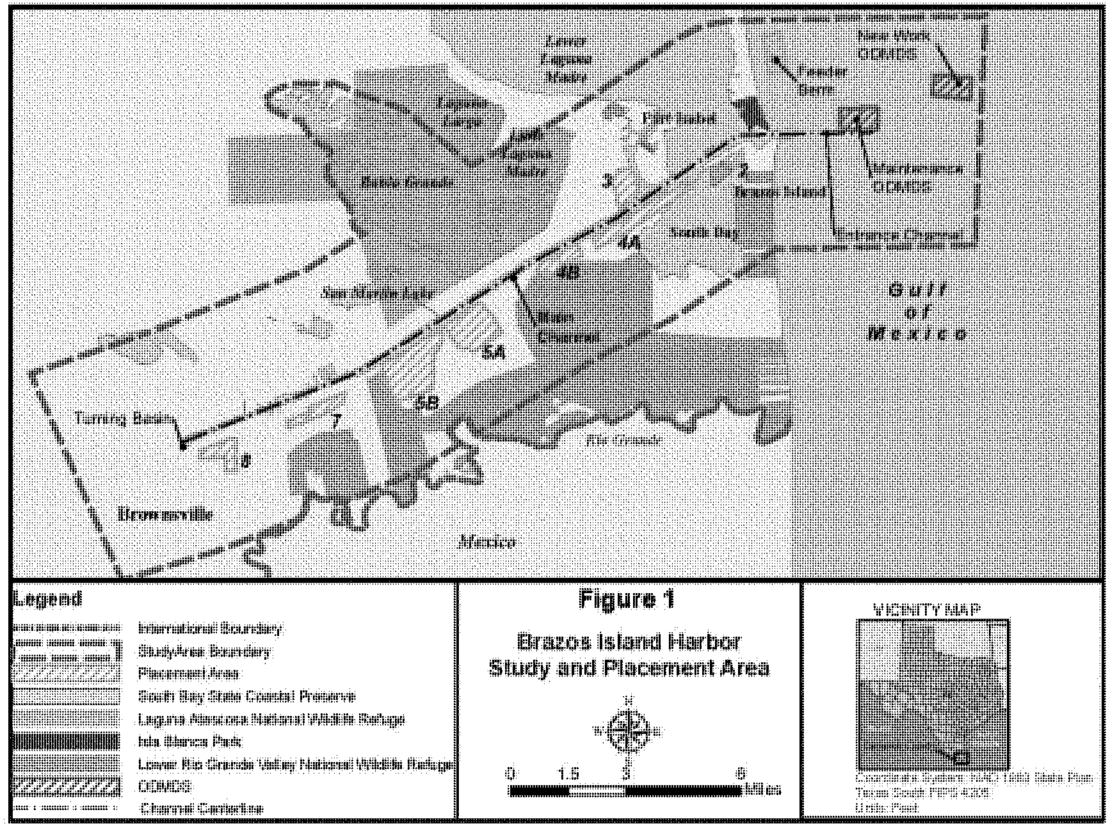

Figure 1. Brazos Island Harbor Study and Placement Areas

There are 10 placement areas (PAs) available for placement of dredged material from the BIH Project including two ODMDSs, one nearshore Feeder Berm, which can receive maintenance dredged material from the Entrance Channel, and seven upland, confined PAs for containment of material from the Main Channel (USACE, 1975, 1999). The ODMDSs and the nearshore Feeder Berm are all dispersive and therefore have unlimited capacity.

Offshore disposal of dredged material began prior to 1964 with records of disposal beginning that year (USACE, 1981). After 1964, 0.2 to 0.4 million cubic yards (mcy) per year of dredged material were placed at an interim disposal site where only minor accumulation of dredged material was observed.

1.2 PROPOSED BRAZOS ISLAND HARBOR CHANNEL IMPROVEMENT PROJECT

The Port of Brownsville is primarily a bulk commodity port for liquid and dry cargo handling. Commodity traffic increased to meet industrial needs in Mexico resulting from the North American Free Trade Agreement (NAFTA). Current and predicted future activities at the Port of Brownsville include:

- Construction and maintenance of offshore rigs,
- Ship repair and dismantling,
- Steel fabrication,
- Liquid petroleum gas storage and distribution,
- Bulk terminals for petroleum, chemical and miscellaneous liquid,
- Steel products and ore minerals offloading, and
- Grain handling and storage.

Navigation improvements in the BIH that could be facilitated by deepening and widening the channel include:

- Increased navigational efficiency of vessels using the channel, and
- Increased ability of the channel to accommodate offshore rigs for maintenance and repair as well as fabrication of new rigs.

One-way traffic limitations do not appear to be an issue with the existing channel and are not expected to become a concern in the future.

The feasibility study has resulted in the identification of the 52-x-250-foot alternative as the TSP. Proposed BIH channel improvements would:

- Extend the BIH Entrance Channel 0.75 mile farther east into the Gulf of Mexico (station -17+000 to -13+000) at a depth of 54 feet below mean lower low water (MLLW) and width of 300 feet;

- Deepen the existing BIH Entrance Channel from station -13+000 to -6+000 to 54 feet below MLLW at the existing width of 300 feet;
- Deepen the BIH Jetty Channel to 54 feet below MLLW from station -6+000 to -1+026 at the existing width of 300 feet, transitioning to the existing 400 feet width through station 0+000;
- Deepen the Brownsville Main Channel to a depth of 52 feet below MLLW at the existing 400-foot width from station 0+000 to 1+517, transitioning to the existing 250-foot width at station 2+329;
- Deepen 15.5 miles of the Brownsville Main Channel to 52 feet below MLLW at existing widths ranging from 250 to 400 feet from station 2+239 to station 84+200; and
- Maintain existing depths of 42 feet below MLLW and width of 325 feet from station 84+200 to 86+000, and 36 feet below MLLW and width ranging from 325 to 1200 feet from station 86+000 through the end of the channel and turning basin at station 89+500.

New work material from channel deepening would be distributed among the existing New Work ODMDS and PAs (Table 2). Under the first construction contract, a hopper dredge would deepen the Entrance and Jetty channels. The total length of these channels (after extension of the Entrance Channel) would be 3.2 miles. Although the authorized depth of the offshore channels would be 54 feet below MLLW, the potential dredging depth of the Entrance and Jetty channels could actually be 58 feet below MLLW, after accounting for removal of 2 feet of advance maintenance and 2 feet of allowable overdepth. One hopper dredge would operate continuously for seven months to remove approximately 2,066,000 cubic yards (CY) of new work material. All material would be placed at the existing New Work ODMDS (EPA, 1991) located approximately 4.4 miles from shore in 60 to 67 feet of water. The 350-acre New Work ODMDS could contain all new work material placed there during construction.

An estimated six subsequent contracts would be awarded for cutterhead suction dredging of the Brownsville Main Channel through station 84+200 for a total length of 15.9 miles. The remainder of the channel (the Turning Basin Extension and Turning Basin) would remain at existing depths. Although the authorized depth for the inland Main Channel would be 52 feet below MLLW, it could be deepened to 55 feet below MLLW, after removing 2 feet of advance maintenance and 1 foot of allowable overdepth. New work material from the Brownsville Main Channel (stations 0+000 through 84+200) would be pumped from the dredges into existing PAs managed by BND. In addition, new work material may be placed in PA 3, a PA managed by the San Benito Navigation District and generally used for Port Isabel Channel material. None of the existing PAs would need to be expanded and no new PAs would be needed.

Table 2: BIH Proposed Project - New Work Quantities

Channel Stations		Placement Area (PA)	Current PA Acreage	Deepening Dredged Material Quantity (CY)
-17+000	00+000	New Work ODMDS	350	2,066,000
00+000	07+000	2	71	937,000
07+000	25+000	4B	243	2,689,000
25+000	50+000	5A	704	3,612,000
50+000	70+000	5B	1020	2,599,000
70+000	82+000	7	257	1,804,000
82+000	89+500	8	288	386,000
			Total CY	14,093,000

Maintenance dredging would generally be conducted by hopper and cutterhead dredges, with material being distributed among the nearshore Feeder Berm or the existing Maintenance ODMDS, and PAs (Table 3). Dredging of the Entrance and Jetty channels and the first 11,000 feet of the Main Channel (+11+000 to -17+000) would generally be performed by a hopper dredge, and material would be placed in the nearshore Feeder Berm (Site 1A), located between 1.5 and 2.5 miles from the north jetty and from 0.4 to 0.9 mile from shore (USACE, 1988). Sediment removed by maintenance dredging would therefore be regularly placed back into the littoral system, available for cross-shore and longshore sediment transport to the beaches of South Padre Island. Monitoring of material placed at the Feeder Berm demonstrated it moves toward the beach and disperses with the major movement in the alongshore direction (Aidala et al., 1992). If the Feeder Berm cannot be used, maintenance material from the Entrance and Jetty channels (station -17+000 to 0+000) could be placed in the Maintenance ODMDS located approximately 1.9 statute miles from shore and just north of the navigation channel (USACE, 1975, 1999). The site analysis provided by this document evaluates the potential impacts of this use of the Maintenance ODMDS.

Maintenance material from the remainder of the Main Channel (stations 11+000 through 89+500) would be placed in existing PAs which are sized to accommodate total quantities over the 50-year period of analysis. Following completion of the proposed project, future maintenance of the Entrance Channel from -17.000 to +11.000 is expected to move 0.47 mcy of maintenance material every 1.5 years to the Feeder Berm, and an additional .16 mcy every 4.5 years. The existing Maintenance ODMDS designated by EPA for placement of maintenance material could continue to be used for placement of future maintenance dredged material from the Entrance Channels, only, provided EPA agrees the designation criteria are still being met. If the Maintenance ODMDS were to be used, material from the first 11,000 feet of the Main Channel would need to be placed in the Feeder Berm, as the site designation for the Maintenance ODMDS restricts its use to material from the Entrance Channel only. Table 3 illustrates the quantities that would be placed in the each of these sites should both be used, and assumes that 2.35 mcy would be placed every 5 years into the maintenance ODMDS. Subsequent to the modeling reported here, dredging cycles for the Entrance Channel were revised to 0.7 mcy every 1.5 years, with the 50 year total quantity remaining nearly the same. The revised placement cycle would place a much smaller amount of material into the Maintenance ODMDS at one time, and thus the modeled scenario represents a conservative analysis of the sizing analysis.

Table 3: BIH Proposed Project – O&M Quantities for ODMDSs

Stations		Shoaling Rate in Cubic Yards/ Year (CY/YR)	Placement Area	Dredge Cycle (years)	Number of Cycles in 50 years	Quantity per Cycle (CY/Cycle)	Total O&M Quantity in 50 Years (CY)
-17+000	0+00	470,630	Maintenance ODMDS	5	10	2,353,150	23,531,500
0+00	11+000	161,595	Nearshore Feeder Berm Site 1A	3	16	484,785	7,756,600

1.2.1 Project Purpose and Need

The Port of Brownsville has experienced strong growth from the mid-1990s to present. Total tonnage on BIH has more than doubled from 1,829,000 short tons in 1992 to 4,617,000 short tons in 2010. Foreign imports, including petroleum products, iron, and steel products, have been the primary area of growth. In addition to traditional vessel traffic, increased channel dimensions are needed to serve offshore rigs operating along the U.S. Gulf Coast. Keppel-AmFELS is an example of one company fabricating, maintaining, and repairing rigs on the BIH. Several oil companies have leased Outer Continental Shelf (OCS) blocks in part because of their proximity to services available from the BIH. The operational draft of the newer rigs ranges from 45 to 63 feet.

Current dimensions of BIH limit the ability of shipyard repair operations to bring in these newer, larger oil rigs. Based on recent economic evaluations, up to 5,000 jobs are attributed to these operations. Without channel improvements, oil rig repair operations and jobs would likely be relocated to Mexico. Lack of channel modifications to the BIH would discourage long-range industrial growth and eventually reduce the volume of imports and exports at the Port of Brownsville. A gradual loss of economic operating efficiency of the port would impact the economy in South Texas and the nation.

Dredged maintenance material can be beneficially used to decrease shoreline erosion and nourish beaches. Maintenance material from certain reaches of the channel is appropriate for placement in an existing underwater Feeder Berm located offshore of South Padre Island. Sandy material deposited in this nearshore berm is transported by cross-shore currents to the shoreline of South Padre Island and along the beaches fronting the City of South Padre Island. These beaches provide nesting habitat for sea turtles and are important economic and recreational resources for the City of South Padre Island and Cameron County. No opportunities to beneficially utilize new work material have been identified in the study area.

1.2.2 Project Alternatives

The final array of alternatives consisted of a no action alternative, and three action alternatives: no widening; 50-foot widening; and 100-foot widening. Four depth scales were also evaluated for each action alternative - 45, 48, 50, and 52 feet MLLW. USACE must consider the "No Action" alternative as one option in order to comply with ER 1105-2-100 and National Environmental Policy Act (NEPA) requirements. The "No Action" or Future Without Project (FWOP) alternative would retain the existing 42-foot deep by mostly 250-foot wide BIH along the waterway and continue one-way traffic operations. It assumes no project would be implemented to achieve planning objectives. The FWOP alternative is a baseline against which benefits and impacts of action alternatives may be measured and is required by NEPA to be included among the alternative plans in the final array of alternatives.

For the final array of alternatives, three width alternatives, including no widening, widening by 50 feet, and widening by 100 feet, were screened with a variety of depth options. Alternatives included:

- F-1a Deepen (only) entire existing channel to 45 feet;
- F-1b Deepen (only) entire existing channel to 48 feet;
- F-1c Deepen (only) entire existing channel to 50 feet;
- F-1d Deepen (only) entire existing channel 52 feet;
- F-2a Deepen existing channel to 45-foot and widen channel by 50 feet;
- F-2b Deepen existing channel to 48-foot and widen channel by 50 feet;
- F-2c Deepen existing channel to 50-foot and widen channel by 50 feet;
- F-2d Deepen existing channel to 52-foot and widen channel by 50 feet;
- F-3a Deepen existing channel to 45-foot and widen channel by 100 feet;
- F-3b Deepen existing channel to 48-foot and widen channel by 100 feet;
- F-3c Deepen existing channel to 50-foot and widen channel by 100 feet;
- F-3 Deepen existing channel to 52-foot and widen channel by 100 feet; and
- F-4 No Action alternative.

For the final array of alternatives, all channel depth alternatives are economically justified at either the current 250-foot or the 300-foot width alternative, but not at the 350-foot width alternative. Oil rigs contribute most to economic benefits because they are the largest vessels that would use the channel. Deepening alternatives with no widening have the greatest benefit-to-cost ratios and net excess benefits compare to those with any widening. In comparing the deepening-only alternatives, net excess benefits increase as channel depths increase.

1.3 ODMDS AUTHORIZATION

MPRSA and the Federal Water Pollution Control Act (FWPCA), later amended by the Clean Water Act of 1977, both passed in 1972 and specifically addressed waste disposal in the aquatic and the marine environment. The FWPCA and the Water Quality Improvement Act of 1970 set up specific water-quality criteria as guidelines for controlling discharges into marine and aquatic environments. These water-quality criteria applied to placement of dredged material only in cases where fixed pipelines were used to transport and discharge dredged material into the environment at discrete points. The MPRSA, however, specifically regulates the transport and ultimate disposal of waste materials in the ocean. Under Title I of the MPRSA, the primary regulatory vehicle of the Act, a permit program for the disposal of dredged and nondredged materials, required determination of impacts and provided for enforcement of permit conditions.

The August 1975 London Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter is the principal international agreement governing ocean dumping. The Convention requires contracting nations to regulate disposal in the marine environment within their jurisdiction and disallows all disposal without permits. It also requires the nature and quantities of all waste material and circumstances of disposal to be periodically reported to the International Maritime Organization which administers the Convention.

In October 1973, EPA issued the final Ocean Dumping Regulations and Criteria (the Regulations or Ocean Dumping Regulations) revised in January 1977 (40 CFR Parts 220 to 229). These regulations established procedures and criteria for review of ocean disposal permit applications (Part 227); assessment of impacts of ocean disposal and alternative disposal methods; enforcement of permits; and designation and management of ocean disposal sites (Part 228). They also established procedures EPA uses to designate ODMDSs, set times for ocean disposal of acceptable materials under Section 102(c) of the MPRSA, and identify criteria for site designation, including general and specific criteria for site selection.

EPA is authorized by Congress as stated specifically in 40 CFR 228.4(e)(1) to regulate ocean dumping through site designation, monitoring, and management. Site designation by EPA does not authorize any dredging project nor does it permit disposal of any dredged material. Sites are designated where ocean disposal is needed based on past dredging demands and projected demands associated with new or expanded projects. However, site designation does not preclude consideration of other placement options, including beneficial use options or the "No Action" alternative. Once an approved ocean disposal site is designated, appropriateness of ocean disposal at the site is determined on a case-by-case basis in accordance with ocean dumping criteria.

Although EPA designates ocean dumping sites necessary for construction and maintenance of a proposed improvement project according to Section 102 of the MPRSA, the USACE may, with concurrence of EPA, authorize a site in accordance with MPRSA 103(b).

For the purpose of the proposed BIH project, the USACE seeks concurrence from EPA to place the new work material dredged from the Entrance Channel within the existing New Work ODMDS and to continue to place future maintenance dredged material in the beneficial use feeder berm and the existing Maintenance ODMDS. Dredged material placement would be implemented by the USACE under authority of MPRSA Section 103, provided EPA concurs that Section 102 (MPRSA) requirements to evaluate criteria and the site continue to be met.

The existing designated Maintenance ODMDS is bounded by:

26° 04′ 32″ N, 97° 07′ 26″ W (northwest corner);
26° 04′ 32″ N, 97° 06′ 30″ W (northeast corner);
26° 04′ 02″ N, 97° 06′ 30″ W (southeast corner); and
26° 04′ 02″ N, 97° 07′ 26″ W (southwest corner).

Water depth is about 44 feet and the site is 1.9 miles from shore at its closest point (Figure 2). The site covers 0.56 square statute mile. Depths may exceed 44 feet in this area, however, the conservative shallower depth of 44 feet was used for this analysis and modeling purposes.

The existing designated New Work ODMDS, designated for the construction material from the 42-foot Project in 1991, is bounded by:

26° 05′ 16″ N, 97° 05′ 04″ W (northwest corner);
26° 05′ 10″ N, 97° 04′ 06″ W (northeast corner);
26° 04′ 42″ N, 97° 04′ 09″ W (southeast corner): and
26° 04′ 47″ N, 97° 05′ 07″ W (southwest corner).

Water depth ranges from 60 to 67 feet, and the site is 4.4 miles from shore at its closest point (Figure 2). The area of the site is 0.56 square statute mile. Depths may exceed 67 feet in this area but, for the reasons noted above, the shallower depths of 60–67 feet were used for this analysis.

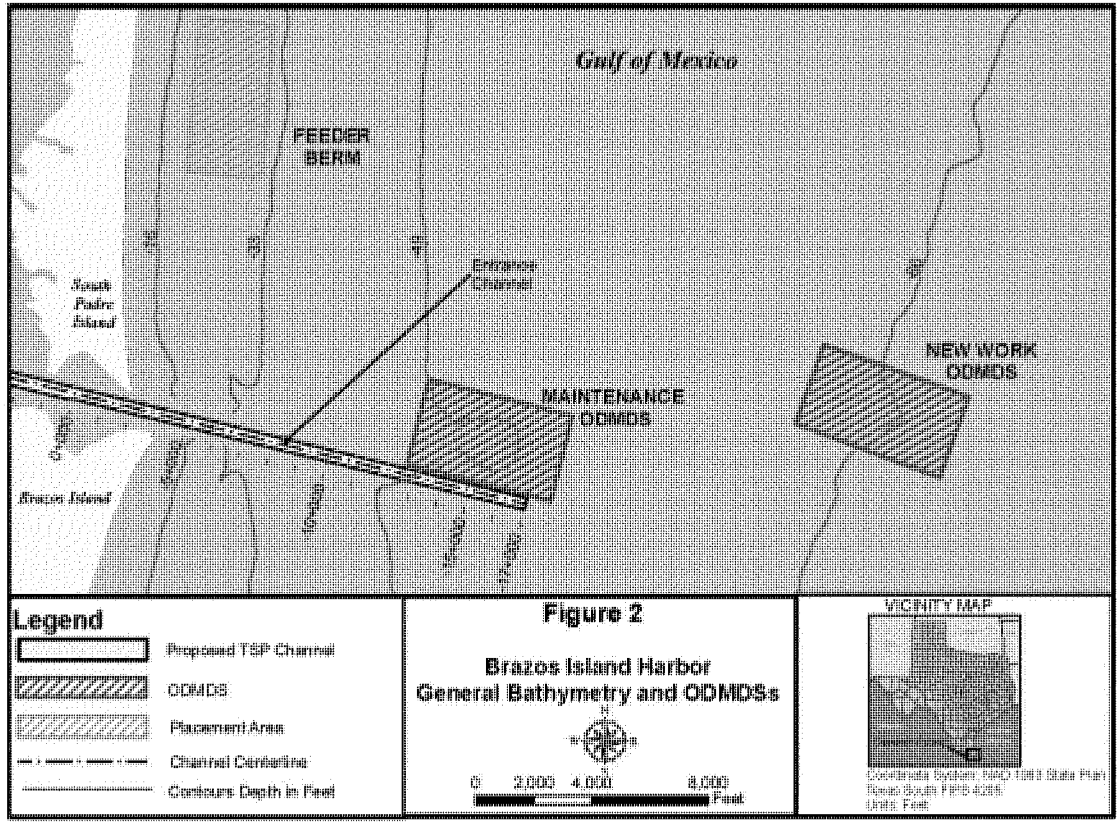

Figure 2, General Bathymetry and ODMDSs.

1.3.1 ODMDS Authorization Purpose and Need

Predominantly northward, longshore transport causes shoaling of the existing Jetty and Entrance channel. Periodic removal of the sediment, primarily sand, which enters the existing channel, is required for continued navigation along the channel. Placing dredged material offshore under the authority of MPRSA Section 103(b) is environmentally acceptable and economically and physically feasible for disposal of new construction dredged material generated from deepening the BIH Jetty and Entrance channels. It is also appropriate for placement of future maintenance material from those channels.

A Maintenance ODMDS was used prior to 1964; however, records are not available indicating use of the site prior to that year. Proposed use of the site in accordance with the MPRSA of 1972 was approved by EPA in 1975 with additional conditions intended to protect water quality during dredging and disposal (USACE, 1975). EPA's Ocean Dumping Regulations revised in January 1977 authorized EPA to designate all existing ODMDSs as interim sites. The BIH Maintenance ODMDS was designated as an interim site at that time (EPA, 1990). The Maintenance ODMDS was designated by EPA in 1990 for the continued placement of dredged maintenance material removed from the BIH Jetty and Entrance channels (EPA, 1990). Based on information provided by the USACE, Table 4 provides dredging dates and volumes dredged from the BIH Jetty and Entrance channels from 1958 through 2012. For that period, the average time between the beginning of each dredging operation was approximately 17 months, and the average amount of maintenance material dredged was approximately 0.37 mcy or 0.25 mcy per year. This did not mean the entire Entrance and Jetty channels were dredged every 17 months but it indicates the average frequency of maintenance dredging.

Table 4: Maintenance Dredging History for Entrance and Jetty Channels

Start	Completed	Quantity Dredged (CY)
26-May-58	30-Jun-58	355,901
14-Jun-59	12-Jul-59	344,300
5-Jun-60	25-Jun-60	253,000
29-May-61	19-Jun-61	244,073
28-May-62	18-Jun-62	208,428
16-Apr-63	28-Apr-63	175,528
10-Feb-65	28-Feb-65	112,089
3-Oct-65	24-Nov-67	337,870
18-Apr-66	8-May-66	247,903
14-Jun-68	30-Jun-68	228,103
6-Aug-68	17-Aug-68	167,520
4-Jul-69	31-Jul-69	217,940
27-Jul-70	30-Aug-70	341,593
9-Aug-71	19-Sep-71	394,387

Start	Completed	Quantity Dredged (CY)
5-Jun-72	17-Jul-72	616,500
14-Jun-73	16-Jul-73	502,451
1-Jul-74	31-Aug-74	160,361
26-Mar-75	9-Apr-75	303,438
1-Jun-76	30-Jun-76	156,366
26-Mar-77	19-Apr-77	360,061
22-Nov-77	13-Mar-78	761,523
25-Oct-81	16-Feb-82	1,016,000
2-Aug-83	8-Sep-83	886,343
4-Apr-86	14-May-86	333,692
30-Nov-88	16-Jan-89	731,545
21-Mar-91	21-Apr-91	576,931
24-Jan-95	26-Feb-95	755,307
30-Mar-97	14-Jun-97	350,907
31-Jan-99	3-Mar-99	186,571
10-Mar-02	20-Mar-02	207,338
13-Dec-02	19-Dec-02	121,549
1-Dec-03	18-Dec-03	355,957
23-Feb-06	11-Mar-06	332,721
20-Feb-07	15-Mar-07	443,000
*	10-Mar-10	237,000
4-Feb-11	17-Mar-11	200,000
*	9-Dec-12	347,000
Total		13,571,196
Average		366,789

* Start date not available

In order to meet future navigational requirements of the BIH, it has been determined the BIH should be deepened. Deepening the channel would require dredging virgin sediment underlying the layer of sand on the ocean bottom. This virgin sediment is predominantly clay.

During consideration of the project, which deepened the Entrance and Jetty channels to 44 feet, EPA decided disposal of virgin material at the Maintenance ODMDS was not appropriate because the virgin material is more than 80 percent clay and silt while sediment at the Maintenance ODMDS is over 60 percent sand. A Final Environmental Impact Statement (FEIS) for use of the 42-foot project New Work ODMDS for 1.33 mcy of new construction material dredged from the BIH was prepared by EPA

(1991) under the authority of MPRSA Section 103(b). This authorization was for a one-time disposal of virgin material.

1.3.2 ODMDS Authorization Alternatives

EPA (1991) examined a suite of alternatives for the location of the New Work ODMDS and the Maintenance ODMDS (EPA, 1990, 1991). These included the "No Action" Alternative, upland placement, beneficial use, and offshore disposal. The offshore alternatives included disposal at mid-continental shelf, continental slope, and nearshore sites, including at the interim-designated, historically used ODMDS. The alternative analysis concluded the only feasible alternatives were nearshore disposal, and the most appropriate sites were selected by eliminating locations near beaches and recreational areas, cultural and historical areas, and living and nonliving resources, including sensitive biota. The BIH New Work and Maintenance ODMDSs were determined appropriate for virgin dredged material and maintenance material, respectively, from the BIH Entrance and Jetty channels.

2.0 PROPOSED USE OF THE ODMDSs

The New Work ODMDS can accommodate a one-time disposal of 2.066 mcy of virgin material that would be dredged from the Jetty and Entrance channels for the preferred deepening alternative. The proposed use of the existing Maintenance ODMDS is for future maintenance material. Maintenance material would be placed in the Feeder Berm off the South Padre Island beach whenever possible and appropriate. If maintenance material could not be placed in the Feeder Berm, all maintenance material from the Entrance and Jetty channels would be placed in the Maintenance ODMDS.

3.0 CHARACTERIZATION OF THE ODMDSs

Sediment, water, and biota were sampled in 1980 in the Entrance Channel and the proposed ODMDS (Espey, Huston & Associates, Inc., 1981). Analyses for 11 organic pesticides and total PCBs were conducted in water and sediment, but none were present at detectable concentrations. Water and sediment were also tested for arsenic, cadmium, total chromium, copper, lead, mercury, nickel, and zinc. Mercury was not detected in water samples. Sediments were 66 to 74 percent fine sand.

TerEco (1980) sampled water and sediment for selected metals, pesticides, and PCBs at three sites in the Entrance and Jetty channel and at a proposed ODMDS and concluded there were no apparent water quality problems. Toxicity of the suspended particulate phase (SPP) was tested with *Acartia tonsa* (copepod), *Palaemonetes pugio* (grass shrimp), and *Cyprinodon variegatus* (sheepshead minnow). The SPP is sometimes referred to as "elutriate" and SPP analysis identifies substances which might move into the water column during dredging and open-water placement. Sediment toxicity was tested with *Mercenaria mercenaria* (quahog clam), *Nereis succinea* (polychaete), and *P. pugio*. TerEco (1980) found no difference in survival between test sediments and SPP and those from a reference location.

A similar study was conducted in 1985 (Espey, Huston & Associates, Inc., 1985). Three Entrance Channel locations were sampled and the same organisms were used for toxicity bioassays with the exception that the mysid shrimp, *Americamysis bahia*, was tested in the SPP instead of *A. tonsa*, and the polychaete, *Nereis virens*, was tested in the sediment instead of *N. succinea*. Most metals for which analyses were conducted in water were below detectable levels. Arsenic and copper were above detectable levels. Arsenic, chromium, copper, lead, nickel, and zinc were detected in sediment samples. All seven synthetic organic pesticides and total PCBs for which testing was conducted were below detectable levels in water and sediment. Sand dominated grain size analysis.

In December 1990, 1994, and 2000, sites in the Entrance and Jetty Channel were sampled for metals and organic compounds in water, SPP, and sediments. None of the analytes were found in 1990 water or SPP samples. Chromium and zinc were detected in sediment samples. Three sites in the Entrance and Jetty Channel and in Feeder Berm (PA 1A) were sampled in 1994. The only metals detected in water and SPP samples were barium and chromium. Barium, chromium, copper, lead, nickel, and zinc were found in sediments. Arsenic, barium, chromium, copper, and zinc were detected in year 2000 water and SPP samples. These metals and cadmium, lead, and selenium were detected in sediments in 2000. None of the organic compounds were found in water, sediment, or SPP samples in the three studies. Sediment grain size analysis showed sand made up from 41 to 97 percent of the sediments in the Feeder Berm. These data were provided by the USACE as raw data to Atkins in 2011.

In February 1998, 10 locations in the Main Channel were sampled for water, SPP, and sediment. Arsenic, barium, chromium, and zinc were the only metals detected in water and SPP samples. In addition to those metals, cadmium, copper, lead, and nickel were also found in sediment samples. None of the organic compounds were detected in water, SPP, or sediment. In 1998, no substances were found at concentrations above EPA acute marine Water Quality Criteria (WQC). Fifty-six to 86 percent of the sediment was sand. These data were provided by the USACE as raw data to Atkins in 2011.

In 1998 (Espey, Huston & Associates, Inc., 1998), water, SPP, and sediment samples were tested along with sediment toxicity at three Entrance Channel locations. Sediment toxicity was tested on the amphipod, *Ampelisca abdita*, and the grass shrimp, *P. pugio* but SPP toxicity was not tested. Toxicity bioassays results indicated no significant toxic effect from sediments or the SPP.

Water and sediment samples were collected in some years between 2002 and 2011 from the Entrance and Jetty channels and the Maintenance ODMDS. Sample data were compared to (1) effects range low (ERLs), obtained from NOAA (Buchman, 2008) for sediment, (2) EPA acute WQC for the protection of aquatic life (EPA, 2011), and (3) Texas acute surface water quality standards (WQS) (Texas Commission on Environmental Quality [TCEQ], 2011) and screening values for sediment (TCEQ, 2010). Thirteen different metals were detected in water samples however none exceeded WQC or screening values.

The only pesticides detected were endrin aldehyde, endrin ketone, and heptachlor epoxide and none of these compounds were detected in samples after 2002. WQC and WQS have not been established for endrin aldehyde (found in all SPP samples and a water sample in 2002) or endrin ketone (found in three water samples and one SPP sample in 2002). Heptachlor epoxide was found in four water samples and two SPP samples in 2002, and all but one value were higher than the WQC for dissolved heptachlor epoxide of 0.053 μg/l. PCBs were not detected.

The only semivolatile organic compound detected in samples collected after 2002 was bis(2-ethylhexyl)phthalate, which was measured in one 2006 SPP sample. Six other semivolatile organic compounds were detected in 2002 samples including diethyl phthalate, di-n-butyl phthalate, phenol, butyl benzyl phthalate, dimethyl phthalate, and n-nitrosodimethylamine. Concentrations in SPP samples were generally higher than water sample concentrations collected at the same site. There are no WQC or WQS for these semivolatile organic compounds.

Ammonia was detected in all SPP samples and six water samples. Ammonia toxicity to aquatic life increases with increasing temperature and pH. Compared to the recommended chronic criteria for marine life (EPA, 1999), ammonia toxicity is not expected at the concentrations measured which are less than or equal to 2.8 milligrams per liter (mg/L). Cyanide was not detected in any water samples at or above 0.10 μg/l. The WQC for cyanide is 1 μg/l (as free cyanide) and therefore no samples contained cyanide at potentially toxic levels.

There are no sediment quality criteria with which to compare concentrations in sediments; however, several different guidelines are used to identify possible levels of concern. One of these guidelines is the effects range low (ERL), which has been used in the past to examine sediments destined for beneficial use or ocean disposal in the Gulf. ERLs were developed by assembling a large group of sediment data for which there was both sediment chemistry and toxicity data. For each chemical in the data set, concentrations were ranked in ascending order, and the ERL was calculated as the lower 10th percentile of the concentrations. However, this approach demonstrates no cause and effect from the chemicals in the data set since the fact that a chemical was detected does not demonstrate it was responsible for any of the toxicity exhibited by the sediment.

When ERLs derived from sets of data from different areas are compared, the results are inconsistent (USACE, 1998). For example, when the ERLs of a number of chemicals were compared using a northern California data set versus a southern California data set, the ERLs differed by a factor of three for total polychlorinated biphenyls (PCBs) to a factor of 2,689 for p,p'dichlorodiphenyldichloroethylene, a breakdown product of the pesticide DDT (DDE). Since the ERLs are not based on cause and effect data, they exhibit low predictive ability and give a high number of false positives (USACE, 1998). Also used, on occasion, is the Effects Range Medium (ERM), similar to the ERLs but representing the median range of concentrations, and thus, higher concentrations. The NOAA screening criteria used here represent ERL values (Buchman, 2008) while the TCEQ sediment screening levels use primarily ERMs (TCEQ, 2010).

Pesticides and PCBs were not detected in any of the sediment samples. The only semivolatile organic compound detected in sediments was di-n-butylphthalate found in a 2002 sediment sample. There are no screening criteria for this compound in marine sediments. All metals were detected in at least one or more sediment samples; however, no values exceeded their respective ERLs. Arsenic, beryllium, chromium, copper, lead, nickel, and zinc were detected in all samples while mercury was only detected in one sample. Sediments in the Entrance Channel are dominated by sand which is two-thirds of the sediment followed by silt, averaging slightly less than 20 percent of the sediment.

4.0 CHARACTERIZATION OF THE MATERIAL EXPECTED TO BE DREDGED

In June 2012, the USACE's Galveston District awarded Task Order 0011 of Contract No. W912HY-11-D-0003. The Task Order required testing of maintenance material from the BIH Entrance Channel. The purpose was to determine potential environmental impact from the dredging and/or placement of material to be dredged from the Entrance Channel. Sediments characteristic of typical maintenance material that would be dredged, new work material, and sediments in the both ODMDSs were sampled. The results of this draft study (SOL and Atkins, 2013) are summarized here.

Values did not exceed any acute Texas Water Quality Standards (TWQS), EPA acute WQC, or Criteria Maximum Concentrations (CMC) for the channel stations, except for cyanide at all channel and PA stations. Based on the Regional Implementation Agreement (RIA), analyses were for total cyanide, while the CMC and TWQS are for free cyanide because only free cyanide is considered to be a biologically meaningful expression of cyanide toxicity (Eisler, 1991). The relationship between total cyanide and free cyanide in natural waters varies with water quality, types of cyanide compounds present, degree of exposure to daylight, and presence of other chemical compounds. Comparing total cyanide values to free cyanide benchmarks is a very conservative approach and even if all of the cyanide were present as free cyanide, the TWQS would not be exceeded. Given the low levels present, the oxygenated (dissolved oxygen above 5 mg/L) and high electrolyte marine environment, and lack of industrial sources, the detection of total cyanide is not considered significant (Cheryl Montgomery, personal communication, 2013).

SPP samples were prepared from test sediment and channel water for chemical analysis. There were no results exceeding acute TWQS or CMC for the channel stations, with the exception of total cyanide for the CMC at all channel and PA stations. Total cyanide concentrations in the SPP samples were equivalent to those is the water samples. As with the water analysis, detection of total cyanide in SPP samples is not considered a significant indication of risk from cyanide.

Concentrations of antimony, arsenic, nickel, selenium, and ammonia were higher in SPP samples than in ambient water. These increases are not considered significant from a risk perspective since none of the SPP concentrations exceeded acute TWQS or CMC.

ODMDS stations had high sand concentrations and relatively low metals concentrations. All organic compounds except total organic carbon (TOC) were below detection limits. No significant differences were noted between channel, ODMDS, and reference stations for ammonia, TOC, phthalates, or total solids.

Several tests were conducted to determine the possible toxicity and bioaccumulation potential of contaminants in water and sediment samples. The SPP survival bioassays indicated no toxicity to sensitive marine organisms is expected during dredging and/or placement. Survival data from the solid phase bioassay indicated no potential environmentally unacceptable toxic impacts to benthic organisms from the placement of sediments from the BIH Entrance and Jetty channels. In bioaccumulation tests, no organic chemicals were found above detection limits in test organisms, except for two phthalate esters and a few isolated instances of polyaromatic hydrocarbons (PAHs) and other organic compounds. Arsenic, total chromium, copper, lead, mercury, nickel, selenium, silver, and zinc were found in polychaete tissue samples above detection limits. Nickel and copper bioaccumulated in test organisms, however concentrations were not considered significant from an ecological or human health perspective.

4.1 PARTICLE SIZE OF MATERIAL

Maintenance material from the Entrance Channel is predominantly sand, averaging 62 percent sand for samples collected in 2012 (Table 5). New work material is expected to be dominated by clay, making up 84 percent of virgin material.

Table 5: Sediment Grain Size for Maintenance and New Work Material. Samples collected August 2012 (SOL and Atkins, 2013).

	Maintenance Material				New Work
Percent	Minimum	Maximum	Average	Sample Size	Material
Gravel	0	55.1	12.6	4	0
Sand	41.5	81.7	61.6	4	11.2
Silt	0.8	16.9	7.6	4	4.7
Clay	2.6	28.5	18.2	4	84.1
D50	0.111	5.752	1.258	4	<0.0011

5.0 MODELING OF DREDGED MATERIAL DISTRIBUTION

The placement of dredged material was simulated using an updated version (Multiple Dump Fate [MDFATE]; USACE/EPA, 1991) of a 1976 model, Dredged Material Fate (DMF), developed for the USACE through the Dredged Material Research Program by Tetra Tech., Inc. (Brandsma and Divoky, 1976). Modeling was done to determine whether the New Work ODMDS and the Maintenance ODMDS were large enough to contain the new work and future maintenance dredged material.

This program models the behavior of dredged material placed at the ODMDS through the doors of a hopper dredge. The MDFATE model assumes this procedure may be broken into three phases: (1) convective descent, during which the discharge of dredged material falls under the influence of gravity; (2) dynamic collapse, occurring when the descending dredged material impacts the bottom or arrives at a level of neutral buoyancy, at which point the descent is retarded and horizontal spreading dominates; and (3) long-term passive dispersion, beginning when material transport and spreading are determined more by ambient currents and turbulence than by dynamics of the disposal operation (Johnson and Holliday, 1978). The model also includes the settling of suspended solids.

The model was run for the size of hopper dredge expected to be used for this project, a 3,818-CY hopper dredge for New Work and 3,316-CY hopper dredge for maintenance work (28.0-foot loaded draft, 15.0-foot light draft, 1.9 knots during discharge, 2.58 minutes to empty hoppers). Model runs were made for both ODMDSs. A 0.059 knot to the north current was used.

5.1 NEW WORK MATERIAL

Based on recent sampling, the percentage of the various soil particle types used in the model for new work sediment to be dredged is to be 0.0 percent gravel, 15.8 percent sand, 9.9 percent silt, and 74.3 percent clay. Output from the MDFATE model simulates the results of randomly depositing the entire amount of dredged material on the ocean floor at predetermined grid points. For a dredged material volume of 2.066 mcy, MDFATE simulated the mound height at its highest peak within the New Work ODMDS as 14.3 feet. As can be seen in Attachment A, all new work material should remain within the boundaries of the New Work ODMDS boundaries and consequently there should not be adverse impacts to the benthic community outside of the ODMDS boundaries (EPA/USACE, 1996). Given the upslope ambient depth at the site is 60 feet, there should not be any interference to navigation associated with formation of the new work dredged material disposal mound. It has been safely assumed that the maximum disposal mound height within the New Work ODMDS will not exceed 14.3 feet, nor will the material build up more than 0.5 foot outside the boundaries of the ODMDS within the first month after placement of all material.

5.2 MAINTENANCE MATERIAL

The MDFATE model program was also run on the maintenance material using a 3,316-CY hopper dredge. The percentages of grain sizes expected in maintenance material to be dredged from the extended Entrance and Jetty channels and used in the MDFATE model are 68.3 percent sand, 21.3 percent silt, and 10.4 percent clay using analyses of maintenance material from the existing channel from USACE Galveston District Dredging Histories Data Base. The total volume of maintenance material modeled for placement was 2.353 mcy. As with the new work simulation, all maintenance material should remain within the boundaries of the maintenance ODMDS boundaries. Consequently adverse impacts to the benthic community outside of the ODMDS boundaries should not be experienced (EPA/USACE, 1996). Attachment A shows the simulated maximum mound height one month after completion of material placement within the boundaries of the Maintenance ODMDS is approximately 16.2 feet. Given the ambient water depths within the Maintenance ODMDS are about 44 feet or greater, there should be sufficient clearance with the disposal mound in place for the hopper dredge and larger supply boats (15-foot draft) that may cross the area.

6.0 ENVIRONMENTAL CONSEQUENCES

As required by the Ocean Dumping Regulations (40 CFR 220–229) promulgated to apply requirements of the MPRSA, the previously designated New Work ODMDS was examined relative to criteria for the evaluation of applications for ocean dumping (40 CFR 227, Subpart A-E and G, and 40 CFR 228.4), and the 5 general criteria and the 11 specific evaluation factors (40 CFR 228.5 and 40 CFR 228.6(a), respectively). Since the maintenance material to be dredged from the TSP channel should be the same as existing maintenance material, except for volume, the existing Maintenance ODMDS has been examined to determine whether it is of sufficient size to receive the greater quantity of material. This information will be included in the examination relative to the 5 general criteria and the 11 specific factors where pertinent. In the following section, the criteria and factors are presented in italics, followed by the statement indicating compliance.

Other environmental regulations, which are pertinent to ODMDS designation, are addressed in the BIH Draft Integrated Feasibility Report (DIFR) environmental assessment for channel improvements of the BIH to which this ODMDS analysis is attached: Coastal Zone Management (Appendix H), Endangered Species Act (Appendix I), Section 404(b)(1) Water Quality Certification (Appendix G), Magnuson-Stevens Fishery Conservation and Management Act or Essential Fish Habitat (Section 7.4 of the DIFR) and cultural and historic resources (Section 7.9 of the DIFR).

6.1 REGULATORY CHARACTERIZATION

6.1.1 Evaluation of Application for Ocean Dumping of Material

6.1.1.1 **Subpart A – General (40 CFR 227.1-227.3)**

This general section has been reviewed and the proposed dredging and dredged material placement plan as described here has been found to be acceptable in accordance with Part 227.2, "Materials which satisfy the environmental impact of Subpart B".

6.1.1.2 **Subpart B – Environmental Impact (40 CFR 227.4 through 227.13)**

The final Brazos Island Harbor – Entrance Channel Contaminant Assessment (March 2013) was submitted to the EPA's Region 6 on April 29, 2014. The overall conclusion for new work material testing was that, under the guidance provided by the Regional Implementation Agreement (RIA) and/or the Task Order and based on the weight of evidence evaluation of chemical analyses, Suspended Particulate Phase (SPP) Bioassays, Solid Phase (SP) Bioassays and Bioaccumulation Bioassays, no adverse effects or significant impacts are expected to either human or ecological receptors during dredging or at the disposal site from ocean placement of these new work dredge materials. New work and maintenance dredging sediments met the Limiting Permissible Concentration (LPC) (Subpart G §227.27) for open water ocean disposal.

40 CFR 227.4, Criteria for evaluating environmental impaet: the proposed new work and maintenance dredging and new work and maintenance dredged material placement will not cause any of the adverse effects listed in (a) through (d);

40 CFR 227.5, Prohibited materials: none of the materials listed in (a) through (d) are known to exist in the materials to be removed by the proposed new work and maintenance dredging;

40 CFR 227.6, Constituents prohibited as other than trace contaminants: The new work and maintenance materials are considered to be of acceptable quality in accordance with this section. None of the contaminants listed in §227.6 (a) (1-5) are known to exist in the new work and maintenance material other than in trace quantities; determination of trace contaminants was included in the 2012 bioassay study. While some constituents listed in the section, such as carcinogens, mutagens and teratogens were not specifically tested for, they are not historically known to be present in the BIH Project new work sediments;

40 CFR 227.7, Limits established for specific wastes or waste constituents: Not applicable to dredged materials;

40 CFR 227.8, Limitations on the disposal rates of toxic wastes: Not applicable to dredged materials;

40 CFR 227.9, Limitations of the quantities of waste materials: The quantity of new work and maintenance dredged material to be deposited at one time within the New Work and Maintenance ODMDSs, respectively, is considered to be within safe limits to prevent any long-term damage to the environment;

40 CFR 227.10, Hazards to fishing, navigation, shorelines or beaches: new work and maintenance materials to be placed at the New Work and Maintenance ODMDSs, respectively, will have no unacceptable interference with fishing, navigation, shorelines or beaches;

40 CFR 227.11, Containerized wastes: Not applicable to dredged materials;

40 CFR 227.12, Insoluble wastes: Not applicable to dredged materials;

40 CFR 227.13, Dredged materials:

New Work Dredging. The results of chemical and grain size analyses, as well as SP, SPP and bioaccumulation bioassays indicated that no adverse impacts would occur as a result of dredging and dredge material placement of new work material.

Maintenance Dredging. Material from the existing Entrance Channel and the Entrance Channel Extension was last evaluated in 2005; the results of chemical and grain size analyses, as well as SP, SPP and bioaccumulation bioassays indicated that no adverse impacts would occur as a result of maintenance dredging and maintenance dredge material placement. No unacceptable impacts have been noted from the past placement of maintenance dredge materials.

The results of chemical and grain size analyses, as well as SP, SPP and bioaccumulation bioassays from the current maintenance material indicated that no adverse impacts would occur as a result of dredging and dredge material placement of current maintenance material.

The National Response Center (NRC) webpage is currently down for reconstruction for security reasons; the last NRC review in 2005 showed no report of any significant chemical or petroleum spills in the project vicinity. Although tar balls did wash up on the shore of South Padre Island after the Texas City Wye Spill of March 22, 2014, the release did not reach the BIH Project area and no other significant chemical or petroleum spills have occurred in the project vicinity since the most recent dredging in November of 2008.

6.1.1.3 Subpart C – Need for Ocean Dumping (40 CFR 227.14 through 227.16)

An evaluation of the factors listed in 227.15 has been made. Factors (a) and (b) are not applicable, since the material to be placed consists of existing Gulf of Mexico sediment that have been redistributed by ocean processes and consequently settled in the navigation channel. Chemical and biological testing of the material indicates that the material is clean and does not require treatment.

New work material from the Main Channel may be stockpiled within existing PAs and used for future incremental dike raisings. No marshes in need of clay material for restoration were identified near the project area and as new work sediments to be dredged are expected to be predominantly clay they would not be suitable for placement at the nearshore Feeder Berm, which was designed to receive sandy sediments.

Both the remaining new work dredged material not stockpiled or alternatively all new work material can be placed at the existing New Work ODMDS (EPA, 1991) located approximately 4.4 miles from shore in 60 to 67 feet of water. The 350-acre New Work ODMDS can contain all new work material placed there during construction (US ACE, 2013).

Dredged maintenance material from the Entrance and Jetty channels and the first 11,000 feet of the Main Channel (+11+000 to -17+000) can be beneficially placed in the nearshore Feeder Berm (Site 1A), located between 1.5 and 2.5 miles from the north jetty and from 0.4 to 0.9 mile from shore. Placement in the existing underwater Feeder Berm located offshore of South Padre Island will decrease shoreline erosion and nourish beaches. Sandy material deposited in this nearshore Feeder Berm will be regularly placed back into the littoral system and available for transport by cross-shore currents to the shoreline of South Padre Island and along the 8 beaches fronting the City of South Padre Island. These beaches provide nesting habitat for sea turtles and are important economic and recreational resources for the City of South Padre Island and Cameron County.

If the Feeder Berm cannot be used, maintenance material from the Entrance and Jetty channels (station -17+000 to 0+000) can be placed in the Maintenance ODMDS located approximately 1.9 statute miles from shore and just north of the navigation channel (US ACE, 2013).

6.1.1.4 Subpart D - Impact of the Proposed Dumping on Esthetic, Recreational and Economic Values (CFR Part 227.17 through 227.19)

An assessment of the impact of the proposed placement of new work and maintenance dredged material has been made based on the considerations listed in §227.17 ((a) and (b)) and the factors listed in 227.18 ((a) through (h)). The overall impact of the placement operation on aesthetic, recreational and economic values of the placement area will be negligible.

6.1.1.5 Subpart E – Impact of the Proposed Dumping on Other uses of the Ocean (CFR Part 227.20 through 227.22)

An assessment of the impact of the proposed new work and maintenance ODMDS placement operations has been made based on the considerations listed in §227.20 ((a) and(b)) and uses listed in §227.21 ((a) through (k)). The overall impact of the placement operation on other uses of the ocean in the vicinity of the New Work and Maintenance ODMDSs will be negligible.

6.1.1.6 Subpart G – Definitions (CFR Part 227.27 through 227.32)

All applicable definitions in Subpart G were adhered to in the conduct and evaluation of the new work and maintenance material dredging and testing.

6.1.2 Existing Dredged Material Permits (40 CFR 228.4)

The New Work ODMDS was designated by Federal Register, Vol. 56, No. 1036, dated January 1, 1992. Hydrographic surveys of the new work material ODMDS will be performed in accordance with and adhere to the requirements of the ODMDS Site Monitoring and Management Plan currently under development for the new work project.

The Maintenance ODMDS was designated by Federal Register, Vol. 55, No. 178, dated September 11, 1990. Monitoring, including hydrographic surveys, will be performed in accordance with the BIH Maintenance ODMDS Site Monitoring and Management Plan.

40 CFR Subparts B, C, D, E and G and Section 228.4(e) have been performed and no significant adverse impacts are indicated. Therefore, the LPC for open water placement was met (§ 227.27, RIA 10.2.3) and adverse ecological impacts resulting from dredging and the placement of new work and maintenance dredge material in the designated New Work and Maintenance ODMDSs, respectively, are unlikely.

6.1.3 Five General Criteria

6.1.3.1 40 CFR 228.5(a)

The dumping of materials into the ocean will be permitted only at sites or in areas selected to minimize the interference of disposal activities with other activities in the marine environment, particularly avoiding areas of existing fisheries or shellfisheries, and regions of heavy commercial or recreational navigation.

The New Work and Maintenance ODMDSs avoid artificial reefs (Texas Parks and Wildlife Department, 2013), navigation channels, sensitive ecological features identified by the Texas General Land Office (GLO) Oil Spill Response program (GLO, 2013), and known shipwrecks. The New Work ODMDS is outside the navigation fairway while the Maintenance ODMDS is outside the navigation fairway except for its far east end. Both avoid known navigational obstructions.

6.1.3.2 40 CFR 228.5(b)

Locations and boundaries of disposal sites will be so chosen that temporary perturbations in water quality or other environmental conditions during initial mixing caused by disposal operations anywhere within the site can be expected to be reduced to normal ambient seawater levels or to undetectable contaminant concentrations or effects before reaching any beach, shoreline, marine sanctuary, or known geographically limited fishery or shellfishery.

The results of the analyses and studies discussed in this report indicate the New Work material and material to be dredged for Entrance and Jetty channel maintenance are acceptable for ocean disposal under 40 CFR 227. Over 60 percent of the maintenance material is sand and should fall to the bottom with relatively minor perturbations of water quality during initial mixing. Concentrations of oxygen-demanding materials and potentially toxic materials are below levels expected to cause toxicity to marine organisms. Consequently there should be little impact on water quality beyond the boundary of the Maintenance ODMDS, which is 1.9 miles east of the nearest beach. Additionally maintenance material is usually placed at the Feeder Berm which is closer to the City of South Padre Island and where the material beneficially builds the beach. The repeated beneficial use of maintenance material discharged within a mile from the beach without known water quality or sediment impacts further suggests placement of maintenance material at the Maintenance ODMDS should not significantly impact nearby important ecological, cultural, navigational, or commercial features.

New work material is predominantly clay and silt, which settles relatively slowly compared to sand. A substantial portion of the new material will be dredged and placed as relatively firm, large pieces of clay, which should settle in the New Work ODMDS without contributing significantly to increased turbidity. However turbidity might be higher when dredged material is disposed of at the New Work ODMDS than at the Maintenance ODMDS because of the slower rate at which clay settles than the settling rate for sand. As with the maintenance material, concentrations of oxygen-demanding and potentially toxic materials in new work sediments are below levels expected to cause toxicity to marine organisms. Consequently there should be little impact on water quality beyond the boundary of the New Work ODMDS, which is 4.4 miles to the east of the nearest beach.

Both ODMDSs are over 1.9 miles east of the nearest shore and prevailing currents are to the north. Therefore turbidity plumes and contaminants will usually be transported to the north parallel to the shore, further diminishing the possibility placement will affect significant features. Modeling indicates no impact inside the ODMDS beyond 4 hours after placement and at no time outside the ODMDS.

Recent modeling with MDFATE indicates movement of sediments out of the ODMDSs will be minimal over the short-term. Both locations are considered dispersive and sediments would be expected to generally disperse to the north along the bottom without impacting significant features.

6.1.3.3 40 CFR 228.5(c)

If at any time during or after disposal site evaluation studies, it is determined that existing disposal sites presently approved on an interim basis for ocean dumping do not meet the criteria for site selection set forth in 228.5–228.6, the use of such sites will be terminated as soon as suitable alternative disposal sites can be designated.

The Maintenance ODMDS was designated in 1990 and the New Work ODMDS was designated in 1991. The process of designating both sites considered criteria for site selection set forth in 40 CFR 228.5-228.6. Neither site is therefore approved on an interim basis, and this criterion is not applicable to the ODMDSs.

6.1.3.4 40 CFR 228.5(d)

The sizes of ocean disposal sites will be limited in order to localize for identification and control any immediate adverse impacts and to permit the implementation of effective monitoring and surveillance programs to prevent adverse long-range impacts. The size, configuration, and location of any disposal site will be determined as a part of the disposal site evaluation or designation study.

The size of the New Work ODMDS, 0.56 square statute miles (0.42 square nautical mile), was as small as possible to reasonably meet the criteria stated at 40 CFR 228.5 and 228.6(a) for the 42-foot Project. The designated Maintenance ODMDS is also 0.56 square statute miles (0.42 square nautical mile) in area. Both ODMDSs are rectangular in size with a length to width ratio less than 1.9 and are within 4.4 miles of Brazos Santiago Pass. Both ODMDSs are in water less than 70 feet deep. Proximity of the ODMDSs to boat ramps, their depths, and dimensions facilitate sampling them to monitor possible impacts on water or sediment quality, benthos, or other marine organisms.

6.1.3.5 40 CFR 228.5(e)

EPA will, wherever feasible, designate ocean dumping sites beyond the edge of the continental shelf and other such sites that have been historically used.

EPA (1991) decided cost, safety, and time factors, plus difficulties with monitoring and surveillance, indicated the distance to the edge of the continental shelf (over 50 statute miles) near the BIH precluded the use of any ODMDS off the continental shelf. Additionally, lack of resilience of the deep-ocean benthic community and the grain-size disparity between the material to be discharged and the deep-ocean sediments off Brownsville indicated an off-shelf disposal site may cause severe impacts to the off-shelf benthic community. No advantage to an off-shelf site was noted.

6.1.4 Eleven Specific Factors

40 CFR 228.6(a) requires the factors included below as sections 6.1.2.1 through 6.1.2.11 will be considered in the selection process for site designation.

6.1.4.1 40 CFR 228.6(a)(1)

Geographical position, depth of water, bottom topography, and distance from coast.

The preferred site for construction (new work) material disposal, as proposed in EPA (1991), is bounded by the following coordinates (see Figure 2):

26° 04′ 47″ N, 97° 05′ 07″ W;

26° 05′ 16″ N, 97° 05′ 04″ W;

26° 05′ 10″ N, 97° 04′ 06″ W; and

26° 04′ 42″ N, 97° 04′ 09″ W.

The water depth at the preferred site ranges from 60 to 67 feet (see Figure 2), the bottom topography is relatively flat, and the New Work ODMDS is 4.4 statute miles from the coast at its closest point.

The existing Maintenance ODMDS, as determined in EPA (1990), is bounded by the following coordinates (see Figure 2):

26° 04′ 32″ N, 97° 07′ 26″ W;

26° 04′ 32″ N, 97° 06′ 30″ W;

26° 04′ 02″ N, 97° 06′ 30″ W; and

26° 04′ 02″ N, 97° 07′ 26″ W.

The water depth at the maintenance ODMDS is about 44 feet, and the site is 1.9 miles from shore at its closest point (see Figure 2).

6.1.4.2 40 CFR 228.6 (a)(2)

Location in relation to breeding, spawning, nursery, feeding, or passage areas of living resources in adult or juvenile phases.

Brown, and white shrimp and blue crabs spawn in the Gulf of Mexico in the vicinity of the ODMDSs (Berger/EA, 2008). Fishes and invertebrates characteristic of the northwestern Gulf of Mexico use this portion of the Gulf for breeding, spawning, feeding, and passage. Sea turtles also use this area for passage and nest on South Padre Island beaches. Habitat in the ODMDSs is not unique in this portion of the Gulf and not critical to the survival of any species of fish, invertebrates, or sea turtles.

Limited interference with nearshore fisheries may occur during dredging and placement of maintenance and new work material. Active dredging and placement may impede movement/migration of some marine organisms. These impacts on the movement/migration of marine organism populations affected would be relatively small and probably undetectable. The stress and possible mortality of individual organisms encountering adverse conditions during dredging and placement operations in the ODMDSs would be negligible compared to the passage of the far greater majority of individuals crossing into or out of the Laguna Madre and at other locations.

Placement of material at the proposed ODMDSs would have negligible effects on endangered and threatened species. Occurrences of whales in the area are rare because they generally inhabit waters far deeper than those in the proposed ODMDS. Dredging operations might affect sea turtles through incidental take. Hopper dredging has been identified as a source of mortality to sea turtles in inshore waters (Dickerson et al., 2004); however, placement operations are not known to cause sea turtle mortality. Hopper dredging of maintenance material would be conducted in accordance with all reasonable and prudent measures and terms and conditions required by the National Marine Fisheries Service (NMFS) in its 2007 Biological Opinion (NMFS, 2007). Hopper dredging of new work material would be conducted in accordance with reasonable and prudent measures of a Biological Opinion for the 52 by 250-foot project (TSP) currently under preparation by NMFS.

6.1.4.3 40 CFR 228.6(a)(3)

Location in relation to beaches or other amenity areas.

The New Work ODMDS and the Maintenance ODMDS are roughly 4.4 and 2 miles, respectively, from beaches and other amenity areas. Maintenance material from the Entrance and Jetty channels is however used in a Feeder Berm less than a statute mile from the beach and from which it nourishes beaches along South Padre Island and in the City of South Padre Island. Maintenance material is considered beneficial to area beaches. New Work clay will be placed at least 4.4 miles from the recreational beach, and transport of clays is expected to be to the north parallel to the beach.

6.1.4.4 40 CFR 228.6(a)(4)

Types and quantities of wastes proposed to be disposed of and proposed methods of release, including methods of packaging the waste, if any.

New work material (2.066 mcy) which is predominantly clay and silt from the Entrance and Jetty channels will be discharged into the New Work ODMDS. Material will be discharged from the hopper dredge over the New Work ODMDS. The new work material is considered virgin material and sediment sampling indicates nontoxic concentrations of any possible contaminants. Dredging will occur over a period of 7 months and the site is projected to be used only once. There will not be any waste contained or disposed of with new work material.

Maintenance dredging will occur at a rate of about 0.47 mcy per year and will be conducted with a hopper dredge. Most maintenance material will be discharged at the beneficial use feeder berm and the remainder will be discharged into the Maintenance ODMDS. There will not be any waste contained or disposed of with maintenance material.

6.1.4.5 40 CFR 228.6(a)(5)

Feasibility of surveillance and monitoring.

Both the New Work ODMDS and Maintenance ODMDS are amenable to surveillance and monitoring, as is evidenced by sampling described in SOL and Atkins (2013) and by their relative proximity to boat ramps.

6.1.4.6 40 CFR 228.6(a)(6)

Dispersal, horizontal transport, and vertical mixing characteristics of the area, including prevailing current velocity, if any.

Predominant longshore currents, and thus predominant longshore transport, are to the north. Steady longshore transport and occasional storms, including hurricanes, should move the placed material from the site. The size of the ODMDSs was evaluated using MDFATE, which includes vertical mixing, to ensure they were large enough to prevent significant mounding (Section 5.0).

6.1.4.7 40 CFR 228.6(a)(7)

Existence and effects of current and previous discharges and dumping in the area (including cumulative effects).

There is no indication benthic or nekton communities have substantially changed as a result of maintenance or new work material disposal in the area. Information from SOL and Atkins (2013) plus chemical analyses of water from the area indicate there has not been water or sediment quality contamination resulting from maintenance material disposal in the Maintenance ODMDS. There has not been any disposal of maintenance material at the New Work ODMDS.

6.1.4.8 40 CFR 228.6(a)(8)

Interference with shipping, fishing, recreation, mineral extraction, desalination, fish and shellfish culture, areas of special scientific importance, and other legitimate uses of the ocean.

The locations of the ODMDSs were selected so their use would not interfere with other legitimate uses of the ocean (EPA, 1990, 1991). Placement of maintenance or new work material in the past has not been known to interfere with other uses.

6.1.4.9 40 CFR 228.6(a)(9)

Existing water quality and ecology of the site as determined by available data or by trend assessment or baseline surveys.

Water and sediment chemistry data collected in 2012 indicate there is not degraded water or sediment quality in the ODMDSs. Water and sediment chemistry sampling since 1980 showed there were not significant water quality issues and no significant trends in water quality resulting from dredged material placement. There is not recent sampling of benthic macroinvertebrates in the ODMDSs and there is very little sampling of nekton in the area. Biological data are not specific to the ODMDSs and not frequent enough to elucidate trends in ecological health in the vicinity of the ODMDSs. There is not indirect evidence of degraded water quality or ecological health in the vicinity of the ODMDSs. Indirect evidence if present might have consisted of complaints about water quality, major fish kills or die-offs of benthos.

Some benthic macroinvertebrates colonizing sediments in the ODMDSs may be killed by disposal of new work or maintenance dredged material. Recovery should be relatively rapid after disposal of dredged material ceases and chemical testing (SOL and Atkins, 2013) indicated no impacts to organisms outside the ODMDS can be expected from chemical contaminants. Although there may be some ecological impacts from dredged material placement these impacts are expected to be limited to the immediate area of the ODMDSs and to be temporary in nature. Sampling of coastal fish communities where dredging and dredged material placement was occurring indicated some fish and benthic communities demonstrated no effects while some fish and benthos exhibited temporary avoidance of these areas (ECORP, 2009).

6.1.4.10 40 CFR 228.6(a)(10)

Potential for the development or recruitment of nuisance species in the disposal site.

With a disturbance to any benthic community, initial colonization after disturbance will be by opportunistic species. However, these species are not nuisance species in the sense that they would interfere with other legitimate uses of the ocean or that they are human pathogens. There is no evidence of nuisance species being recruited to disturbed bottoms in this part of the Gulf of Mexico. The time when dredging and dredged material placement will occur will be relatively short, perhaps up to 7 months, and is not expected to support colonization of open waters by nuisance species.

6.1.4.11 40 CFR 228.6(a)(11)

Existence of or in close proximity to the site of significant natural or cultural features of historical importance.

The nearest natural feature of historical importance is the Laguna Madre which is one of the few large hypersaline lagoons in the world. The Laguna Madre is known for its transparency and the extensive seagrass beds associated with its relatively shallow, transparent waters. The Maintenance ODMDS is over 2 miles and the New Work ODMDS is more than 4.4 miles from the Laguna Madre. Both sites are north of the Brazos-Santiago Pass where currents exchange water between the Gulf and the Laguna Madre. Since the primary currents are along shore towards the north, sediments and turbidity from disposal of dredged material at the ODMDSs are not likely transported into the Laguna Madre. Additionally, dredging and dredged material disposal are expected to be temporary and less likely to result in sediment transport into the Laguna than if dredging and dredged material were ongoing.

There are no significant cultural resources known from the Gulf of Mexico in the vicinity of the ODMDSs. A number of ship wrecks may be present near Brazos Santiago Pass; however, since the proposed project will not involve widening the channel, no cultural features should be disturbed by either dredging or dredged material disposal.

7.0 SITE MONITORING AND MANAGEMENT PLAN

One of the ODMDS management responsibilities cited in 40 CFR 228.3 is "developing and maintaining effective ambient monitoring programs," although this is tempered somewhat by 40 CFR 228.9(a), which states, "The monitoring program, if deemed necessary by the Regional Administrator or the District Engineer, as appropriate, may include baseline or trend assessment surveys. . . ." Since 40 CFR 229(c) states that "EPA will require the full participation of permittees . . . in the development and implementation of disposal monitoring programs," a monitoring program and draft Site Monitoring and Management Plan (SMMP) are under development. There are two approaches that may be applied to determining unfavorable trends. One is to conduct monitoring surveys on the ecosystem at and near the ODMDSs at regular intervals. The other approach is to determine the quality of the material to be discharged at the site, from a chemical and biological perspective, and thereby determine expected impacts. The testing requirements specified in 40 CFR 227.13, as applied by the USACE, Galveston District, satisfy parts of both of the above-mentioned approaches.

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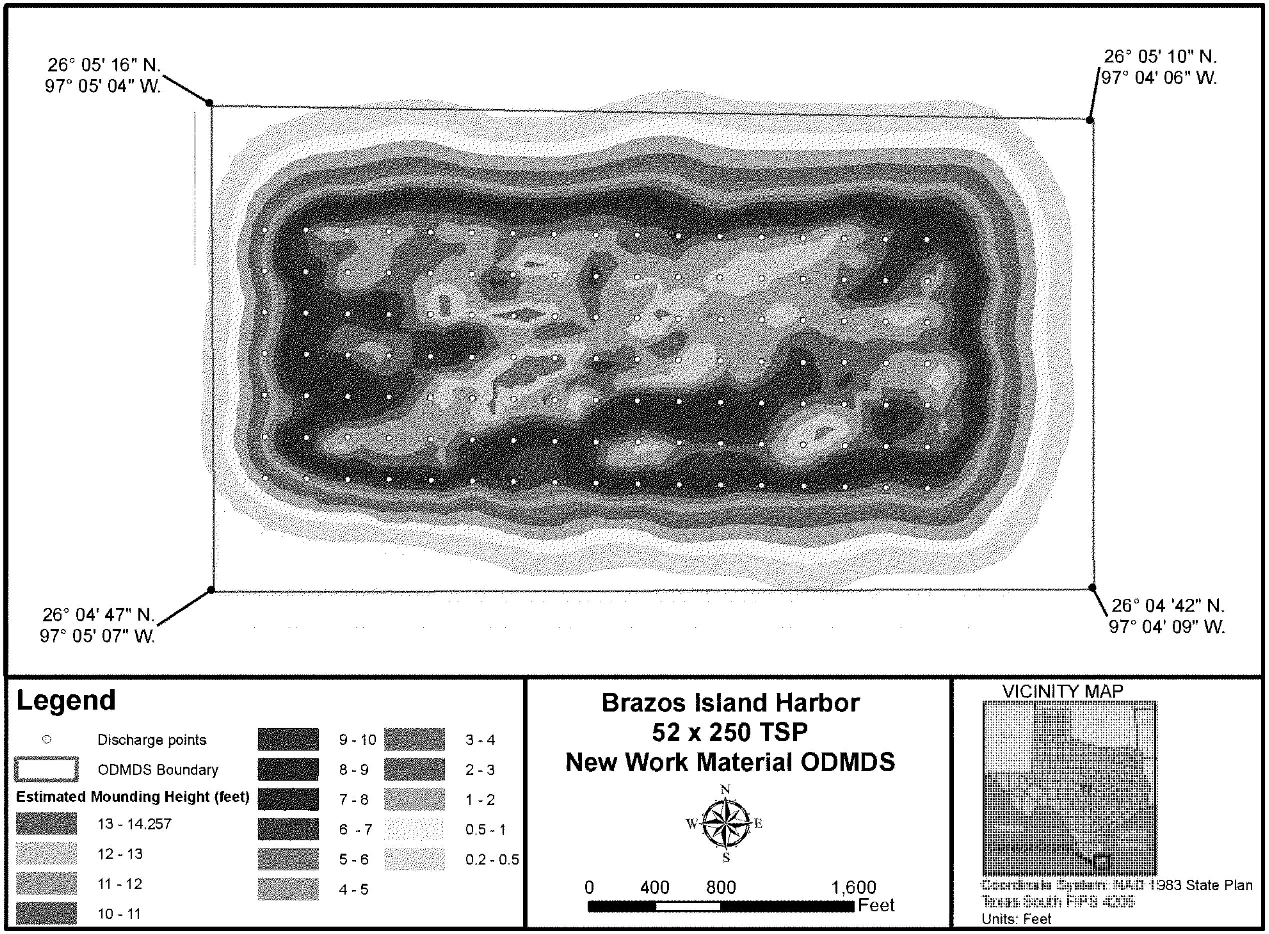
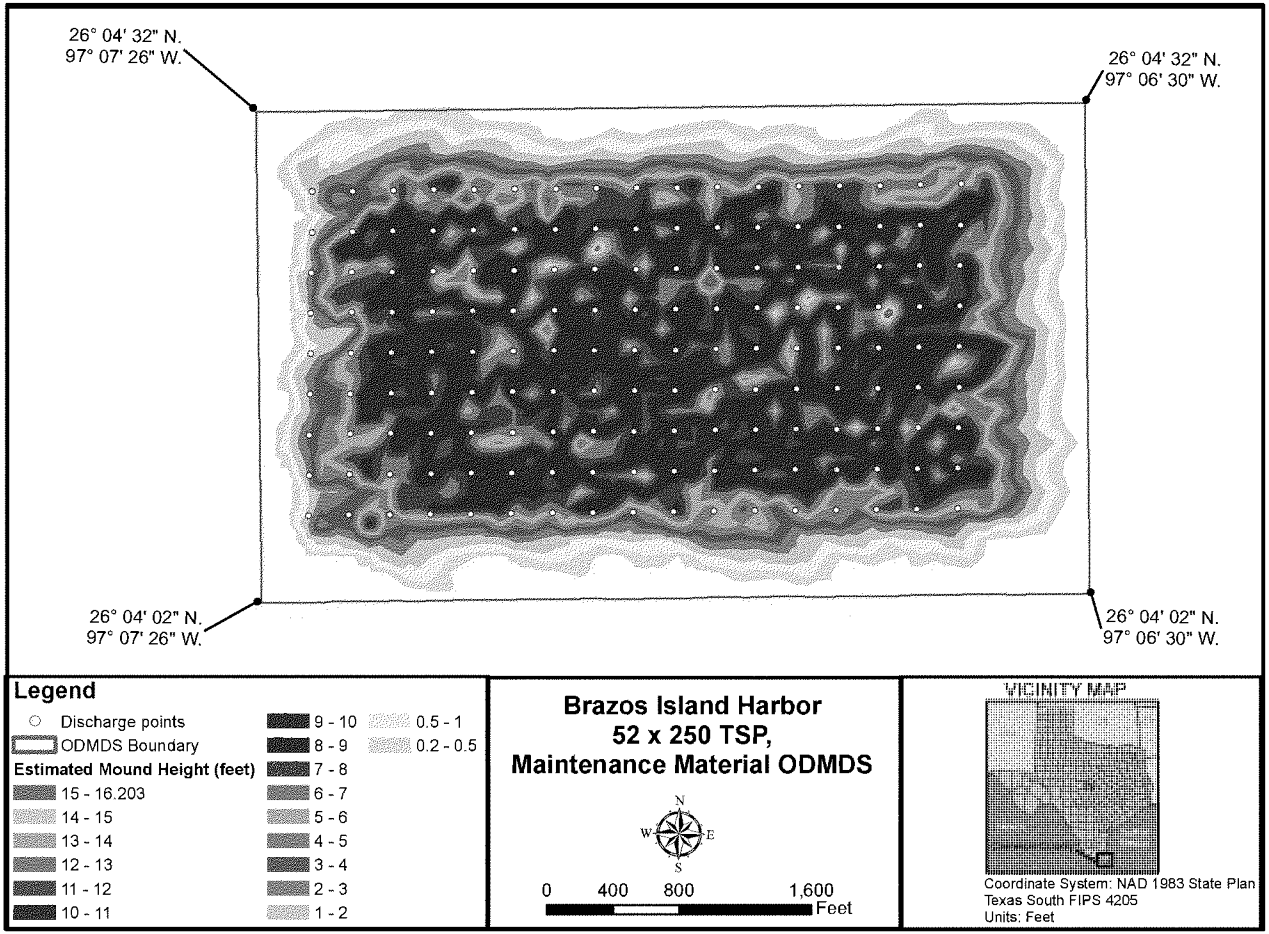
Attachment A

MDFATE Modeling Results



26° 05' 16" N.
97° 05' 04" W.
26° 05' 10" N.
97° 04' 06" W.
26° 04' 47" N.
97° 05' 07" W.
26° 04 '42" N.
97° 04' 09" W.
Legend
Discharge points
ODMDS Boundary
Estimated Mounding Height (feet)
13 - 14.257
12 - 13
11 - 12
10 - 11
9 - 10
8 - 9
7 - 8
6 - 7
5 - 6
4 - 5
3 - 4
2 - 3
1 - 2
0.5 - 1
0.2 - 0.5
Brazos Island Harbor
52 x 250 TSP
New Work Material ODMDS
N
W
E
S
0
400
800
1,600
Feet
VICINITY MAP
Coordinate System: NAD 1983 State Plan
Units: Feet


26° 04' 32" N.
97° 07' 26" W.
26° 04' 32" N.
97° 06' 30" W.
26° 04' 02" N.
97° 07' 26" W.
26° 04' 02" N.
97° 06' 30" W.
Legend
Discharge points
ODMDS Boundary
Estimated Mound Height (feet)
15 - 16.203
14 - 15
13 - 14
12 - 13
11 - 12
10 - 11
9 - 10
8 - 9
7 - 8
6 - 7
5 - 6
4 - 5
3 - 4
2 - 3
1 - 2
0.5 - 1
0.2 - 0.5
Brazos Island Harbor
52 x 250 TSP,
Maintenance Material ODMDS
N
W
E
S
0
400
800
1,600
Feet
VICINITY MAP
Coordinate System: NAD 1983 State Plan
Texas South FIPS 4205
Units: Feet

Brazos Island Harbor, Texas
Channel Improvement Project

Appendix G
Clean Water Act Section 404(b)(1) Evaluation

July 2014

APPENDIX G

CLEAN WATER ACT SECTION 404(B)(1) EVALUATION

BRAZOS ISLAND HARBOR

CHANNEL IMPROVEMENT PROJECT

CAMERON COUNTY, TEXAS

U.S. Army Corps of Engineers, Galveston District
2000 Fort Point Road
Galveston, Texas 77550

July 2014

APPENDIX G
BRAZOS ISLAND HARBOR, TEXAS
CHANNEL IMPROVEMENT PROJECT
SECTION 404(b)(1) EVALUATION

I. Project Description

a. Location

The Brazos Island Harbor (BIH) project is an existing deep-draft navigation project located on the south Texas coast near the border with Mexico (Figure 1). The channel uses the natural Brazos-Santiago Pass to connect the Gulf of Mexico with the Main Channel (the inland portion of the BIH). The Port of Brownsville is located at the western end of the Main Channel and includes a man-made basin located three miles north of the Rio Grande River and five miles east of the City of Brownsville. The BIH provides for 42-foot mean lower low water (MLLW) depth on the inland portion of the channel and a 44-foot MLLW depth in the offshore Entrance and Jetty Channels. The BIH is essentially a straight waterway with no bridges or other obstructions for the entire 19.4-mile length of the waterway and is operated for one-way traffic only. The existing waterway consists of the Entrance Channel (1.3 miles), Jetty Channel (1.1 miles), Main Channel (15.1 miles), Turning Basin Extension (1.3 miles) and Turning Basin (0.6 mile).

The study area is located entirely within Cameron County, Texas, and encompasses the entire BIH and surrounding region. The area is located in the Lower Rio Grande Valley (LRGV) and encompasses approximately 103,250 acres (160 square miles), extending 3 miles north, south, and west of the BIH and continuing 5 miles offshore into the Gulf of Mexico. The study area also is extended for 10 miles along both sides of Brazos-Santiago Pass for the purpose of evaluating potential shoreline impacts from deepening and extending the Entrance Channel.

b. General Description

This Section 404(b)1 evaluation addresses the discharge of dredged or fill material into the waters of the U.S. The U.S. Army Corps of Engineers (USACE) prepared a draft Integrated Feasibility Report and Environmental Assessment (DIFR-EA) which identifies a Tentatively Selected Plan (TSP) to deepen the existing channel from an authorized depth of 42-feet to a new depth of 52 feet and evaluates the potential impacts of this plan on the environment. The improvements would extend the BIH Entrance Channel to a depth of -54 feet MLLW at a width of 300 feet, deepen the existing BIH Entrance Channel to -54 feet MLLW at an existing width of 300 feet, and deepen the existing BIH Jetty Channel to -54 feet MLLW at an existing width of 300 feet. The TSP would also deepen the Main Channel to a depth of -52 feet MLLW at existing widths ranging from 250 to 400 feet, maintain the existing depth of -42 feet MLLW and width of 325 feet from station 84+200 to 86+000, and maintain the existing depth of -36 feet MLLW and widths ranging from 325 to 1200 feet from station 86+000 through the end of the turning basin at station 89+500. No channel widening is proposed and channel side slopes would remain the same as the existing project – one foot vertical over six feet horizontal in the Entrance and Jetty Channels; one foot vertical over three feet horizontal from station 0+000 to 35+000 and one foot vertical over two and one-half feet horizontal from station 35+000 through 89+500 in the Main Channel. The actual dredging depth would be up to 4 feet deeper in the Entrance and Jetty Channels due to 2 feet of advance maintenance (AM) and 2 feet of allowable overdepth (AO), and up to 3 feet deeper in the Main Channel due to 2 feet of AM and 1 foot of AO. No improvements are proposed for the existing jetties. If the project is authorized, the three-year construction period could begin in fiscal year 2018.

Construction of the proposed project would generate approximately 14.1 million cubic yards (mcy) of dredged material. Maintenance of the deepened channel would generate a total of 61.7 mcy of maintenance-dredged material over the 50-year period of analysis. Material dredged from the Entrance and Jetty channels during construction would be placed in the new work Ocean Dredged Material Disposal Site (ODMDS), and the remainder of the new work material would be placed in existing, upland, confined dredged material placement areas (PAs) 2, 4B, 5A, 5B, 7, and 8. Maintenance dredging would generally be conducted by hopper and cutterhead dredges, with material being distributed among a nearshore Feeder Berm or the existing Maintenance ODMDS, and upland, confined PAs 4A, 4B, 5A, 5B, 7, and 8. Maintenance dredging would utilize the same placement areas as those utilized for the existing project, and the duration and frequency of dredging events would be within the range occurring under current conditions. Dredging of the Entrance and Jetty Channels and the first 11,000 feet of the Main Channel (+11+000 to -17+000) would generally be performed by a hopper dredge, and material would be placed in the nearshore Feeder Berm Site 1A, located between 1.5 and 2.5 miles from the North Jetty and from 0.4 to 0.9 miles from shore. Sediment removed by maintenance dredging would therefore be regularly placed back into the littoral system, available for cross shore and longshore sediment transport.

The TSP avoids impacts to natural and cultural resources to the greatest degree possible. No significant adverse impacts to natural and cultural resources, with the potential exception of threatened and endangered sea turtles, have been identified and no mitigation is required. Section 7 consultation with National Marine Fisheries Service (NMFS) has been initiated, and it is anticipated that reasonable and prudent conservation measures will be identified to minimize potential impacts to sea turtles. Opportunities for beneficial use of dredged material were thoroughly evaluated. As a result, maintenance material from the Entrance and Jetty Channels, and the first 11,000 feet of the Main Channel will be routinely placed in the nearshore Feeder Berm, maximizing the return of beneficial sediments to the long shore current north of the jetties. The TSP is also the environmentally preferable alternative because it is the most efficient alternative in terms of minimizing damages to the biological and physical environment while providing the maximum economic benefit for the general welfare of the Nation.

c. Authority and Purpose

The Congress authorized the U.S. Army Corps of Engineers (USACE) to conduct a study of BIH, Texas to determine whether the project should be modified in any way, particularly with a view to widening and deepening the existing channels, pursuant to a resolution of the Committee on Public Works, U.S. House of Representatives dated May 5, 1966. The Feasibility Cost Sharing Agreement for the feasibility study was signed on June 28, 2006, with the Brownsville Navigation District (BND) acting as the financial representative for the Port of Brownsville.

The Water Resources Development Act (WRDA) of 1986 (Public Law 99-662) dated November 17, 1986, Section 105 established cost share requirements for this study. Additional legislation was passed in the Fiscal Year (FY) 2003 Omnibus Appropriations Bill, stating that any work performed by the BND as part of the restoration of wetlands in Bahia Grande will be used as credit towards the mitigation requirements of the BIH deepening project.

d. General Description of Dredged or Fill Material

(1) General Characteristics of Material

Located in West Gulf Coastal Plain physiographic province, the study area topography developed from sediments deposited in a mostly marine environment and later uplifted and tilted toward the Gulf (Texas Water Development Board [TWDB], 1990). Surface soils are comprised of sand, silt, mud and clay deposits of Holocene and recent ages deposited by alluvial, eolian and marine processes (Brown et al., 1980; Page et al., 2005). In the area around Port Isabel and the barrier islands, landforms include beach ridges, tidal channels, tidal deltas, washover fans, sand and clay dunes, wind-tidal flats and marine-plain flats. Extending inland from the marine plain through the western edge of the study area are floodplain deposits of mud, silt and sand. Beneath the surface deposits lie the Beaumont Formation, a massive and complex alluvial deposit of clay, silt, sand and gravel deposited during the Pleistocene. Offshore, the Beaumont Formation lies beneath a thin mantle of sand and extends as far as the continental shelf, with thicknesses ranging from 450 to 900 feet.

Galveston District dredging records indicate that the average particle size in the offshore channel is 68 percent sand, 21 percent silt and 10 percent clay; in the Brownsville Main Channel, average particle size is 25.9 percent sand, 35.6 percent silt and 38.5 percent clay. A review of core borings of the sediments to be dredged for construction of the TSP confirmed that BIH new work sediments would be overwhelmingly consolidated clay (USACE, 1990; TWE, 2010).

(2) Quantity of Material

Construction of the TSP would generate 14.1 million cubic yard (mcy) of new work material. The term "new work" refers to the material below the existing navigation channel template, which is needed to be removed in order to increase to the new project depth. Maintenance dredging of the TSP is expected to consist of 61.7 mcy of shoaled material over the 50-year period of analysis.

Table 1 – BIH Dredging Quantities			
Channel Stations		Channel Name	Dredge Quantity in Cubic Yards (cy)
New Work Dredging			
-17+000	0+000	Entrance and Jetty Channels	2,066,000
0+000	89+500	Main Channel through Turning Basin	12,027,000
		Total	14,093,000
Maintenance Dredging (50-year total)			
-17+000	0+000	Entrance and Jetty Channels	23,298,000
0+000	89+500	Main Channel through Turning Basin	38,376,000
		Total	61,674,000

(2) Source of Material

The source of material routinely dredged in the Entrance and Jetty Channels is the Gulf of Mexico. Redistributed Gulf of Mexico sediments settle in the channel as a result of migration by wind and wave actions. The source of material routinely dredged in the Main Channel is surface sediments from the adjacent uplands. Sediments are primarily blown or carried by sheet flow into the channel, and near the eastern end of the Main Channel, stream flow carries small amounts of sediment into the channel. All but the far western end of the lands adjacent to the channel are either in their natural state or are upland, confined placement areas. At the western end, docks and industries line the channel.

e. Description of the Proposed Discharge Sites

(1) Location

Ten placement areas (PAs) would be used to manage the CIP's new work and maintenance material over a 50-year period (seven upland, confined PAs, two Ocean Dredged Material Sites [ODMDS], and one nearshore Feeder Berm) (Figure 1). All are existing sites; none would need to be expanded and no new

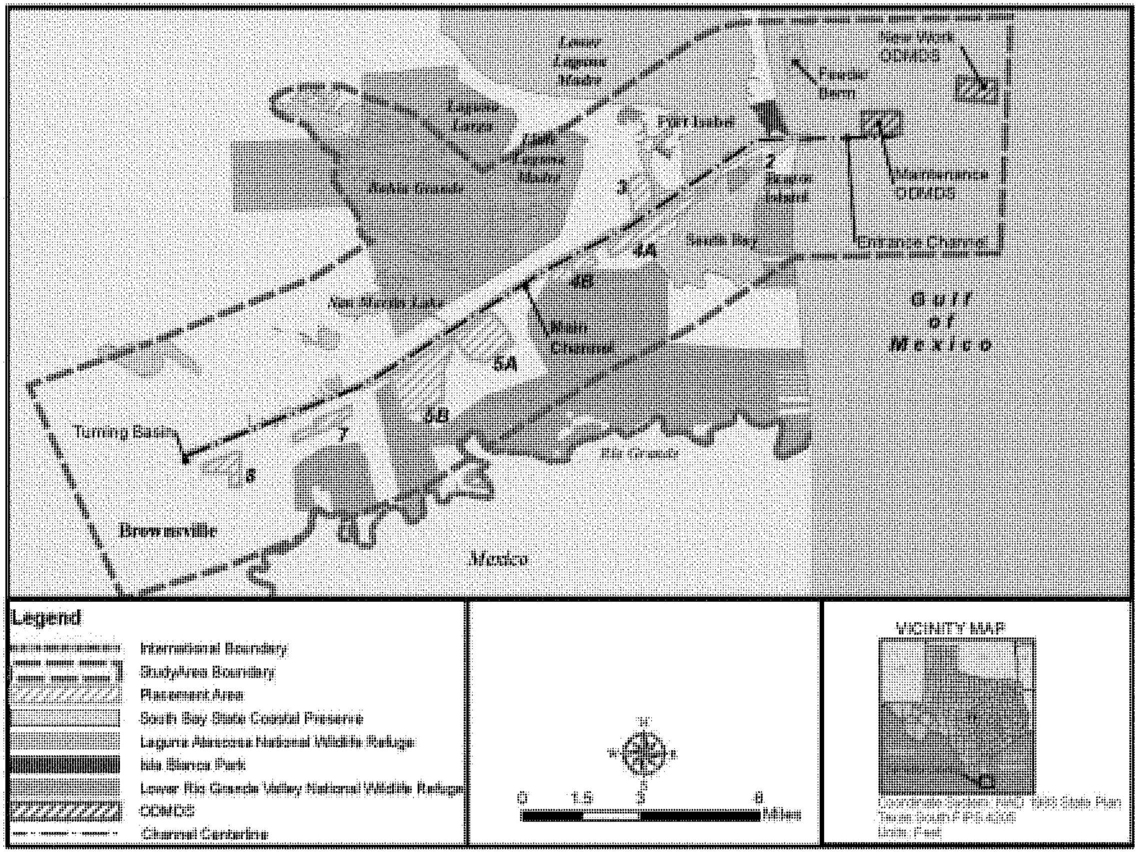


Figure 1 – Map of the Tentatively Selected Plan

PAs would be needed. All of the upland PAs are located along the Main Channel. They are confined with water discharged from the sites via controlled spillways to existing outfall canals and drainage ditches. The ODMDSs and Feeder Berm sites are unconfined and have unlimited capacities as they are located in dispersive environments. The New Work and Maintenance ODMDS are located an average of 4.4 and 1.9 miles from the Gulf shoreline, respectively, and the Feeder Berm is located from 0.4 to 0.9 mile from the shoreline of South Padre Island.

New work material volumes by reach and proposed PAs (the new work plan) are presented in Table 2. New work material from the Main Channel (stations 0+000 through 84+200) would be pumped from the dredges through a combination of fully submerged and floating hydraulic pipelines into existing upland confined PAs managed by the BND (PAs 2, 4B, 5A, 5B, 7 and 8). New work from the Entrance and Jetty Channels (station -17+000 to 0+000) would be placed by hopper dredge into the unconfined New Work ODMDS.

Table 2: BIH New Work Discharge Locations

Channel Stations		Placement Area (PA)	PA Size (acres)	Deepening Dredge Quantity in Cubic Yards (CY)
-17+000	0+000	New Work ODMDS	350	2,066,000
0+000	7+000	2	71	937,000
7+000	25+000	4B	243	2,689,000
25+000	50+000	5A	704	3,612,000
50+000	70+000	5B	1020	2,599,000
70+000	82+000	7	257	1,804,000
82+000	89+500	8	288	386,000

Maintenance dredging would generally be conducted by hopper and cutterhead dredges, with material being distributed among a nearshore Feeder Berm or the existing Maintenance ODMDS, and upland, confined PAs as shown in Table 3. Maintenance dredging would utilize the same placement areas as those utilized for existing conditions, and the duration and frequency of dredging events would be within the range occurring under current conditions. Dredging of the Entrance and Jetty Channels and the first 11,000 feet of the Main Channel (+11+000 to -17+000) would generally be performed by a hopper dredge, and material suitable for beach placement would be placed in the nearshore Feeder Berm Site 1A, located between 1.5 and 2.5 miles from the North Jetty and from 0.4 to 0.9 miles from shore (USACE, 1988). Sediment removed by maintenance dredging would therefore be regularly placed back into the littoral system, available for cross shore and longshore sediment transport to the beaches of South Padre

Table 3: BIH Maintenance Discharge Locations and Frequency

Channel Stations		Shoaling Rate in Cubic Yards/Year (CY/YR)	PA	PA size (acres)	Dredge Cycle (years)	Number of Cycles in 50 years	Quantity per Cycle (CY/Cycle)	Total O&M Quantity in 50 years (CY)
-17+000	0+000	470,630	Nearshore Feeder Berm Site 1A	320	1.5	33	706,000	23,298,000
0+000	11+000	161,595			4.5	11	727,000	7,997,000
11+000	28+000	183,995	4A	469	4	12	736,000	8,832,000
28+000	34+000	43,047	4B	243	4	12	172,000	2,064,000
34+000	50+000	123,527	5A	704	4	12	494,000	5,928,000
50+000	65+000	143,577	5B	1020	5	10	718,000	7,180,000
65+000	79+000	98,637	7	257	6	8	586,000	4,688,000
79+000	89+500	30,377	8	288	7	7	241,000	1,687,000
							Total CY	61,674,000

Island. Monitoring of material placed at the Feeder Berm has demonstrated that it moves toward the beach and disperses with the major movement being in the alongshore direction (McLellan et al. 1997; USACE, 1989). If for some reason the Feeder Berm cannot be used, maintenance material from the Entrance and Jetty Channels (station -17+000 to 0+000) could be placed in the Maintenance ODMDS, which is located approximately 2.5 nautical miles from shore and north of the channel (USACE, 1975).

Maintenance material from the remainder of the Main Channel (stations 11+000 through 89+500) would be placed in existing PAs 4A, 4B, 5A, 5B, 7 and 8. Upland PAs and containment dikes are sized to accommodate total quantities over the 50-year period of analysis. None of the existing PAs would need to be expanded and no new PAs would be needed. Construction to raise the containment dikes to heights needed to accommodate the 50-year maintenance quantities would be done within the footprints of the existing PAs. Dikes would be raised incrementally as needed to contain maintenance quantities.

(2) Size

Sizes of all of the PAs, ODMDSs and Feeder Berm are shown in Tables 2 and 3.

(3) Type(s) of Sites and Habitats

The proposed project would utilize three types of sites – upland, confined PAs, a nearshore Feeder Berm, and ODMDS. The upland, confined PAs contain temporary, low quality habitats for small mammals, birds and insects between dredging cycles. These habitats are dependent upon a disturbance regime created by recurrent dredged material placement. Vegetation within the PAs consists of scattered grasses, cactus, and shrubs. Grasses include Gulf cordgrass (*Spartina spartinae*), silver bluestem *(Bothriochloa saccharoides)*, curly mesquite *(Hilaria belangeri)* and the introduced species, guinea grass (*Urochloa maxima*). Salt cedar *(Tamarix ramosissima)*, giant sumpweed (*Cyclachaena xanthifolia*), mesquite (*Prosopis glandulosa),* and prickly pear cactus (*Opuntia engelmannii)* are typical tree and shrub species found in the PAs. The PAs are not considered high quality wildlife habitat due to recurring disturbance and lack of established native vegetation. The sparse vegetation in the PAs consists mainly of opportunistic species that thrive on disturbed soils and do not contribute significantly as food or detritus sources or scrub habitat. The Feeder Berm is located in an area of open Gulf of Mexico habitat, a flat featureless slightly sloping seabed with surficial sandy sediment.

(4) Time and Duration of Discharge

Seven construction contracts are planned for dredging and discharging new work material (Table 4). Contract 1 would be constructed with a hopper dredge and contracts 2-7 with hydraulic pipeline dredges. The dredging contracts would be accomplished over a period of about 3.5 years, with most contracts occurring concurrently with at least one other contract. The proposed sequence for dredge and construction is shown in the following table. Construction would begin after the project is authorized by the U.S. Congress. The frequency of maintenance dredging contracts is shown in Table 3.

f. Description of Disposal Method

The construction and maintenance activities would utilize traditional dredging techniques. Equipment used to dredge the channels would be those traditionally employed: hopper dredges in the offshore reaches, and hydraulic pipeline dredges in the other reaches. Disposal of the new work material would be in conventional upland PAs and the offshore ODMDS. Disposal of the maintenance material would be by hopper dredge into the Feeder Berm or Maintenance ODMDS, and by hydraulic pipeline dredges into upland PAs. Best Management Practices (BMPs), such as silt curtains, may be implemented where appropriate to control and reduce turbidity during dredging and placement.

Table 4: Timing and Duration of New Work Discharges			
Contract	Description	PAs	Duration (months)
1	Hopper Dredging Entrance & Jetty Channel (Stations -17+000 to 0+000)	New Work ODMDS	7
2	Dike Construction at PAs 4B and 5A	N/A	15
3	Dike Construction at PAs 8 and 7, and Cutterhead Pipeline Dredging of adjacent section of Main Channel	7 & 8	13
4	Cutterhead Pipeline Dredging of adjacent section of Main Channel	5A	16
5	Dike Construction at PA 2, and Cutterhead Pipeline Dredging of adjacent section of Main Channel	2	6
6	Cutterhead Pipeline Dredging of adjacent section of Main Channel	4B	11
7	Dike Construction at PA 5B, and Cutterhead Pipeline Dredging of adjacent section of Main Channel	5B	12

II. Factual Determinations

a. Physical Substrate Determinations

(1) Substrate Elevation and Slope

The nearshore feeder berm is located between the 19 and 30 foot contours with a gradual slope (less than 1°). The substrate is generally bathymetrically featureless.

(2) Sediment Type

Sediments at the Feeder Berm are sands similar in characteristics to maintenance material to be excavated from the BIH Entrance Channel.

(3) Dredged/Fill Material Movement

Monitoring of material placed at the Feeder Berm has demonstrated that it moves toward the beach and disperses with the major movement being in the alongshore direction (Aidala et al., 1992; McLellan et al., 1997; USACE, 1989). The longshore drift in this area generally flows from south to north, and thus most of the material would move toward the shore and to the north of the Berm location. Temporary mounding of approximately 6 feet would occur as the material is being discharged, but the material would be quickly redistributed into the surf zone by the littoral current and wave action. Upland PAs would have containment levees to control fill movement after deposition; minor amounts of suspended solids may occur during construction.

(4) Physical Effects on Benthos

Temporary and localized impacts to benthic organisms and their Gulf water-bottom habitats would occur; however, benthic organisms are expected to quickly rebound from the short-term impacts of dredged material placement. At the upland, confined PAs, BMPs would be used where appropriate to contain and control sediment and dredged material movement.

(5) Other Effects

None known.

(6) Actions Taken to Minimize Impacts

Impacts to the physical substrate from discharge of dredged material were minimized by confining them to an existing nearshore Feeder Berm and existing upland, confined PAs.

b. Water Circulation, Fluctuation, and Salinity Determinations

(1) Water

Increases in turbidity would occur at dredging locations during construction and maintenance dredging. Temporary increases in turbidity would also occur in the vicinity of the Feeder Berm when dredge material is placed at those locations. Temporary changes in turbidity have not been modeled however they are not expected to significantly impact water quality. The BIH Main Channel is a dead-end channel with low tidal exchange, little fresh water inflow and low velocities, all of which contribute to low dissolved oxygen in some areas at some times during the existing condition. This would be expected to continue. Analyses of water, sediment, and elutriate samples, combined with toxicity and bioaccumulation tests on sediments and suspended sediments, indicate no unacceptable negative impacts can be expected to water quality or sensitive marine organisms during dredging or dredged material placement (SOL and Atkins, 2013).

(a) Salinity. Deepening the Entrance and Jetty Channels at Brazos-Santiago Pass would only minimally increase water exchange between the Gulf of Mexico, South Bay, and the Lower Laguna Madre (Tate and Ross 2012). Recent data show southern portions of the formerly hypersaline Lower Laguna Madre now have salinities approximating those of the Gulf of Mexico (Basin and Bay Expert Science Team, 2012).

Hydrodynamic modeling has determined that no effect on tidal range in the Laguna Madre was discernible. However, the minor increase in circulation in those southern portions of the Lower Laguna Madre may slightly extend periods when salinities are similar to those of the Gulf of Mexico.

(b) Water Chemistry. There are no indications of water or elutriate problems, no impacts are expected.

(c) Clarity. There may be a local and temporary increase in turbidity during dredging and placement operations. BMPs such as temporary containment levees and spill boxes would be implemented where appropriate at the upland, confined PAs to control and reduce turbidity during dredging and discharges. Water clarity is expected to return to normal background levels shortly after operations are completed.

(d) Color. Water immediately surrounding the construction area may become discolored temporarily due to disturbance of the sediment. BMPs as described above would be implemented to reduce and control turbidity.

(e) Odor. The new work material is not expected to be anoxic, so there should be no odors associated with dredging and placement, nor are any expected from Feeder Berm placement. Negligible amounts of hydrogen sulfide may be expected. There should be no change in the maintenance material.

(f) Taste. No impacts are expected.

(g) Dissolved Gas Levels. Areas of low dissolve oxygen occur in the Main Channel under existing conditions. No change is expected with construction of the TSP.

(h) Nutrients. Nutrient levels may be elevated near the PAs during discharge but these increases would be local and temporary.

(i) Eutrophication. Nutrients are not expected to reach levels high enough for periods long enough to lead to eutrophication of the surrounding waters.

(j) Others as Appropriate. None known.

(2) Current Patterns and Circulation

(a) Current Patterns and Flow. The TSP would not have an effect on freshwater inflows to the system. Negligible differences in water surface elevations would occur with construction of the TSP (Tate and Ross, 2012). No effect on tidal range in the Laguna Madre would be discernible. Placement at the Feeder Berm would not block or significantly effect longshore drift or currents. Salinity intrusion is not an issue because overall salinities are already high in this dead-end man-made channel and there is little vertical stratification.

(b) Velocity. Hydrodynamic modeling has determined that the deepening would result is a small change in phasing of flows and in the peak velocity magnitudes in the Main Channel, but velocities are quite low and therefore the increased velocity results in a negligible effect.

(c) Stratification. The Main Channel is well-mixed with little evidence of stratification. No change in this condition is expected with channel deepening (Tate and Ross, 2012).

(d) Hydrologic Regime. Hydrologic and tidal regimes would not be significantly altered (Tate and Ross, 2012).

(3) Normal Water Level Fluctuations

The average water surface elevation throughout the study area would largely be unaffected by the TSP.

(4) Salinity Gradients

Salinity intrusion is not an issue because overall salinities are already high in this dead-end man-made channel and there is little vertical stratification.

(5) Actions That Will Be Taken to Minimize Impacts

Changes in channel depth and width were minimized to the greatest extent possible, such that TSP impacts to water circulation, fluctuation, and salinity would be negligible.

c. Suspended Particulate/Turbidity Determination

(1) Expected Changes in Suspended Particulates and Turbidity Levels in Vicinity of Disposal Site

A temporary and localized increase in suspended particulates and turbidity levels is expected during placement of maintenance material at the Feeder Berm. BMPs would be implemented at upland, confined PAs to minimize suspended particulates and turbidity levels near effluent discharge sites. The upland confined placement area will be designed and operated with the goal of achieving an effluent TSS concentration of not more than 300 mg/L.

(2) Effects on Chemical and Physical Properties of the Water Column

(a) Light Penetration. Turbidity levels would be temporarily increased during dredging and placement operations of new work and maintenance material.

(b) Dissolved Oxygen. No adverse impacts to dissolved oxygen (DO) are expected; a reduction in DO may occur at localized and temporary events during placement.

(c) Toxic metals and organics. Suspended particles resulting from placement would not result in detrimental effects to chemical and physical properties of the water column. Extensive chemical analyses, bioassays, and bioaccumulation studies of offshore sediment material were conducted in accordance with EPA Regulations and the *Ocean Testing Manual* (SOL and Atkins, 2012; SOL and Atkins, 2013) Results indicate that there are no causes for concern related to chemical contaminants and that these sediments are suitable for ocean placement. Similar testing was performed numerous times on maintenance material dredged from the existing BIH Channel, and these sediments were always found to be acceptable for ocean placement.

(d) Pathogens. None expected or found.

(e) Aesthetics. No new upland, confined PAs would be constructed, and the Feeder Berm is located in open Gulf waters.

(f) Others as Appropriate. None known.

(3) Effects on Biota

No impacts are expected on photosynthesis, suspension/filter feeders, and sight feeders, except for temporary and localized impacts from placement operations (e.g., burial of benthos or temporary increase of local turbidity levels).

(4) Actions Taken to Minimize Impacts

Changes in channel depth and width were minimized to the greatest extent possible, such that TSP impacts to suspended particulates and turbidity levels would be negligible.

d. Contaminant Determinations

The USACE has collected and archived a significant amount of water and sediment chemistry data as well as elutriate data that provide information on those constituents that are dissolved into the water column during dredging and placement. Based on available data, there is no indication of current water or elutriate contaminant problems along the BIH Channel.

Extensive chemical analyses, bioassays, and bioaccumulation studies of offshore sediment material were conducted in accordance with EPA Regulations and the *Ocean Testing Manual* (SOL and Atkins, 2012; SOL and Atkins, 2013) Results indicate that there are no causes for concern related to chemical contaminants and that these sediments are suitable for ocean placement.

e. Aquatic Ecosystem and Organism Determinations

(1) Effects on Plankton

Construction and placement operations are expected to have only minor temporary, local impacts on plankton from increased turbidity levels.

(2) Effects on Benthos

Temporary and localized impacts to benthic organisms and their Gulf water-bottom habitats would occur; however, benthic organisms are expected to quickly rebound from the short-term impacts from marsh restoration and shoreline nourishment.

(3) Effects on Nekton

The elutriate analyses and bioassessments with undisturbed virgin sediment yielded no expectation of short-term water column or benthic toxicity from dredging or placement operations, except from increased turbidity. Therefore, no significant impacts to the nekton of the area from the proposed dredging and placement operations are expected.

(4) Effects on Aquatic Food Web

Reductions in primary productivity from turbidity would be localized around the immediate area of the construction and maintenance dredge operations and would be limited to the duration of the plume at a given site.

(5) Effects on Special Aquatic Sites

The TSP is not expected to have detrimental effects on special aquatic sites in the study area (i.e., sanctuaries and refuges, wetlands, mudflats, vegetated shallows). There are no coral reefs or riffle and pool complexes in the study area.

(6) Threatened and Endangered Species

Potential TSP effects on threatened and endangered species have been assessed and coordinated with the U.S. Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS). The Biological Assessment is provided in Appendix I of the DIFR-EA.

For the species under the jurisdiction of NMFS, USACE has concluded that hopper dredging to construct the proposed project is likely to adversely affect federally-listed endangered swimming Kemp's ridley and hawksbill sea turtles, and the threatened swimming green and loggerhead sea turtles. USACE has also concluded that the project may affect, but is not likely to adversely affect the endangered swimming leatherback sea turtle. The TSP would have no effect on the listed blue whale, finback whale, humpback whale, sei whale, or sperm whale, or on the following Candidate species and Species of Concern - scalloped hammerhead shark, boulder star coral (subspecies *annularis* and *franksi*), elliptical star coral, Lamarck's sheet coral, mountainous star coral, pillar coral, rough cactus coral, dusky shark, sand tiger shark, opossum pipefish, warsaw grouper and speckled hind (USACE 2013; USFWS 2013).

For the species under the jurisdiction of USFWS, USACE has concluded that the TSP would have no effect on threatened or endangered nesting sea turtles, South Texas ambrosia, Texas ayenia or piping plover critical habitat. USACE has determined that the TSP may effect but is not likely to adversely affect the federally-listed piping plover, Northern Aplomado falcon, Gulf Coast jaguarundi, ocelot, and West Indian manatee. The BIH TSP will also have no effect on Candidate bird species potentially present in the study area - the red knot, red-crowned parrot, Sprague's pipit.

(7) Other Wildlife

No significant TSP impacts to other wildlife species are anticipated.

(8) Actions to Minimize Impacts

USACE has requested formal Section 7 consultation with NMFS regarding potential TSP impacts to threatened and endangered swimming sea turtles, and will apply reasonable and prudent conservation measures to minimize impacts to these species. In addition, the USACE will implement USFWS conservation recommendations to minimize impacts to the piping plover, Northern Aplomado falcon, Gulf Coast jaguarundi, ocelot, and West Indian manatee. These conservation measures are described in section 7.4 of the DIFR-EA.

f. Proposed Disposal Site Determinations

(1) Mixing Zone Determination

Mixing is not required due to the lack of contaminated sediments that would be associated with construction of the TSP. At the Feeder Berm, widespread dispersion by the longshore littoral current w spread the dredged material naturally over a large area of substrate.

(2) Determination of Compliance with Applicable Water Quality Standards

In the No Action Alternative (FWOP condition) condition, water and sediment quality are not expected to substantially change in the BIH channel, its surrounding waters, and the near-shore Gulf of Mexico. The Gulf of Mexico should continue to dominate water quality in the study area. TCEQ water quality standards should continue to be met in South Bay, the Lower Laguna Madre, and the near-shore Gulf of Mexico. Episodes of low dissolved oxygen and occasional elevated levels of *Enterococcus* bacteria in the BSC, believed to result from nonpoint source pollution, would probably continue to occur (TCEQ, 2011). Three decades of water and chemistry data from the BIH have documented no concerns with contaminated sediments in the project area. Information describing in the results of water, sediment, and elutriate water testing under current conditions are available upon request.

For the future with project alternative, no violation of water quality standards is anticipated. Sediment analyses of material that would be dredged in the Entrance and Jetty Channels, and testing of elutriates prepared with shoaled material from the Main Channel have been performed, and neither have demonstrated any violation of applicable water quality standards. Material that would be dredged with TSP deepening is expected to be overwhelmingly impervious clay sediment. Analyses of recent water, sediment, and elutriate samples, combined with toxicity and bioaccumulation tests on sediments and suspended sediments, indicate no unacceptable negative impacts can be expected to water quality or sensitive marine organisms during dredging or dredged material placement (SOL and Atkins, 2012; SOL and Atkins, 2013).

(3) Potential Effects on Human Use Characteristics

(a) Municipal and Private Water Supply. The TSP would not impact any municipal or private water supplies.

(b) Recreational and Commercial Fisheries. No impacts to recreational and commercial fishing in the lower Laguna Madre and the immediate Gulf are anticipated as there are no expected impacts to the marine food web.

(c) Water-related Recreation. The project would improve navigation, which may improve water-related recreation.

(d) Aesthetics. The project is designed to minimize any adverse impacts to the environment and aesthetic qualities in the area.

(e) Parks, National and Historic Monuments, National Seashores, Wilderness Areas, Research Sites, and Similar Preserves. No special sites would be negatively impacted by the project.

g. Determination of Cumulative Effects on the Aquatic Ecosystem. The TSP is expected to have negligible impacts to the environment and therefore would not add to negative cumulative impacts in the aquatic ecosystem.

h. Determination of Secondary Effects on the Aquatic Ecosystem. No adverse significant secondary effects on the aquatic ecosystem should occur as a result of the TSP.

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FINDINGS OF COMPLIANCE WITH
SECTION 404(b)(1) GUIDELINES
FOR
BRAZOS ISLAND HARBOR CHANNEL IMPROVEMENT PROJECT
CAMERON COUNTY, TEXAS

1. No significant adaptations of the Guidelines were made relative to the evaluation for this project.

2. The TSP is the result of thorough evaluation of thirteen proposed alternatives (including the No-Action Alternative).

3. The TSP would not violate any applicable State or Federal water quality criteria or toxic effluent standards of Section 307 of the Clean Water Act.

4. The TSP would not adversely affect any federally or State-listed threatened or endangered species or their critical habitat or violate any protective measures for any sanctuary. The US Fish and Wildlife Service and National Marine Fisheries Service have been consulted regarding potential issues of any federally or State-listed threatened or endangered species or their critical habitat (e.g., sea turtle avoidance measures would be implemented during operations).

5. The TSP would not result in adverse effects on human health and welfare, including municipal and private water supplies, recreation and commercial fishing, plankton, fish, shellfish, wildlife, and special aquatic sites. There are no significant adverse impacts expected to the estuarine ecosystem diversity, productivity and stability, or recreational, aesthetic, and economic values.

6. Appropriate steps to minimize potential adverse impacts on the estuarine system include close coordination with State and Federal resource agencies during final design prior to construction to incorporate all valid suggestions.

7. Based on the guidelines, the preferred alternative is specified as complying with the requirements of the Section 404(b)(1) guidelines.

Carolyn Murphy

Carolyn Murphy
Chief, Environmental Section
U.S. Army Corps of Engineers, Galveston District

30 Oct 13
Date

Brazos Island Harbor, Texas
Channel Improvement Project

Appendix H
Coastal Zone Management Act Coordination – Consistency Determination

July 2014

APPENDIX H

TEXAS COASTAL MANAGEMENT PROGRAM
CONSISTENCY DETERMINATION
COMPLIANCE WITH GOALS AND POLICIES – DREDGING AND DREDGED MATERIAL DISPOSAL AND PLACEMENT
BRAZOS ISLAND HARBOR
CHANNEL IMPROVEMENT PROJECT
CAMERON COUNTY, TEXAS

U.S. Army Corps of Engineers, Galveston District
2000 Fort Point Road
Galveston, Texas 77550

July 2014

Appendix H

Compliance with Goals and Policies – Section 501.25 (*a*)–(*i*)
Dredging and Dredged Material Disposal and Placement
Brazos Island Harbor Channel Improvement Project
Environmental Assessment
Cameron County, Texas
Texas Coastal Management Program

INTRODUCTION

To achieve navigation efficiency and safety objectives, the U.S. Army Corps of Engineers (USACE) plans to extend the Brazos Island Harbor (BIH) Entrance Channel to a depth of -54 feet mean lower low water (MLLW) and width of 300 feet, deepen the existing BIH Entrance Channel to -54 feet MLLW at an existing width of 300 feet, deepen the existing BIH Jetty Channel to -54 feet MLLW at an existing width of 300 feet, deepen the Brownsville Main Channel to a depth of -52 feet MLLW at existing widths ranging from 250 to 400 feet, and maintain the existing depth of -42 feet MLLW and width of 325 feet from station 84+200 to 86+000, and maintain the existing depth of -36 feet MLLW and widths ranging from 325 to 1200 feet from station 86+000 through the end of the channel and turning basin at station 89+500. No channel widening is proposed and channel side slopes would remain the same as the existing project – one foot vertical over six feet horizontal in the Entrance and Jetty Channels; one foot vertical over three feet horizontal from station 0+000 to 35+000 and one foot vertical over two and one-half feet horizontal from station 35+000 through 89+500 in the Main Channel. The actual dredging depth would be up to 4 feet deeper in the Entrance and Jetty Channels due to 2 feet of advance maintenance (AM) and 2 feet of allowable overdepth (AO), and up to 3 feet deeper in the Main Channel due to 2 feet of AM and 1 foot of AO. No improvements are proposed for the existing jetties. If the project is authorized, the three-year construction period could begin in fiscal year 2018.

Construction of the proposed project would generate approximately 14.1 million cubic yards (mcy) of dredged material. Maintenance of the deepened and widened channel would generate a total of 61.7 mcy of maintenance-dredged material over the 50-year evaluation period. Material dredged from the Entrance and Jetty channels during construction would be placed in the new work Ocean Dredged Material Disposal Site (ODMDS), and the remainder of the new work material would be placed in dredged material placement areas (PAs) 2, 4B, 5A, 5B, 7, and 8. Several alternatives were analyzed including a No Action Alternative and the USACE Tentatively Selected Plan (TSP).

The existing Brownsville Ship Channel 42-Foot Project was authorized by the Water Resources Development Act of 1986, providing for an Entrance Channel of 44-foot depth and 300-foot width from the Gulf to offshore end of the jetties, for the Jetty channel of 44-foot depth and 300 to 400-foot width to the Laguna Madre, and the main channel of 42-foot depth and 250 to 400-foot width from the Laguna Madre to the Turning Basin Extension. The Turning Basin Extension was authorized to a depth of 42 feet transitioning to 36-foot depth with widths transitioning from 400 feet to 325 feet into the Turning Basin at the 36-foot depth and widths ranging from 325 to 1,200 feet. The waterway traverses 19.4 miles with no bridges or obstructions and is operated for one-way traffic only.

The Port of Brownsville is the only deep-draft port available to industry along the U.S. – Mexico border. Brownsville is primarily a bulk commodity port covering both liquid and dry cargo handling. The increased traffic is a direct result of NAFTA (North American Free Trade Agreement) in that a majority of the increased commodity traffic is to meet industrial needs in Mexico. The current dimensions of the ship channel limit the efficient movement of commodities by vessels travelling the waterway. As vessels increase in draft, the restrictive depth of the waterway would prevent vessels from entering with full loads or prevent larger vessels from utilizing the waterway. One-way traffic limitations do not appear to be an issue with the existing channel and are not expected to become a concern in the future. Additionally, the current channel dimensions limit the ability for oil drilling rig fabrication, maintenance, and repair at the Port of Brownsville.

The USACE and the Brownsville Navigation District (referred to as Port of Brownsville), as the non-Federal sponsor, propose to improve the navigation channels of Brazos Island Harbor as a Federal action by deepening the current channel alignment, starting at the 54-foot depth contour, and terminating at the Brownsville Turning Basin. This project is referred to as the Brazos Island Harbor Channel Improvement Project (BIHCIP).

COMPLIANCE WITH GOALS AND POLICIES

The following goals and policies of the Texas Coastal Management Program (TCMP) were reviewed for compliance:

§501.25 – Dredging and Dredged Material Disposal and Placement

(a) *Dredging and the disposal and placement of dredged material shall avoid and otherwise minimize adverse effects to coastal waters, submerged lands, critical areas, coastal shore areas, and Gulf beaches to the greatest extent practicable. The policies of this section are supplemental to any further restrictions or requirements relating to the beach access and use rights of the public. In implementing this section, cumulative and secondary adverse effects of dredging and the disposal and placement of dredged material and the unique characteristics of affected sites shall be considered.*

<u>Compliance</u>: Deepening of the Entrance Channel to an authorized depth of -54 feet would extend the existing navigation channel an additional 4,000 feet (0.75 mile) and impact 27.5 acres of submerged lands. Dredged material will be placed in seven existing, upland, confined PAs, one nearshore Feeder Berm and two Ocean Dredged Material Disposal Sites (New Work and Maintenance ODMDSs). Placement within the ODMDSs would result in placement of dredged material within submerged lands, but the ODMDSs are dispersive by nature, have been previously used, and will likely revert to the in situ topography within a few months of their use. Maintenance material would also be placed by hopper dredge in the nearshore Feeder Berm Site 1A, located between 1.5 and 2.5 miles from the north jetty and from 0.4 to 0.9 miles from shore. Sediment removed by maintenance dredging would therefore be regularly placed back into the littoral system, available for cross shore and longshore sediment transport to the beaches of South Padre Island.

Dredging operations would alter benthic habitats through evacuation of bay bottom and dredged material placement; evacuation buries and removes benthic organisms and placement smothers or buries benthic communities. The impact to benthic organisms is likely to be confined to the immediate vicinity of the area dredged (Newell et al., 1998) and recovery of benthic macroinvertebrates following burial in the ODMDS and Feeder Berm is typically rapid (recovering within months rather than years) (VanDerWal et al., 2011; Wilber et al. 2006; Wilber and Clarke, 2001). No long-term impacts are expected in the area dredged or disposal areas.

Monitoring of material placed at the Feeder Berm has demonstrated that it moves toward the beach and disperses with the major movement being in the alongshore direction (McLellan et al. 1997; USACE 1989). No construction activities would occur on the adjacent Gulf shoreline; sediment would be moved by natural processes on the shoreline. With the exception of submerged lands, which would be temporarily impacted, all critical areas, shore areas, and Gulf beaches are avoided.

(1) Dredging and dredged material disposal and placement shall not cause or contribute, after consideration of dilution and dispersion, to violation of any applicable surface water quality standards established under §501.21 of this title.

<u>Compliance</u>: Samples have been taken from both maintenance and new work sediments in the project area and subjected to elutriate preparation and suspended particulate bioassays. No Texas Water Quality Standards or U.S. Environmental Protection Agency Water Quality Criteria were exceeded, and nothing in the results of the bioassays indicates any cause for concern. For all PAs, adequate dilution and dispersion occurs so that applicable surface water standards are not violated.

(2) Except as otherwise provided in paragraph (4) of this subsection, adverse effects on critical areas from dredging and dredged material disposal or placement shall be avoided and otherwise minimized, and appropriate and practicable compensatory mitigation shall be required, in accordance with §501.23 of this title.

Compliance: The TSP Alternative PAs, ODMDSs and Feeder Berm avoid adverse effects on critical areas.

(3) Except as provided in paragraph (4) of this subsection, dredging and the disposal and placement of dredged material shall not be authorized if:

(A) there is a practicable alternative that would have fewer adverse effects on coastal waters, submerged lands, critical areas, coastal shore areas, and Gulf beaches, so long as that alternative does not have other significant adverse effects;

Compliance: Several alternatives were analyzed including a No Action Alternative and a TSP Alternative; dredged material placement activities were confined to existing PA footprints, avoiding of detrimental impacts to coastal natural resources such as estuarine wetlands, oyster reefs, etc., to reduce impacts.

(B) all appropriate and practicable steps have not been taken to minimize adverse effects on coastal waters, submerged lands, critical areas, coastal shore areas, and Gulf beaches; or

Compliance: All practicable steps, including upland placement to the extent practicable, utilization of existing PAs, and minimum channel size to meet the project needs have been taken to minimize adverse affects on these resources.

(C) Significant degradation of critical areas under §501.23(a)(7)(E) of this title would result.

Compliance: Critical areas are avoided and degradation of such areas is not anticipated as a result of the TSP Alternative.

(4) A dredging or dredged material disposal or placement project that would be prohibited solely by application of paragraph (3) of this subsection may be allowed if it is determined to be of overriding importance to the public and national interest in light of economic impacts on navigation and maintenance of commercially navigable waterways.

Compliance: Dredging and placement is not precluded by paragraph (3).

(b) Adverse effects from dredging and dredged material disposal and placement shall be minimized as required in subsection (a) of this section. Adverse effects can be minimized by employing the techniques in this subsection where appropriate and practicable.

Compliance: There will be no adverse effects of dredging and disposal, as described in this DIFR-EA.

(1) Adverse effects from dredging and dredged material disposal and placement can be minimized by controlling the location and dimensions of the activity. Some of the ways to accomplish this include:

(A) locating and confining discharges to minimize smothering of organisms;

(B) locating and designing projects to avoid adverse disruption of water inundation patterns, water circulation, erosion and accretion processes, and other hydrodynamic processes;

(C) using existing or natural channels and basins instead of dredging new channels or basins, and discharging materials in areas that have been previously disturbed or used for disposal or placement of dredged material;

(D) limiting the dimensions of channels, basins, and disposal and placement sites to the minimum reasonably required to serve the project purpose, including allowing for reasonable overdredging of channels and basins, and taking into account the need for capacity to accommodate future expansion without causing additional adverse effects;

(E) discharging materials at sites where the substrate is composed of material similar to that being discharged;

(F) locating and designing discharges to minimize the extent of any plume and otherwise control dispersion of material; and

(G) avoiding the impoundment or drainage of critical areas.

Compliance: PAs have been selected to minimize impacts by using existing upland confined PAs or existing and previously authorized ODMDS. Dimensions of the proposed channel have been minimized to the greatest extent possible. Only negligible impacts to water circulation and salinity from channel improvements have been identified. Discharges will be confined with reinforced levees, where applicable. Only proper material will be used for certain substrates and uses. No impoundment or draining of critical areas will occur. No new channels are required to access existing or proposed PAs (upland and ODMDS).

(2) Dredging and disposal and placement of material to be dredged shall comply with applicable standards for sediment toxicity. Adverse effects from constituents contained in materials discharged can be minimized by treatment of or limitations on the material itself. Some ways to accomplish this include:

(A) disposal or placement of dredged material in a manner that maintains physiochemical conditions at discharge sites and limits or reduces the potency and availability of pollutants;

(B) limiting the solid, liquid, and gaseous components of material discharged;

(C) adding treatment substances to the discharged material; and

(D) adding chemical flocculants to enhance the deposition of suspended particulates in confined disposal areas.

Compliance: Sediments to be dredged from the TSP Alternative have been tested for a variety of chemical parameters, and there appears to be no cause for concern relative to placing these sediments in the ODMDSs, Feeder Berm or upland confined PAs.

(3) Adverse effects from dredging and dredged material disposal or placement can be minimized through control of the materials discharged. Some ways of accomplishing this include:

(A) use of containment levees and sediment basins designed, constructed, and maintained to resist breaches, erosion, slumping, or leaching;

(B) use of lined containment areas to reduce leaching where leaching of chemical constituents from the material is expected to be a problem;

(C) capping in-place contaminated material or, selectively discharging the most contaminated material first and then capping it with the remaining material;

(D) properly containing discharged material and maintaining discharge sites to prevent point and nonpoint pollution; and

(E) timing the discharge to minimize adverse effects from unusually high water flows, wind, wave, and tidal actions.

Compliance: Discharges will be confined with reinforced levees where applicable. Analyses of water, sediment, and elutriate samples, combined with toxicity and bioaccumulation tests on sediments and suspended sediments, indicate no unacceptable negative impacts can

be expected to water quality or sensitive marine organisms during dredging or dredged material placement (SOL and Atkins, 2013).

(4) Adverse effects from dredging and dredged material disposal or placement can be minimized by controlling the manner in which material is dispersed. Some ways of accomplishing this include:

(A) where environmentally desirable, distributing the material in a thin layer;

(B) orienting material to minimize undesirable obstruction of the water current or circulation patterns;

(C) using silt screens or other appropriate methods to confine suspended particulates or turbidity to a small area where settling or removal can occur;

(D) using currents and circulation patterns to mix, disperse, dilute, or otherwise control the discharge;

(E) minimizing turbidity by using a diffuser system or releasing material near the bottom;

(F) selecting sites or managing discharges to confine and minimize the release of suspended particulates and turbidity and maintain light penetration for organisms; and

(G) setting limits on the amount of material to be discharged per unit of time or volume of receiving waters.

Compliance: All of the sites minimize or avoid adverse dispersal effects to the greatest extent practicable. At the ODMDS, studies indicate adequate dispersion and dilution would occur during discharge. Sequenced discharge points will be used to disperse material across the ODMDS. There are no sediments of concern.

(5) Adverse effects from dredging and dredged material disposal or placement operations can be minimized by adapting technology to the needs of each site. Some ways of accomplishing this include:

(A) using appropriate equipment, machinery, and operating techniques for access to sites and transport of material, including those designed to reduce damage to critical areas;

(B) having personnel on site adequately trained in avoidance and minimization techniques and requirements; and

(C) *designing temporary and permanent access roads and channel spanning structures using culverts, open channels, and diversions that will pass both low and high water flows, accommodate fluctuating water levels, and maintain circulation and faunal movement.*

Compliance: Where applicable, all sites in this project meet this requirement. Contracts will be written to ensure compliance with all standards. The ODMDS is accessed by offshore hopper dredging vessels and all upland PAs can be accessed by land-based equipment without damaging critical areas.

(6) *Adverse effects on plant and animal populations from dredging and dredged material disposal or placement can be minimized by:*

(A) *avoiding changes in water current and circulation patterns that would interfere with the movement of animals;*

(B) *selecting sites or managing discharges to prevent or avoid creating habitat conducive to the development of undesirable predators or species that have a competitive edge ecologically over indigenous plants or animals;*

(C) *avoiding sites having unique habitat or other value, including habitat of endangered species;*

(D) *using planning and construction practices to institute habitat development and restoration to produce a new or modified environmental state of higher ecological value by displacement of some or all of the existing environmental characteristics;*

(E) *using techniques that have been demonstrated to be effective in circumstances similar to those under consideration whenever possible and, when proposed development and restoration techniques have not yet advanced to the pilot demonstration stage, initiating their use on a small scale to allow corrective action if unanticipated adverse effects occur;*

(F) *timing dredging and dredged material disposal or placement activities to avoid spawning or migration seasons and other biologically critical time periods; and*

(G) *avoiding the destruction of remnant natural sites within areas already affected by development.*

Compliance: Proper coordination with the U.S. Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS), under the requirements of the Endangered Species Act, was implemented, and no impacts to endangered species or their habitats are

anticipated, except for potential impacts to sea turtles during hopper dredging. Impacts to sea turtles, a primary wildlife concern, will be avoided or minimized via: (1) hopper dredging will be limited to the cooler months, when possible, when sea turtle activity and abundance is lowest; (2) dredges will employ trawls to safely remove sea turtles before being adversely affected by dredge equipment; and (3) qualified turtle observers will be used to document any turtles that become entrained by the hopper dredge dragheads, and all information will be submitted accordingly to USFWS and NMFS. Additional conservation recommendations from USFWS have been adopted to minimize the potential, though low probability, of impacts to the piping plover, Aplomado falcon, jaguarundi, ocelot, and manatee.

(7) Adverse effects on human use potential from dredging and dredged material disposal or placement can be minimized by:

(A) selecting sites and following procedures to prevent or minimize any potential damage to the aesthetically pleasing features of the site, particularly with respect to water quality;

(B) selecting sites which are not valuable as natural aquatic areas;

(C) timing dredging and dredged material disposal or placement activities to avoid the seasons or periods when human recreational activity associated with the site is most important; and

(D) selecting sites that will not increase incompatible human activity or require frequent dredge or fill maintenance activity in remote fish and wildlife areas.

Compliance: Only existing PAs are proposed for use to avoid additional impacts to resources. Temporary and minor adverse effects to fisheries may result from altering or removing productive fishing grounds and interfering with fishing activity near or in the ODMDS and within the project area during construction and maintenance.

(8) Adverse effects from new channels and basins can be minimized by locating them at sites:

(A) that ensure adequate flushing and avoid stagnant pockets; or

(B) that will create the fewest practicable adverse effects on CNRAs from additional infrastructure such as roads, bridges, causeways, piers, docks, wharves, transmission line crossings, and ancillary channels reasonably likely to be constructed as a result of the project; or

(C) *with the least practicable risk that increased vessel traffic could result in navigation hazards, spills, or other forms of contamination that could adversely affect CNRAs;*

(D) *provided that, for any dredging of new channels or basins subject to the requirements of §501.15 of this title (relating to Policy for Major Actions), data and information on minimization of secondary adverse effects need not be produced or evaluated to comply with this paragraph if such data and information is produced and evaluated in compliance with §501.15(b)(1) of this title.*

Compliance: The TSP Alternative will not impact any CNRAs (except submerged lands at the ODMDSs and Feeder Berm, which are expected to return to ambient bathymetry since they are dispersive sites).

(c) *Disposal or placement of dredged material in existing contained dredge disposal sites identified and actively used as described in an environmental assessment or environmental impact statement issued prior to the effective date of this chapter shall be presumed to comply with the requirements of subsection (a) of this section unless modified in design, size, use, or function.*

Compliance: All dredged material will be placed within existing contained upland PAs, the ODMDSs and the nearshore Feeder Berm. A new levee will be constructed along a portion of the southern boundary of PA 4B to provide protection between a loma to the south and the east and west cells of PA 4B. This new levee construction will occur within the boundaries of the existing, active PA.

(d) *Dredged material from dredging projects in commercially navigable waterways is a potentially reusable resource and must be used beneficially in accordance with this policy.*

Compliance: Material from construction is expected to be primarily stiff clay, which can be used to reestablish appropriate intertidal elevations in existing open water areas prior to wetland restoration. However, areas suitable for this type of restoration are extremely limited near the BIH channel, and the potential for ancillary impacts to significant resources such as SAV and black mangroves is high. This material type is not conducive for the BU that is most important for this area (i.e., beach nourishment, which requires high sand content). However, material from maintenance dredging is expected to be comprised primarily of sand and silt. Sandy material from the Entrance and Jetty Channels and the first 11,000 feet of the Main Channel would be used beneficially. This material would generally be placed in the nearshore Feeder Berm Site 1A (USACE, 1988). Sediment removed by maintenance dredging

would therefore be regularly placed back into the littoral system, available for cross-shore and longshore sediment transport to the beaches of South Padre Island.

(1) If the costs of the BU of dredged material are reasonably comparable to the costs of disposal in a non-beneficial manner, the material shall be used beneficially.

(2) If the costs of the BU of dredged material are significantly greater than the costs of disposal in a non-beneficial manner, the material shall be used beneficially unless it is demonstrated that the costs of using the material beneficially are not reasonably proportionate to the costs of the project and benefits that will result. Factors that shall be considered in determining whether the costs of the BU are not reasonably proportionate to the benefits include, but are not limited to:

(A) environmental benefits, recreational benefits, flood or storm protection benefits, erosion prevention benefits, and economic development benefits;

(B) the proximity of the BU site to the dredge site; and

(C) the quantity and quality of the dredged material and its suitability for BU.

(3) Examples of the BU of dredged material include, but are not limited to:

(A) projects designed to reduce or minimize erosion or provide shoreline protection;

(B) projects designed to create or enhance public beaches or recreational areas;

(C) projects designed to benefit the sediment budget or littoral system;

(D) projects designed to improve or maintain terrestrial or aquatic wildlife habitat;

(E) projects designed to create new terrestrial or aquatic wildlife habitat, including the construction of marshlands, coastal wetlands, or other critical areas;

(F) projects designed and demonstrated to benefit benthic communities or aquatic vegetation;

(G) projects designed to create wildlife management areas, parks, airports, or other public facilities;

(H) projects designed to cap landfills or other waste disposal areas;

(I) projects designed to fill private property or upgrade agricultural land, if cost-effective public BUs are not available; and

(J) projects designed to remediate past adverse impacts on the coastal zone.

<u>Compliance</u>: New work material will be comprised primarily of stiff clays which are not suitable for beneficial use. Material from maintenance dredging is expected to be comprised primarily of sand and silt. Sandy material from the Entrance and Jetty Channels and the first 11,000 feet of the Main Channel would be used beneficially. This material would generally be placed in the nearshore Feeder Berm Site 1A (USACE, 1988). Sediment removed by maintenance dredging would therefore be regularly placed back into the littoral system, available for cross-shore and longshore sediment transport to the beaches of South Padre Island.

(e) If dredged material cannot be used beneficially as provided in subsection (d)(2) of this section, to avoid and otherwise minimize adverse effects as required in subsection (a) of this section, preference will be given to the greatest extent practicable to disposal in:

(1) contained upland sites;

(2) other contained sites; and

(3) open water areas of relatively low productivity or low biological value.

<u>Compliance:</u> New work and future maintenance dredged material whose sediment characteristics preclude being used beneficially will be placed in either the ODMDS or the existing upland confined PAs.

(f) For new sites, dredged materials shall not be disposed of or placed directly on the boundaries of submerged lands or at such location so as to slump or migrate across the boundaries of submerged lands in the absence of an agreement between the affected public owner and the adjoining private owner or owners that defines the location of the boundary or boundaries affected by the deposition of the dredged material.

<u>Compliance</u>: All dredged material will be placed within the existing ODMDS, Feeder Berm and upland PAs. No new PAs will be constructed.

(g) Emergency dredging shall be allowed without a prior consistency determination as required in the applicable consistency rule when:

(1) there is an unacceptable hazard to life or navigation;

(2) there is an immediate threat of significant loss of property; or

(3) an immediate and unforeseen significant economic hardship is likely if corrective action is not taken within a time period less than the normal time needed under

standard procedures. The council secretary shall be notified at least 24 hours prior to commencement of any emergency dredging operation by the agency or entity responding to the emergency. The notice shall include a statement demonstrating the need for emergency action. Prior to initiation of the dredging operations the project sponsor or permit-issuing agency shall, if possible, make all reasonable efforts to meet with council's designated representatives to ensure consideration of and consistency with applicable policies in this subchapter. Compliance with all applicable policies in this subchapter shall be required at the earliest possible date. The permit-issuing agency and the applicant shall submit a consistency determination within 60 days after the emergency operation is complete.

Compliance: The project would comply with *section (g)* in the event that emergency dredging is necessary.

(h) There will be no mining of sand, shell, marl, gravel, or mudshell for project purposes. Dredged new work and maintenance material will be placed within ODMDSs, which are located within submerged lands, and shall be prohibited unless there is an affirmative showing of no significant impact on erosion within the coastal zone and no significant adverse effect on coastal water quality or terrestrial and aquatic wildlife habitat within any CNRA.

Compliance: Use of the ODMDSs would have no significant impact on erosion, water quality or aquatic wildlife habitat within any CNRA. The effects of the ODMDSs have been evaluated and are discussed in the DIFR-EA. With the exception of submerged lands, which would be temporarily impacted, all CNRAs are avoided.

(i) The GLO and the SLB shall comply with the policies in this section when approving oil, gas, and other mineral lease plans of operation and granting surface leases, easements, and permits and adopting rules under the Texas Natural Resources Code, Chapters 32, 33, and 51 - 53, and Texas Water Code, Chapter 61, for dredging and dredged material disposal and placement. TxDOT shall comply with the policies in this subchapter when adopting rules and taking actions as local sponsor of the Gulf Intracoastal Waterway under Texas Transportation Code, Chapter 51. The TCEQ and the RRC shall comply with the policies in this section when issuing certifications and adopting rules under Texas Water Code, Chapter 26, and the Texas Natural Resources Code, Chapter 91, governing certification of compliance with surface water quality standards for Federal actions and permits authorizing dredging or the discharge or placement of dredged material. The TPWD shall comply with the policies in this section when adopting rules at Chapter 57 of this title (relating to Fisheries) governing dredging and dredged material disposal and placement. The TPWD shall comply with the policies in subsection (h) of

this section when adopting rules and issuing permits under Texas Parks and Wildlife Code, Chapter 86, governing the mining of sand, shell, marl, gravel, and mudshell.

Compliance: This project does not pertain to oil, gas, and other mineral lease plans of operation and granting surface leases, easements, and permits; *section (i)* is not applicable.

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TEXAS GENERAL LAND OFFICE
JERRY PATTERSON, COMMISSIONER

March 10, 2014

Colonel Richard P. Pannell
District Commander
U.S. Army Corps of Engineers, Galveston District
P.O. Box 1229
Galveston, TX 77553-1229

Re: Consistency Determination for the Brazos Island Harbor Channel Improvement Project, Cameron County, Texas
CMP#: 14-1310-F2

Dear Colonel Pannell:

Pursuant to Title 31 Natural Resources and Conservation, Part 16 Coastal Coordination Council rules, the project referenced above has been reviewed for consistency with the Texas Coastal Management Program (CMP).

It has been determined that there are no significant unresolved consistency issues with respect to the project. Therefore, this project is consistent with the CMP goals and policies.

Please note that this letter does not authorize the use of Coastal Public Land. No work may be conducted or structures placed on State-owned land until you have obtained all necessary authorizations, including any required by the General Land Office and the U.S. Army Corps of Engineers.

If you have any questions or concerns, please contact me at (512) 475-3624 or at ray.newby@glo.texas.gov

Sincerely,

Ray Newby, P.G.
Coastal Geologist
Coastal Resources
Texas General Land Office

email cc: Janelle Stokes, USACE

Brazos Island Harbor, Texas Channel Improvement Project

Appendix I
Endangered Species Act – Biological Assessment

July 2014

APPENDIX I

ENDANGERED SPECIES ACT COORDINATION
BRAZOS ISLAND HARBOR
CHANNEL IMPROVEMENT PROJECT
CAMERON COUNTY, TEXAS

U.S. Army Corps of Engineers, Galveston District
2000 Fort Point Road
Galveston, Texas 77550

July 2014

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US Army Corps
of Engineers ®
Galveston District

FINAL
BIOLOGICAL ASSESSMENT FOR
FEDERALLY-LISTED
THREATENED AND ENDANGERED SPECIES

BRAZOS ISLAND HARBOR CHANNEL IMPROVEMENT PROJECT
TENTATIVELY SELECTED PLAN (52 FEET BY 250 FEET PROJECT)
CAMERON COUNTY, TEXAS

PREPARED BY U.S. ARMY CORPS OF ENGINEERS
GALVESTON DISTRICT
2000 FORT POINT ROAD
GALVESTON, TEXAS 77550

May 2014

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Texas General Land Office (GLO)
Total suspended solids (TSS)
Turtle extruder devices (TEDs)
United States (U.S.)
United States Army Corps of Engineers (USACE)
United States Fish and Wildlife Service (USFWS)

1.0 INTRODUCTION

1.1 PURPOSE OF THE BIOLOGICAL ASSESSMENT

This Biological Assessment (BA) is being prepared for the purpose of fulfilling the U.S. Army Corps of Engineers (USACE) requirements as outlined under Section 7(c) of the Endangered Species Act (ESA) of 1973, as amended, and to assist the National Marine Fisheries Service (NMFS) and United States Fish and Wildlife Service (USFWS) personnel in fulfilling their obligations under the ESA. The proposed Federal action is a channel improvement project for the Brazos Island Harbor (BIH) Project, an existing Federal deep-draft navigation project in Cameron County, Texas (USACE, 1990). The tentatively selected plan (TSP) would deepen the existing 42-foot authorized project to an authorized depth of 52-feet mean lower low water (MLLW).

This BA addresses potential new construction to deepen the channel and associated placement of new work materials, and operations and maintenance dredging activities for the 50-year period of analysis. However, for the purposes of Section 7 consultation with NMFS, operation and maintenance dredging activities for the proposed project would be covered by the existing Biological Opinion Consultation No. F/SER/2000/01287 with the National Marine Fisheries Service (NMFS, 2003).

1.2 PROJECT SETTING

The existing BIH navigation project services the Port of Brownsville (POB), which is situated at the western end of the man-made BIH navigation channel in Cameron County, Texas (Figure 1). The non-Federal sponsor for the study is the Brownsville Navigation District (BND). The existing project includes the BIH Entrance-Jetty Channel which extends about 2.5 miles into the Gulf of Mexico, and the Brownsville Main Channel which terminates at a turning basin about 17 miles inland from the Gulf of Mexico (Table 1). The POB is located at the turning basin, about three miles north of the Rio Grande River (the international border with Mexico) and five miles east of the City of Brownsville. In this assessment, the footprint of proposed navigation improvements and placement areas will be referred to as the "project area."

The" study area" encompasses the entire project area, as defined above, and is a larger area for which environmental effects of alternative plans have been analyzed. The study area consists of approximately 103,250 acres (160 square miles) in the Brownsville Navigation District (BND and extends 3 miles north, south, and west of the BIH channel and 5 miles offshore into the Gulf of Mexico. The study area also is extended for 10 miles along the Gulf of Mexico beach on both sides of Brazos Santiago Pass for the purpose of evaluating potential shoreline impacts from

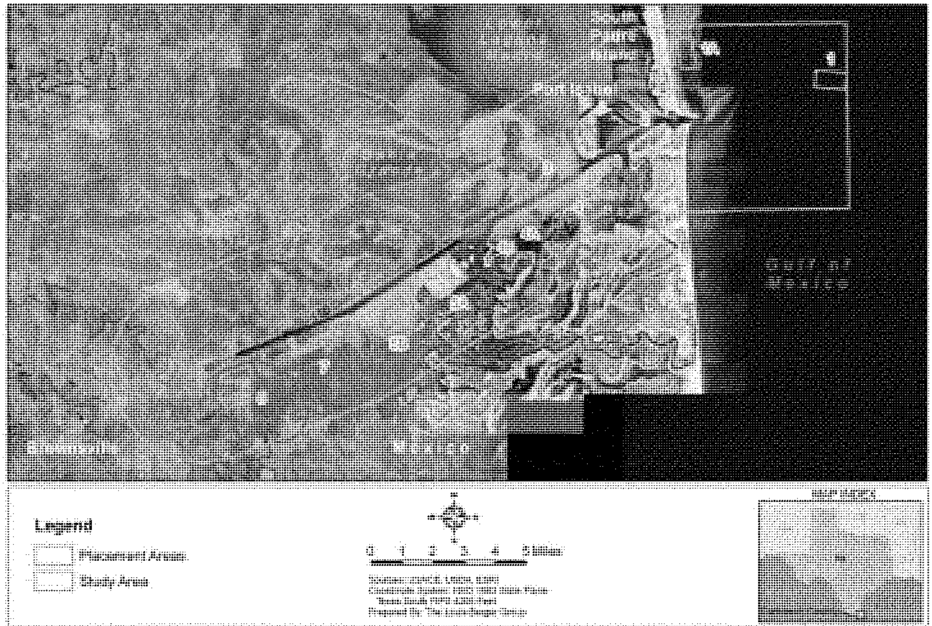

Figure 1: BIH Project Vicinity Map and Study Area

deepening and extending the Entrance Channel.

1.3 HABITATS IN THE STUDY AREA

Biological communities from the desert, coastal, temperate, sub-tropical, and tropical zones converge at the LRGV, creating one of the most biologically diverse areas in North America (McMahan et al., 1984). The diversity of ecosystems located within the project area provide habitat for an array of terrestrial and coastal flora and fauna, including a variety of threatened and endangered species, as well as providing an important stopping point for a substantial number of migratory birds.

Consistent with much of the Texas Gulf coast, the study area includes barrier islands, shallow inland lagoons, and a relatively flat inland area. South Padre Island and Brazos Island, which border the Entrance Channel to the north and the south, respectively, are barrier islands. Unique to the area are extensive mud tidal flats and clay dune formations, or lomas, several of which lie adjacent to the ship channel. Emergent elevations within the study area range from sea level to a maximum of 12 feet above sea level, with an average land elevation of 1.2 feet above sea level.

Table 1: Dimensions of Existing and Proposed Brazos Island Harbor Project

Channel Reach	Constructed Depth (feet, MLLW)	Proposed Depth (feet, MLLW)	Constructed Bottom Width (feet)	Proposed Bottom Width (feet)	Channel Length (miles)
Entrance Channel Extension		54		300	0.75
Entrance Channel (Gulf of Mexico to offshore end of jetties)	44	54	300	same as existing	1.3
Jetty Channel (Gulf of Mexico to Laguna Madre)	44	54	Transitions from 300 to 400	same as existing	1.1
Main Channel (Laguna Madre to Turning Basin Extension)	42	52	Varies 250 to 400	same as existing	15.1
Turning Basin Extension	Transitions from 42 to 36	same as existing	Transitions from 400 to 325	same as existing	1.3
Turning Basin	36	same as existing	Transitions from 325 - 1,200	same as existing	0.6

The major inland bay is the Laguna Madre, a long, narrow, shallow, hypersaline lagoon extending from Corpus Christi Bay to the southern end of Port Isabel. Only the Lower Laguna Madre is within the project study area; it lies between the Texas mainland and South Padre Island. One of two main inlets connecting Laguna Madre to the Gulf of Mexico, the Brazos-Santiago Pass Inlet, is also located within the study area.

The Laguna Madre is the largest estuarine system on the Texas coast and is characterized as a hypersaline lagoon having little freshwater inflow, clear waters, and abundant submerged aquatic vegetation (SAV). In the Lower Laguna Madre, SAV cover approximately 118,000 acres of water bottom, or slightly more than 65 percent of the total water bottom. Seagrasses grow in patchy strips along the banks of navigation channels where water depths and clarity are sufficient to allow light penetration, including along portions of the GIWW and BIH channels. Although shoal, turtle, and manatee grasses are the primary SAV in the study area, widgeon grass may occur where salinity levels are lowest; South Bay contains small patches of star grass.

Important fish and wildlife habitats in the study area include thornscrub forest and brush, mesquite savannahs, tidal and wind-tidal algal flats, clay lomas, coastal dunes, and bays and deepwater habitats.

- The thornscrub forest and brush serve as travel corridors for the federally-listed ocelot (*Leopardus pardalis*) and jaguarundi (*Herpailurus yaguarondi*). Many birds only found in the LRGV use thornscrub forest and brushland as habitat. Within the study area, thornscrub forest occurs along resacas in and near the City of Brownsville and on high depositional ridges and lomas throughout the Rio Grande Delta.
- Mesquite savannahs mostly occur south of the Main Channel and north of the Rio Grande (Jahrsdoerfer and Leslie,1988) . The open grassland or savannah habitats have scattered mesquite trees or yucca (Yucca spp.). The grassland is a good hunting area for Northern Aplomado Falcon (*Falco femoralis*) and the yuccas are resting and nesting habitat.
- Tidal flats provide important habitat for a variety of coastal wildlife from migratory waterfowl, shorebirds (like the federally listed piping plover, *Charadrius melodius*), wading birds, and other estuarine-dependent species like shrimp and various finfish (White, 1986). Some portions of study area are unique in that wind and storm events dictate inundation, as opposed to typical, astronomically driven tidal regimes. Since wind and storm events only rarely inundate these flats, they are called wind-tidal flats (Tunnel and Judd, 2002). Conditions on wind-tidal flats are not conducive to marsh vegetation, and consequently these flats are usually barren except for large areas colonized by blue-green algae mats called algal flats.
- Clay lomas are brush-covered clay dunes situated within tidal and wind-tidal flats. Since lomas are dunes situated within tidal zones, the abrupt topographic reliefs create unique habitats. Lomas can reach a height of 30 feet above surrounding flats. Texas fiddlewood, Texas ebony and other woody brush typically colonize lomas while base vegetation usually consists of sea ox-eye daisy and glasswort (Jahrsdoerfer and Leslie, 1988). Clay lomas occur within wind-tidal flats north and south of the Main Channel and are located primarily in the eastern portion of the study area.
- Coastal dunes are mounds or ridges associated with barrier islands and beaches that are formed from sands that are transported and deposited by the wind and the Gulf longshore current. Coastal dunes occur in the study area on Brazos and South Padre islands. In the study area, primary dunes generally occur immediately landward of the beachfront and are usually the largest. Immediately behind the primary dunes, secondary and back island dunes form. Although a variety of wildlife species use coastal dunes and barrier islands, coastal dune habitats are especially known to include species like the Gulf Coast kangaroo rat, keeled earless lizard, and the spotted ground squirrel. Migrating peregrine falcons also use study area coastal dunes and barrier islands as stopover habitat (Tunnel and Judd, 2002).
- Bays and deepwater habitats are extensive in the study area and include the Main Channel, South Bay, the Laguna Madre, and the open Gulf of Mexico (USFWS, 2012). These bays and deepwater areas are important habitats for a variety of marine species, such as commercially and recreationally important finfish, federally endangered sea turtles, marine

mammals and benthos. The Lower Laguna Madre is one of the most productive estuaries in Texas, supporting a diversity of fish species, plankton, and benthic organisms and has great importance as a finfish and shellfish nursery area (Armstrong et al., 1987, Tunnel and Judd, 2002).

1.4 ALTERNATIVES CONSIDERED

A lengthy array of alternatives was considered during plan formulation. The alternatives were developed from ideas provided by the public, resource agencies, USACE, and the non-Federal sponsor. Alternatives considered were the "no-action" plan (retaining the existing 42 feet deep by 250 feet wide channel), non-structural plans (improving traffic scheduling, modifying traffic rules, utilizing another port), and numerous structural alternatives which consisted of variations of channel depths (ranging from 45 to 55 feet deep), widths (ranging from the existing 250-foot width to a 650-foot width) and turning basin location (moving the primary turning basin closer to the Gulf of Mexico). An initial array, an evaluation array, and a final array of alternatives were screened to identify the TSP. All of the alternatives were evaluated in terms of whether they met the planning objective and produced a positive preliminary benefit to cost ratio. The planning objective is to develop a comprehensive plan to increase the efficiency of ship and offshore rig traffic on the BIH while avoiding and minimizing impacts to the area's environmental resources. The TSP, the Final Array alternative plan which maximizes net excess benefits, is the 52 feet by 250-foot plan which would deepen the channel to -52 feet MLLW with no widening.

1.5 DESCRIPTON OF THE TENTATIVELY SELECTED PLAN (TSP)

The 52 by 250 feet TSP for the BIH channel improvement project would:

- extend the Brazos Island Harbor (BIH) Entrance Channel 0.75 miles farther into the Gulf of Mexico (station -17+000 to -13+000) at a depth of -54 feet mean lower low water (MLLW) and a width of 300 feet;
- deepen the existing BIH Entrance Channel from station -13+000 to -6+000 to a depth of -54 feet MLLW at the existing width of 300 feet;
- deepen the BIH Jetty Channel to -54 feet MLLW from station -6+000 to -1+026 at the existing width of 300, transitioning to the existing 400 feet width through station 0+000;
- deepen the Brownsville Main Channel to a depth of -52 feet MLLW at the existing 400 feet width from station 0+000 to 1+517, transitioning to the existing 250 feet width at station 2+329;
- deepen 15.5 miles of the Brownsville Main Channel to a depth of -52 feet MLLW at existing widths ranging from 250 to 400 feet from station 2+239 to station 84+200; and maintain existing depth of -42 feet MLLW and width of 325 feet from station 84+200 to

86+000, and existing depth of -36 feet MLLW and width ranging from 325 to 1200 feet from station 86+000 through the end of the channel and turning basin at station 89+500.

New work material from channel deepening would be distributed among the existing New Work ODMDS and upland, confined PAs as shown in Table 2. All project channels and PAs are shown on draft plan drawings presented in Appendix A. Under the first construction contract, a hopper dredge would be used to construct the Entrance and Jetty Channels, with a total length (after extension of the Entrance Channel) of 3.2 miles. Although the authorized depth of the offshore channels would be -54 feet MLLW, the potential dredging depth of the Entrance and Jetty Channels could actually be -58 feet MLLW, after accounting for 2 feet of advance maintenance and 2 feet of allowable overdepth. One hopper dredge would be operated continuously for an

Table 2: BIH TSP - New Work Quantities and Placement Area Dike Elevations

Channel Stations		Placement Area (PA)	Current PA Acreage	Deepening Dredge Quantity in Cubic Yards (CY)	Existing PA Dike Elevation in Feet (NAVD 88)	New Work Dike Elevation in Feet (NAVD 88)
-17+000	00+000	New Work ODMDS	350	2,066,300		
00+000	07+000	2	71	937,200	27	36
07+000	25+000	4B	243	2,688,800	7	19
25+000	50+000	5A	704	3,611,800	6	12
50+000	70+000	5B	1020	2,599,000	12	15
70+000	82+000	7	257	1,804,000	20	26
82+000	89+500	8	288	438,900	22	25
			Total CY	14,146,000		

estimated duration of seven months to remove approximately 2,066,300 cubic yards of new work material from the Entrance and Jetty Channels. Bed leveling may be performed at the conclusion of dredging by dragging a metal bar to smooth over high spots. All of the material would be placed at the existing New Work Ocean Dredged Material Disposal Site (ODMDS) (EPA, 1991). This site is located in a dispersive offshore environment and has unlimited capacity. It is located approximately four miles from shore in 60-70 feet of water. The 350-acre site is large enough to contain the all new work material that would be placed there during construction.

It is estimated that five subsequent contracts would be awarded for cutterhead suction dredging of the Brownsville Main Channel through station 84+200 for a total length of 15.9 miles. The remainder of the channel (the Turning Basin Extension and Turning Basin) would remain at existing depths. The authorized depth for the inland Main Channel would be -52 feet MLLW, but the potential dredging depth could actually be -55 feet MLLW, after accounting for 2 feet of advance maintenance and 1 foot of allowable overdepth. Two or three cutterhead dredges would be working simultaneously to remove approximately 12,079,700 cubic yards of new work material over an estimated 29 months. New work material from the Brownsville Main Channel (stations 0+000 through 84+200) would be pumped from the dredges through a combination of fully submerged and floating hydraulic pipelines into existing upland confined PAs managed by the Brownsville Navigation District (PAs 2, 4B, 5A, 5B, 7 and 8). In addition, new work material may be placed in PA 3, a PA managed by the San Benito Navigation District and generally used for Port Isabel Channel material. The clay new work material would be stockpiled and used to raise the PA 3 dikes for later, unrelated maintenance dredging of the Port Isabel Channel. Specific quantities going to PA 3 are unknown at this time; should PA 3 be utilized, quantities going to PA 2 and/or 4B would be reduced. None of the existing PAs would need to be expanded and no new PAs would be needed. Construction to raise the containment dikes to heights needed to accommodate new work quantities would be done within the footprints of the existing PAs. The resulting elevations of the PA dikes for the new work placement activities are also shown in Table 3. They would range from a total elevation of 12 feet NAVD 88 around PA 5A to a total elevation of 36 feet around PA 2. Armoring of the exterior toe of the PA 4A and 4B dikes on the side facing the channel would be necessary from station 22+000 to 33+800.

Maintenance dredging would generally be conducted by hopper and cutterhead dredges, with material being distributed among a nearshore Feeder Berm or the existing Maintenance ODMDS, and upland, confined PAs as shown in Table 4. Maintenance dredging would utilize the same placement areas as those utilized for existing conditions, and the duration and frequency of dredging events would be within the range occurring under current conditions. Dredging of the Entrance and Jetty Channels and the first 11,000 feet of the Main Channel (+11+000 to -17+000) would generally be performed by a hopper dredge, and material would be placed in the nearshore Feeder Berm Site 1A, located between 1.5 and 2.5 miles from the north jetty and from 0.4 to 0.9 miles from shore (USACE, 1988). Sediment removed by maintenance dredging would therefore be regularly placed back into the littoral system, available for cross-shore and longshore sediment transport to the beaches of South Padre Island. Monitoring of material placed at the Feeder Berm has demonstrated that it moves toward the beach and disperses with the major movement being in the alongshore direction (McLellan et al. 1997;

CETN; 1989). If for some reason the Feeder Berm cannot be used, maintenance material from the Entrance and Jetty Channels (station -17+000 to 0+000) could be placed in the Maintenance ODMDS which is located approximately 2.5 nautical miles from shore and north of the channel (USACE, 1975; 1999). The ODMDS and Feeder Berm are located in dispersive environments and have unlimited capacities.

Maintenance material from the remainder of the Main Channel (stations 11+000 through 89+500) would be placed in existing PAs 4A, 4B, 5A, 5B, 7 and 8. Upland PAs and containment dikes are sized to accommodate total quantities over the 50-year period of analysis. None of the existing PAs would need to be expanded and no new PAs would be needed. Construction to raise the containment dikes to heights needed to accommodate the 50-year maintenance quantities would be done within the footprints of the existing PAs. Dikes would be raised incrementally as needed to contain maintenance quantities. The resulting elevations of the PA dikes for the 50-year placement plan are also shown in Table 3. They range from a total elevation of 17 feet NAVD 88 around PA 5A to a total elevation of 38 feet around PA 7.

Table 3: BIH TSP - O&M Quantities and Placement Area Dike Elevations

Stations		Shoaling Rate in Cubic Yards/ Year (CY/YR)	Placement Area	Dredge Cycle (years)	Number of Cycles in 50 years	Quantity per Cycle (CY/Cycle)	Total O&M Quantity in 50 Years (CY)	Total Dike Elevation in 50 yrs (feet NAVD88)
-17+000	0+00	470,630	Nearshore Feeder Berm Site 1A	5	10	2,353,150	23,531,500	N/A
0+00	11+000	161,595	Nearshore Feeder Berm Site 1A	3	16	484,785	7,756,600	N/A
11+000	28+000	183,995	4A	4	12	735,980	8,831,800	35
28+000	34+000	43,047	4B	4	12	172,188	2,066,300	24
34+000	50+000	123,527	5A	4	12	494,108	5,929,300	17
50+000	65+000	143,577	5B	5	10	717,885	7,178,900	19
65+000	79+000	98,637	7	6	8	591,822	4,734,600	38
79+000	89+500	30,377	8	7	7	212,639	1,488,500	28
				Total CY		5,762,557	61,517,500	

2.0 FEDERALLY-LISTED THREATENED AND ENDANGERED SPECIES AND CRITICAL HABITAT

The study area is located entirely in Cameron County, Texas. USACE contacted the USFWS and NMFS by letter, requesting information on threatened and endangered species in the study area. The agency responses are provided in Appendix B. The USFWS and NMFS consider the endangered or threatened species contained in Table 5 as possibly occurring in this county. The status, range, habitat and presence in the study area are presented below for the species listed in Table 4. The USFWS has also identified Critical Habitat for the wintering piping plover in the study area. No other species, and no other designated or proposed critical habitat, were identified as occurring in study area.

Table 4: Threatened and Endangered Species, Cameron County, Texas

Common Name	Scientific Name	Listing Status	Jurisdiction
BIRDS			
brown pelican	*Pelecanus occidentalis*	Delisted/Monitoring	USFWS
piping plover	*Charadrius melodus*	Threatened	USFWS
Northern Aplomado falcon	*Falco femoralis septentrionalis*	Endangered/ Experimental Non-Essential Population	USFWS
MAMMALS			
Gulf Coast jaguarundi	*Herpailurus (=Felis) yagouaroundi cacomitli*	Endangered	USFWS
ocelot	*Leopardus (=Felis) pardalis*	Endangered	USFWS
West Indian manatee	*Trichechus manatus*	Endangered	USFWS
blue whale	*Balaenoptera musculus*	Endangered	NMFS
finback whale	*Balaenoptera physalus*	Endangered	NMFS
humpback whale	*Megaptera novaeangliae*	Endangered	NMFS
sei whale	*Balaenoptera borealis*	Endangered	NMFS
sperm whale	*Physeter macrocephalus*	Endangered	NMFS
REPTILES			
green sea turtle	*Chelonia mydas*	Threatened	USFWS; NMFS
Kemp's ridley sea turtle	*Lepidochelys kempii*	Endangered	USFWS; NMFS

Common Name	Scientific Name	Listing Status	Jurisdiction
loggerhead sea turtle	*Caretta caretta*	Threatened	USFWS; NMFS
hawksbill sea turtle	*Eretmochelys imbricata*	Endangered	USFWS; NMFS
leatherback Sea turtle	*Dermochelys coriacea*	Endangered	USFWS; NMFS
PLANTS			
South Texas Ambrosia	*Ambrosia cheiranthifolia*	Endangered	USFWS
Texas Ayenia	*Ayenia limitaris*	Endangered	USFWS
CANDIDATE SPECIES			
red knot	*Calidris canutus rufa*	Candidate	USFWS
red-crowned parrot	*Amazona viridigenalis*	Candidate	USFWS
Sprague's pipit	*Anthus spragueii*	Candidate	USFWS
scalloped hammerhead shark	*Sphyrna lewini*	Candidate	NMFS
boulder star coral	*Montastraea annularis*	Candidate	NMFS
boulder star coral	*Montastraea franksi*	Candidate	NMFS
elliptical star coral	*Dichocoenia stokesii*	Candidate	NMFS
Lamarck's sheet coral	*Agaricia lamarcki*	Candidate	NMFS
mountainous star coral	*Montastraea faveolata*	Candidate	NMFS
pillar coral	*Dendrogyra cylindrus*	Candidate	NMFS
rough cactus coral	*Mycetophyllia ferox*	Candidate	NMFS
SPECIES OF CONCERN			
dusky shark	*Carcharhinus obscurus*	Species of Concern	NMFS
sand tiger shark	*Carcharias taurus*	Species of Concern	NMFS
opossum pipefish	*Microphis brachyurus lineatus*	Species of Concern	NMFS
warsaw grouper	*Epinenphelus nigritus*	Species of Concern	NMFS
speckled hind	*Epinephelus drummondhayi*	Species of Concern	NMFS

Sources: USFWS and NMFS websites:
http://www.fws.gov/southwest/es/ES_Lists_Main.cfm (accessed June 6, 2013)
http://sero.nmfs.noaa.gov/pr/esa/specieslst.htm (accessed June 6, 2013)
http://www.nmfs.noaa.gov/pr/species/esa/other.htm (accessed June 6, 2013)
http://sero.nmfs.noaa/gov/pr/SOC.htm (accessed June 6, 2013)

2.1 BROWN PELICAN

The adult brown pelican (*Pelecanus occidentali)s* is a large dark gray-brown water bird with white about the head and neck which lives primarily in coastal marine and estuarine environments along the coast of the Gulf of Mexico from Mississippi to Texas and the coast of Mexico, and other coastal zones of the Caribbean, the Pacific Coast and the West Indies. The brown pelican almost completely disappeared from the coast of Texas by the 1960s, largely due to the use of agricultural pesticides which bioaccumulate in the marine food chain and cause reproductive failure (TPWD, 2013a). Since then, the use of chlorinated hydrocarbons for pest control has declined and the brown pelican has recovered and spread through its original range. It is now common along the Texas coast and nests on several isolated islands where they are safe from predators such as raccoons and coyotes. The brown pelican forages and rests in the coastal and near-shore zones of the study area. In 2010, four brown pelican nests were sighted on small islands in the Bahia Grande (Brownsville Herald, 2010). However, the majority of breeding brown pelicans in Texas occur from Nueces County to Galveston County (USFWS, 2009a). The species was delisted in 2009 due to recovery but is currently being monitored by the USFWS (USFWS, 2013a).

2.2 PIPING PLOVER

2.2.1 Status, Habitat and Presence in the Study Area

USFWS listed the piping plover (*Charadrius melodus*) as threatened and endangered on 11 December 1985 (50 FR 50726, December, 11 1985). The piping plover is an endangered species in the northern Great Plains and Great Lakes where it breeds in the summer. Piping plovers wintering in Texas are part of the northern Great Plains and Great Lakes populations and, therefore, are listed as threatened (USFWS, 2009b). The wintering range on the Atlantic and Gulf coasts stretches from North Carolina to Mexico (AOU, 1998; 50 FR 50726, December, 11 1985). Migration occurs both through the interior of North America east of the Rocky Mountains (especially in the Mississippi Valley) and along the Atlantic Coast (AOU, 1998). Approximately 35 percent of the known global population of piping plovers winters along the Texas Gulf Coast, where they spend 60 to 70 percent of the year. Piping plover concentrations in Texas occur in the following counties: Aransas, Brazoria, Calhoun, Cameron, Chambers, Galveston, Jefferson, Kleberg, Matagorda, Nueces, San Patricio, and Willacy. On their wintering grounds, piping plover use beaches, mudflats, sandflats, dunes, and offshore emergent placement areas (USFWS, 1995; AOU, 1998), as well as sandflats in existing USACE placement areas. Piping plovers are known to frequent the study area.

Threats to piping plovers and their habitat in their migration and wintering ranges indicates a continuing loss and degradation of habitat due to sand placement projects, inlet stabilization, sand mining, groins, seawalls and revetments, exotic and invasive vegetation and wrack removal (USFWS, 2009b). There is also concern with projects that would impede the ability of barrier islands to respond to natural habitat building processes in the context of "accelerating sea-level rise".

2.2.2 Critical Habitat

USFWS has designated critical habitat for the overwintering piping plover in the study area (66 FR 36137, July 10, 2001a) (Figure 2). Unit TX-1 is located on the south side of the Brazos Island Harbor Jetty Channel and Brownsville Main Channel, extending from the coast on Brazos Island inland about 5.5 miles. Unit TX-2 is located on the Laguna Madre side of South Padre Island on both sides of the Queen Isabella Causeway. Critical habit in Unit TX-3 is divided into subunits 3A (Gulf of Mexico Shoreline) and 3B (South Padre Island interior) (74 FR 23476, May 19, 2009). The Unit 3A beach unit and the 3B interior unit begin about 5 miles and 6 miles, respectively, from Brazos Santiago Pass and extend northward well past the study area boundary. Threats identified in these areas are oil and gas activities, including stockpiling materials, dredge disposal, and discharging fresh water; residential and commercial development; recreational use, including beach maintenance, human, vehicle, and domestic animal disturbance; and predation. Critical habitat is comprised of areas considered essential for the conservation of a listed species. Piping plovers spend the majority of the year on the wintering grounds. Due to the difficulty of separating out the populations of piping plover (Great Lakes, Northern Great Plains, and Atlantic) when on their wintering grounds, critical habitat was designated for all wintering piping plover.

The primary constituent elements (PCEs) for the piping plover wintering habitat are those habitat components that are essential for the primary biological needs of foraging, sheltering, and roosting, and only those areas containing these PCEs within the designated boundaries are considered critical habitat. The PCEs are found in coastal areas that support intertidal beaches and flats (between annual low tide and annual high tide) and associated dune systems and flats above annual high tide. The USFWS describes the important components of the PCEs as follows (66 FR 36137, July 10, 2001a):

> Important components (primary constituent elements) of intertidal flats include sand and/or mud flats with no or very sparse emergent vegetation. In some cases, these flats may be covered or partially covered by a mat of blue- green algae. Adjacent unvegetated or sparsely vegetated sand, mud, or algal flats above high tide are also important, especially for roosting piping plovers. Such sites may have debris, detritus

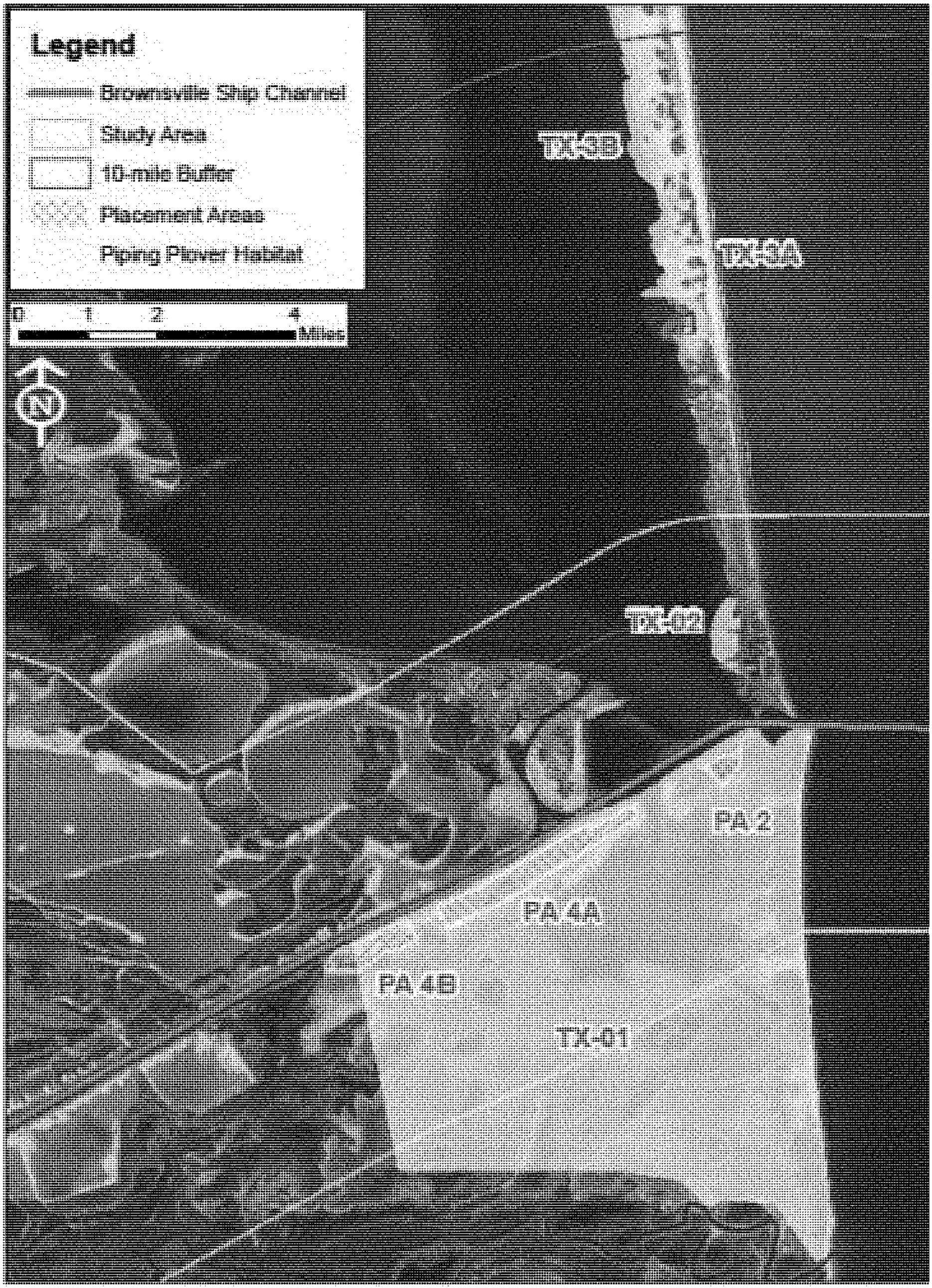

Figure 2: Piping Plover Critical Habitat in BIH Study Area

(decaying organic matter), or micro-topographic relief (less than 50 cm above substrate surface) offering refuge from high winds and cold weather. Important components of the beach/dune ecosystem include surf-cast algae for feeding of prey, sparsely vegetated backbeach (beach area above mean high tide seaward of the dune line, or in cases where no dunes exist, seaward of a delineating feature such as a vegetation line, structure, or road) for roosting and refuge during storms, spits (a small point of land, especially sand, running into water) for feeding and roosting, salterns (bare sand flats in the center of mangrove ecosystems that are found above mean high water and are only irregularly flushed with sea water and washover areas for feeding and roosting. Washover areas are broad, unvegetated zones with little or no topographic relief, that are formed and maintained by the action of hurricanes, storm surge, or other extreme wave action. Several of these components (sparse vegetation, little or no topographic relief) are mimicked in artificial habitat types used less commonly by piping plovers, but that are considered critical habitat (e.g., dredge spoil sites).

Unit TX–01 (South Bay and Boca Chica) is located south of the BIH channel and is 7,217 acres in size. The northern half (approximately) of the interior of the unit and the entire Gulf beach part of the unit are located in the study area. The general boundaries of the unit are the BIH channel on the north, the MLLW line along the Gulf of Mexico beach on the east, the Rio Grande River on the south, and a line from Loma de Las Vacas to Loma Ochoa on the east. The unit is comprised mainly of wind tidal flats that are infrequently inundated by seasonal winds; it does not include densely vegetated habitat. Beaches within the unit reach from the mouth of the Rio Grande northward to Brazos Santiago Pass. The unit boundaries mark the change in habitat from wind tidal flats, preferred by the piping plover, to densely vegetated habitat that is not used by the piping plover. Portions of this unit are owned and managed by the Lower Rio Grande Valley National Wildlife Refuge, the South Bay Coastal Preserve, Boca Chica State Park, and private citizens. BIH PAs 2, 4A, and most of 4B are located within Unit TX-01. They are considered critical habitat because they mimic naturally-formed critical habitat, containing sand and mud flats with sparse vegetation and little or no topographic relief. Sparsely vegetated sand and mud flats result from the periodic placement of hydraulic dredged material into the PAs. These events disturb the existing habitat for a few months, and then new sand or mud flats form that again serve as habitat.

Unit TX–02 (Queen Isabella Causeway) is a 6 acre-area bisected by the Queen Isabella Causeway on the Laguna Madre side of South Padre Island. All of this unit is located within the study area, but there are no project features in or adjacent to this unit. The southern boundary is the Queen Isabella State Fishing Pier, and the northern boundary is at the shoreline at the end of Sunny Isles Street. The eastern boundary is the where developed areas and/or dense vegetation begin, and the western boundary is the MLLW line. This unit contains lands known as wind tidal flats that are infrequently inundated by seasonal winds.

Subunit TX–3A (South Padre Island – Gulf of Mexico Shoreline). This subunit consists of 2,891 acres in Cameron and Willacy Counties, Texas. It is a beach 30 miles long on the gulfside of South Padre Island. The eastern boundary is the estimated MLLW line, and the western boundary is the dune line where the habitat changes from lightly vegetated, sandy beach to densely vegetated dunes. The vegetated dune and Park Road 100, which runs north-south along the western side of the dune, separates Subunits TX–3A and 3B. Approximately one quarter of the subunit is in the Laguna Atascosa National Wildlife Refuge (LANWR), and approximately 64 percent is in private ownership. Ten percent is State land managed by the Texas General Land Office (GLO), and a small portion at the southern end is County park land managed by Andy Bowie County Park. The southern five miles of TX-3A is in the Gulf shoreline study area of the BIH project, but there would be no project construction activities in this unit.

Subunit TX–3B (South Padre Island –Laguna Madre side) consists of 44,137 acres in Cameron and Willacy Counties, Texas. The general boundaries of the unit are from about latitude 26° 09' 19.00'' N on the south, the edge of the intertidal mudflats bordering the lower Laguna Madre on the west, the Mansfield Channel on the north, and dense vegetation, dunes or the western boundary of Park Road 100 on the east. Within that boundary, areas that do not contain PCEs have been excluded from critical habitat designation. Approximately 42 percent of the land is in the LANWR, and approximately 38 percent is State owned and managed by the GLO. The remaining 20 percent is privately-owned. None of this subunit is located within the study area and there would be no project construction activities in this unit.

2.3 NORTHERN APLOMADO FALCON

The Northern aplomado falcon (*Falco femoralis septentrionalis*) is one of three subspecies of the aplomado falcon and the only subspecies recorded in the U.S. Historically, these falcons occurred throughout coastal prairie habitat along the southern Gulf coast of Texas, and in savanna and grassland habitat along both sides of the Texas-Mexico border, southern New Mexico, and southeastern Arizona, and extended south through Mexico and into Central America (USWFS, 2006). Although this falcon continued to nest in the U.S. as late as 1952, it disappeared from most of its U.S. range by 1940 (Hector, 1990).

It was listed as an endangered, nonessential experimental population species in 1986 (51 FR 6686; 25 February 1986) in response to extirpation from the United States (U.S.) and evidence of population declines and severe pesticide contamination in eastern Mexico (Hector, 1990). However, reasons for the decline are poorly known. Poisoning of prairie dogs could have had adverse effects on the falcons, and loss of the ecosystems generated by the prairie dogs could have degraded habitat conditions (NatureServe Explorer, 2013a). Other causes could include widespread shrub encroachment resulting from control of range fires and agricultural or pasture development of grassland habitats (71 FR 42298, July 26, 2006). No critical habitat has been designated.

The USFWS finalized its plan to reintroduce this species into their historic habitat in southern New Mexico and Arizona in 2006 (71 FR 42298, July 26, 2006). It is hoped that current reintroduction efforts may reestablish this bird as a breeder in the southwestern U.S. Captive-bred falcons were released onto private lands in Texas, beginning in 1985. In the study area, releases have occurred on the LANWR. By 2006, these releases had established at least 44 pairs in southern Texas and adjacent Tamaulipas, Mexico, and pairs or reintroduced falcons began breeding in 1995 ((71 FR 42298, July 26, 2006). Nests have been located on a variety of structures, both artificial and natural. Nesting productivity increased by about 40 percent in 2003 and 2004, when falcons were provided with artificial nesting structures that prevent predators (such as horned owls, raccoons, and coyotes) from entering. The USFWS is using information learned from the reintroduction effort in south Texas to inform a reintroduction effort within the species' historical range in New Mexico and Arizona.

Essential habitat elements appear to be open terrain with scattered trees (such as mesquite and yucca in the study area), relatively low ground cover, an abundance of small to medium-sized birds along with insects, rodents, snakes, and lizards for prey, and a supply of nest sites (USFWS, 2013b). The species appears to be non-migratory with most pairs using the vicinity of previous season's nesting platforms as a hunting, roosting, and display area throughout the year. Pairs nest in old stick nests of other bird species such as hawks, caracaras and ravens (NatureServe Explorer, 2013a). Suitable habitat for these falcons in the study area is located primarily in the mesquite/yucca flats south of the placement areas which line the Brownsville Main Channel, and in the Laguna Atascosa NWR, north of the Main Channel.

2.4 GULF COAST JAGUARUNDI

The Gulf Coast Jaguarundi (*Herpailurus yagouaroundi cacomitli*) is listed as endangered throughout its range, from southern Texas into the eastern portion of Mexico in the states of Coahuila, Nuevo Leon, Tamaulipas, San Luis Potosi and Veracruz. The last confirmed siting of this subspecies within the U.S. was in 1986 when a roadkill specimen, found near Brownsville, Texas, was positively identified. In Mexico, as recently as 2010, jaguarundis were photographed by remotely-triggered cameras in central and southern Tamaulipas. Since 1990, little additional information has been obtained and since 1986, no new sightings in Texas have been confirmed. The Gulf Coast subspecies of jaguarundi is currently believed to occur in areas of northeastern

Mexico, where suitable habitat exists but there is no information on current population size or distribution in Mexico (USFWS, 2012b).

In 1975, USFWS proposed listing the Gulf Coast Jaguarundi as an endangered species because it was included in a list of species presented as Appendix I of the Convention on International Trade in Endangered Species of Wild Fauna and Flora and it was not already listed as threatened or endangered in the U.S. (40 FR 44329, September 26, 1975). The final rule listing the jaguarundi as endangered was published in 1976 (41 FR 21062, June 14, 1976). This species is currently listed under the Act as *Herpailurus (=Felis) yagouaroundi cacomitli*. Recent genetic work has assigned the jaguarundi to the genus *Puma*, and this has become the generally accepted nomenclature. USFWS has therefore accepted the new scientific name as *Puma yagouaroundi* for its recovery plan. No critical habitat has been designated.

The Gulf Coast jaguarundi is found in the Tamaulipan Biotic Province where it uses dense thorny shrublands or woodlands and bunchgrass pastures if dense brush or woody cover is nearby. Information on life history aspects of jaguarundi in the wild is limited (USFWS, 2012b). Jaguarundis are solitary, except during mating season (November and December in Mexico), or when a female is raising kittens. Jaguarundis prey mainly on birds, small mammals, and reptiles. The jaguarundi is the only cat in northeastern Mexico which is primarily active during the day, whereas the other cats, such as ocelot, are primarily nocturnal. Jaguarundis are still difficult to observe because they prefer the cover provided by dense woody communities and bunchgrass pastures. The home range of jaguarundis in Tamaulipas was sometimes similar in size to ocelot home ranges—about 3.3 to 4.5 square miles. However, home range sizes vary greatly, with reports of up to 38.6 square miles.

Primary known threats are habitat destruction, degradation, and fragmentation associated with agriculture and urbanization, and to some extent, border security activities (lighting; road, tower, and fence construction and maintenance; brush clearing; human activity) In the U.S., the habitat historically used by the Gulf Coast jaguarundi was once extensive throughout the Lower Rio Grande Valley (LRGV) but has been converted to agriculture and urban development. Roads may cause mortality through collisions with vehicles and by fragmenting habitat, increasing demographic and genetic isolation of populations. Competition with bobcats may be a potential limiting factor in the northern portion of its range (USFWS, 2012b).

Patches of dense brush and woody cover are present in the study area, especially behind the foredune along the Gulf shoreline south of the BIH channel, on isolated lomas, and north of the channel in the LANWR. None of these dense brush areas are located within upland PAs.

2.5 OCELOT

The ocelot (*Leopardus pardalis*) is listed as endangered throughout its range in the western hemisphere where it is distributed from southern Texas and southern Arizona through Central and South America into northern Argentina and Uruguay (USFWS, 2010a). The U.S. contains only a small proportion of the ocelot's current range and habitat. At one time, this species inhabited brushland in the southwestern U.S. as far north as the Texas panhandle and central Arizona.

In 1972, USFWS added the ocelot to the U.S. List of Endangered Foreign Fish and Wildlife (37 FR 6476, March 30, 1972). However, due to an oversight, the U.S. population of this species was not officially listed as an endangered species until a final ruling was issued in 1982 (47 FR 31670, July 21, 1982). No critical habitat has been designated.

Habitats used by the ocelot throughout its range vary from tropical rainforest, pine forest, gallery forest, riparian forest, semi-deciduous forest, and dry tropical forest, to savanna, shrublands, and marshlands. In south Texas, the ocelot inhabits dense thornscrub communities on LANWR and on private lands in three Texas counties. The ocelot requires dense vegetation (greater than 75 percent canopy cover), with 95 percent cover of the shrub layer preferred in Texas. Its prey consists primarily of rabbits, rodents, birds, and lizards (USFWS, 2010a).

As of February 2010, there were fewer than 25 total known individuals in the two populations in south Texas, with the possibility that more cats inhabit surrounding ranches (USFWS, 2010). One population occurs in Willacy and Kenedy Counties (Arroyo Colorado Unit) primarily on private ranches and the other occurs in eastern Cameron County primarily on the LANWR. Both populations are isolated from each other and occupy remnant habitat fragments. Individuals have occurred outside of these two populations, but there is no recent evidence that a breeding population occurs in other areas of Texas.

Habitat conversion, fragmentation, and loss are the primary threats to the ocelot today. Human population growth and development continue throughout the ocelot's range. In Texas, more than 95 percent of the dense thornscrub habitat in the LRGV has been converted to agriculture, rangelands, or urban land uses, and less than one percent of south Texas supports the extremely dense thornscrub used by ocelots. Small population sizes in Texas and isolation from conspecifics in Mexico threaten the ocelot in Texas with inbreeding. Issues associated with border barrier development and patrolling the boundary between the U.S. and Mexico further exacerbate the isolation of Texas and Arizona ocelots from those in Mexico. Commercial exploitation and illegal hunting were significant threats to the species when the ocelot was originally listed, but the harvest and export of ocelots has significantly declined and is controlled by international convention (USFWS, 2010a).

USFWS published a draft recovery plan for the ocelot in 1990 and a first revision in 2010 (USFWS, 2010a). The major focus of this recovery plan is on two cross-border management units, the Texas/Tamaulipas Management Unit (TTMU) and the Arizona/Sonora Management Unit. The TTMU emphasizes efforts to reduce habitat loss and fragmentation of remaining suitable habitat in these borderland areas, to facilitate connectivity with ocelots in Tamaulipas.

Patches of dense brush and woody cover are present in the study area, especially behind the foredune along the Gulf shoreline south of the BIH channel, on isolated lomas, and north of the channel in the LNWR. None of these dense brush areas are located within upland PAs.

2.6 WEST INDIAN MANATEE

Manatees (*Trichechus manatus*) are marine mammals found in marine, estuarine, and freshwater environments. The manatee ranges from the southeastern U.S. and coastal regions of the Gulf, through the West Indies and Caribbean, to northern South America. U.S. populations occur primarily in Florida, where they are effectively isolated from other populations by the cooler waters of the northern Gulf and the deeper waters of the Straits of Florida (NatureServe, 2013b) .

USFWS listed the West Indian manatee (*Trichechus manatus*) as endangered in 1967 (32 FR 4001, March 11,1967). Later it received protection under the ESA of 1973. Critical habitat has been designated in Florida, but none in Texas.

The West Indian manatee inhabits shallow coastal waters, estuaries, bays, rivers, and lakes. Throughout most of its range, it appears to prefer rivers and estuaries to marine habitats. It is not averse to traveling through dredged canals or using quiet marinas. Manatees are apparently not able to tolerate prolonged exposure to water colder than 68 degrees Fahrenheit. In the northern portions of their range, during October through April, they congregate in warmer water bodies, such as spring-fed rivers and outfalls from power plants. They usually avoid areas with strong currents (NatureServe, 2013b). Manatees are primarily dependent upon submergent, emergent, and floating vegetation, with the diet varying according to plant availability.

The largest known human-related cause of manatee mortality is collisions with hulls and/or propellers of boats and ships. The second-largest human related cause of mortality is entrapment in floodgates and navigation locks. Other known causes of human-related manatee mortality include poaching and vandalism, entrapment in shrimp nets and other fishing gear, entrapment in water pipes, and ingestion of marine debris (USFWS, 2001b). Hunting and fishing pressures were responsible for much of its original decline because of the demand for meat, hides, and bones, which resulted in near extirpation of the species (USFWS, 1995). A prominent cause of natural mortality in some years is cold stress, and major die-offs associated with the outbreaks of red tide have occurred (USFWS, 2001b). The low reproductive rate and habitat loss make it difficult for manatee populations to recover.

The West Indian manatee historically inhabited the Laguna Madre, the Gulf, and tidally influenced portions of rivers. It is currently, however, extremely rare in Texas waters and the most recent sightings are likely individuals migrating or wandering from Mexican waters. Historical records from Texas waters include Cow Bayou, Sabine Lake, Copano Bay, the Bolivar Peninsula, and the mouth of the Rio Grande River (Schmidly, 2004). In May 2005, a live manatee appeared in the Laguna Madre near Port Mansfield (Blankinship, 2005). The occurrence of the West Indian manatee in the study area is unlikely.

2.7 WHALES

NMFS identifies five endangered whale species of potential occurrence in the Gulf. These are the sei whale (*Balaenoptera borealis*), blue whale (*Balaenoptera musculus*), finback whale (*Balaenoptera physalus*), humpback whale (*Megaptera novaeangliae*), and sperm whale (*Physeter macrocephalus*). These species are generally restricted to deeper offshore waters; therefore, it is unlikely that any of these five species would regularly occur in the study area (NMFS, 2003).

2.8 GREEN SEA TURTLE

The green turtle (*Chelonia mydas*) is a circumglobal species in tropical and subtropical waters. In U.S. Atlantic waters, it occurs around the U.S. Virgin Islands, Puerto Rico, and continental U.S. from Massachusetts to Texas. Major nesting activity occurs on Ascension Island, Aves Island (Venezuela), Costa Rica, and in Surinam. Relatively small numbers nest in Florida, with even smaller numbers in Georgia, North Carolina, and Texas (NMFS and USFWS, 1991a; Hirth, 1997).

The green turtle was listed in 1978 as threatened except for Florida and the Pacific Coast of Mexico (including the Gulf of California) where it was listed as endangered (43 FR 32808, July 28, 1978a). In 1998, NMFS designated critical habitat to include the coastal waters around Culebra Island, Puerto Rico (63 FR 46693, September 2, 1998).

The green turtle primarily utilizes shallow habitats such as lagoons, bays, inlets, shoals, estuaries, and other areas with an abundance of marine algae and seagrasses. Individuals observed in the open ocean are believed to be migrants en route to feeding grounds or nesting beaches (Meylan, 1982). Hatchlings often float in masses of sea plants (e.g., rafts of sargassum) in convergence zones. Coral reefs and rocky outcrops near feeding pastures often are used as resting areas. The adults are almost exclusively herbivorous, while the juveniles consume more invertebrates. Foods consumed include seagrasses, macroalgae and other marine plants, mollusks, sponges, crustaceans, and jellyfish (Mortimer, 1982).

Terrestrial habitat is typically limited to nesting activities, although in some areas, such as Hawaii and the Galápagos Islands, they will bask on beaches (Balazs, 1980). They prefer high-energy beaches with deep sand, which may be coarse to fine, with little organic content. Most green turtles nest in Florida and in Mexico. At least in some regions, they generally nest consistently at the same beach, which is apparently their natal beach (Meylan et al., 1990; Allard et al., 1994). Green turtle nests are rare in Texas. In 1987 the first confirmed nesting of a green sea turtle on the Texas coast was recorded (Shaver and Amos, 1988). More recently, two green turtle nests were documented in 2006 and three in 2007; all but one in 2007 were from the Padre Island National Seashore (PINS) (Echols, 2006). In 2012, six green sea turtle nests were reported from PINS and two from South Padre Island . The 2012 nest total sets a new record for the number of green turtle nests documented in Texas in a year. The previous record of 6 nests was set during 2011 (NPS, 2012).

The principal cause of the historical, worldwide decline of the green turtle is long-term harvest of eggs and adults on nesting beaches, and juveniles and adults on feeding grounds. These harvests continue in some areas of the world and compromise efforts to recover this species. Incidental capture in fishing gear, such as gillnets and trawls, is a serious ongoing source of mortality that also adversely affects the species' recovery (NMFS, 2013a). Epidemic outbreaks of fibropapilloma or "tumor" infections recently have occurred on green sea turtles, especially in Hawaii and Florida, posing a severe threat. The cause of these outbreaks is largely unknown, but it could be caused by a viral infection (Barrett, 1996). Incidental take of ridleys has been documented with hopper dredges.

Of the green turtle strandings reported from 2004 through 2007 (last year reported) along the Texas Coast, 374 were from Zone 21, which extends from the mouth of the Rio Grande to the vicinity of Yarborough Pass (STSSN, 2013). In 2007, 233 green turtles were reported stranded; of these, at least 147 were cold-stunned turtles resulting from a strong cold front that passed in January (Sea Turtle, Inc., 2008).

Since 1995, the BIH Entrance Channel has been dredged 12 times using hopper dredges; green turtles were captured by the dredge during all of these dredging events. During the course of dredging, 23 green turtles were documented as dredge takes: four in 1995, two of which survived; two in 1999; four in 2002 (two separate dredging contracts); three in 2003; two in 2006; five in 2007, and one each in 2008, 2009 and 2013 (USACE, 2013a). Between 2002 and 2009, pre-dredging and during-dredging relocation trawling was conducted in conjunction with BIH maintenance dredging projects. During the course of this trawling, 118 green turtles were tagged and released unharmed: seven in 2002; 13 in 2003; 34 in 2006; and 64 in 2007 (USACE, 2013a).

2.9 KEMP'S RIDLEY SEA TURTLE

The Kemp's ridley sea turtle (*Lepidochelys kempii*) is the smallest of the sea turtles, with adults reaching about 2 feet in length and weighing up to 100 pounds. Adults are primarily restricted to the Gulf, although juveniles may range throughout the Atlantic Ocean since they have been observed as far north as Nova Scotia (Musick, 1979) and in coastal waters of Europe (Brongersma, 1972). Important foraging areas include Campeche Bay, Mexico, and Louisiana coastal waters. Almost the entire population of Kemp's ridleys nests on an 11-mile stretch of coastline near Rancho Nuevo, Tamaulipas, Mexico, approximately 190 miles south of the Rio Grande. A secondary nesting area occurs at Tuxpan, Veracruz, and sporadic nesting has been reported from Mustang Island, Texas, southward to Isla Aquada, Campeche. Several scattered isolated nesting attempts have occurred from North Carolina to Colombia.

The Kemp's ridley sea turtle was listed as endangered throughout its range in 1970 (35 FR 18319, December 2, 1970a). It is considered to be the most seriously endangered of all sea turtles (USFWS and NMFS, 1992; NPS, 2013b). In 2010, a petition was filed by the WildEarth Guardians to designate critical habitat for nesting beaches along the Texas coast and marine habitats in the Gulf of Mexico and Atlantic Ocean. No critical habitat has yet been designated.

Kemp's ridleys inhabit shallow coastal and estuarine waters, usually over sand or mud bottoms. Adults are primarily shallow-water benthic feeders that specialize on crabs while juveniles feed on sargassum and associated infauna, and other epipelagic species of the Gulf (USFWS and NMFS, 1992). In some regions the blue crab (*Callinectes sapidus*) is the most common food item of adults and juveniles. Other food items include shrimp, snails, bivalves, sea urchins, jellyfish, sea stars, fish, and occasional marine plants (Pritchard and Marquez, 1973; Shaver, 1991; Campbell, 1995).

Populations of this species have declined since 1947, when an estimated 42,000 females nested in one day, to a total nesting population of approximately 1,000 in the mid-1980s. The decline of this species was primarily the result of human activities including collection of eggs, fishing for juveniles and adults, killing adults for meat and other products, and direct take for indigenous use. In addition to these sources of mortality, Kemp's ridleys have been subject to high levels of incidental capture in fishing gear, primarily in shrimp trawls, but also in gill nets, longlines, and traps (USFWS and NMFS, 1992; NMFS, 2013b). The National Research Council's (NRC) Committee on Sea Turtle Conservation estimated in 1990 that 86 percent of the human-caused deaths of juvenile and adult loggerheads and Kemp's ridleys resulted from shrimp trawling (Campbell, 1995).

Another problem shared by adult and juvenile sea turtles is the ingestion of manmade debris and garbage. Postmortem examinations of sea turtles found stranded on the south Texas coast from 1986 through 1988 revealed 54 percent of the sea turtles had eaten some type of marine debris. Much of this debris comes from offshore oil rigs, cargo ships, commercial and recreational fishing boats, research vessels, naval ships, and other vessels operating in the Gulf. Laws enacted during the late-1980s to regulate this dumping are difficult to enforce over vast expanses of water. In addition to trash, pollution from heavy spills of oil or waste products poses additional threats (Campbell, 1995).

Further threats to this species include collisions with boats, explosives used to remove oil rigs, and entrapment in coastal power plant intake pipes (Campbell, 1995). Dredging operations affect Kemp's ridley turtles through incidental take and by degrading the habitat. Incidental take of ridleys has been documented with hopper dredges. In addition to direct take, channelization of the inshore and nearshore areas can degrade foraging and migratory habitat through dredged material placement, degraded water quality/clarity, and altered current flow (USFWS and NMFS, 1992).

Because of the dangerous population decline at the time, a head-starting program was carried out from 1978 to 1988. Eggs were collected from Rancho Nuevo, placed in a hatchery on Padre Island and incubated. The resulting hatchlings were allowed to crawl over the Padre Island beaches into the surf for imprinting purposes before being recovered from the surf and taken to Galveston for rearing, before being released into Texas (mainly) or Florida waters (Caillouet et al., 1995). This program has shown some results. The first nesting from one of these head-started individuals occurred at Padre Island in 1996. From 1996 through the 2007 nesting season, 59 nests were from Headstart turtles (NPS, 2013b).

Sea turtles are especially subject to human impacts during the time the females come ashore for nesting. Modifications to nesting areas can have a devastating effect on sea turtle populations. In many cases, prime sea turtle nesting sites are also prime real estate. If a nesting site has been disturbed or destroyed, female turtles may nest in inferior locations where the hatchlings are less likely to survive, or they may not lay any eggs at all. Artificial lighting from developed beachfront areas often disorients nesting females and hatchling sea turtles, causing them to head inland by mistake, often with fatal results. Adult females also may avoid brightly lit areas that would otherwise provide suitable nesting sites.

Egg collection was an extreme threat to the population, but since nesting beaches were afforded official protection in 1966, this threat no longer poses a major concern. This together with the requirement to use TEDs in shrimp trawls and other measures to reduce turtle bycatch are some of the primary factors in recovery of this species (NMFS, 2013b).

Kemp's ridley appears to be in the earliest stages of recovery. During the 2000 nesting season, an estimated 2,000 females nested at Rancho Nuevo, a single arribada of 1,000 turtles was reported in 2001, and an estimated 3,600 turtles produced over 8,000 nests in 2003. In 2006, a record number of nests were recorded since monitoring began in 1978; 12,143 nests were documented in Mexico, with 7,866 of those at Rancho Nuevo (NMFS, 2013b).

Kemp's ridleys may have nested sporadically in Texas in the last 50 years; however, the number of nests over recent years has shown an ever-increasing trend: 1996 (6 nests); 1997 (9 nests); 1998 (13 nests); 1999 (16 nests); 2000 (12 nests); 2001 (8 nests); 2002 (38 nests); 2003 (19 nests); 2004 (42 nests); 2005 (51 nests); 2006 (102 nests); and 2007 (128 nests); 2008 (195 nests); 2009 (197 nests); 2010 (141 nests); 2011 (199 nests), and 2012 (209 nests) (NPS, 2012 and 2013a). As noted above, some of these nests were from headstarted ridleys. The majority of the Kemp's ridley nests recorded in Texas were at the PINS. Such nestings, together with the proximity of the Rancho Nuevo rookery, probably account for the occurrence of hatchlings and subadults in Texas.

Kemp's ridley occurrence in Texas may well be a reflection of crustacean-rich feeding areas in the northern Gulf and breeding grounds in Mexico. Kemp's ridley nests have been reported in the study area; in 2012, 106 were report from the PINS (most of which lies outside of the study area), 59 were reported from South Padre island, and 10 were located on Boca Chica Beach, south of the BIH Channel (USFWS, 2013a). Of the latest reported ridley standings (2007) along the Texas Coast, 35 were from Zone 21, which extends from the Mouth of the Rio Grande to the vicinity of Yarborough Pass (STSSN, 2013).

Since 1995, the BIH Entrance Channel has been dredged 12 times using hopper dredges; Kemp's ridley turtles were killed by the dredge during three of these dredging events: one each in 1995, 1997 and 2009 (USACE, 2013a). Between 2002 and 2009, pre-dredging and during-dredging relocation trawling was conducted in conjunction with BIH maintenance dredging projects. During the course of this trawling, three Kemp's ridley turtles were tagged and released unharmed. All three relocations occurred in 2008 (USACE, 2013a).

2.10 LOGGERHEAD SEA TURTLE

Loggerhead sea turtles (*Caretta caretta*) were named for their relatively large heads, which support powerful jaws and enable them to feed on hard-shelled prey, such as whelks and conch. The loggerhead is widely distributed in tropical and subtropical seas, being found in the Atlantic Ocean from Nova Scotia to Argentina, the Gulf, Indian, and Pacific oceans (although it is rare in the eastern and central Pacific), and the Mediterranean Sea (Rebel, 1974; Ross, 1982; Iverson, 1986), and is the most abundant sea turtle species in U.S. coastal waters (NMFS, 2013c). In the continental U.S., loggerheads nest along the Atlantic coast from Florida to as far north as New Jersey (Musick, 1979) and sporadically along the Gulf Coast. In recent years, a few have nested on barrier islands along the Texas coast.

The Northwest Atlantic Ocean population of the loggerhead turtle was listed as threatened in 2011 (76 FR 58868, September 22, 2011). In 2011, the NMFS and USFWS determined that the loggerhead sea turtle is composed of nine distinct population segments (DPSs) that constitute "species" that may be listed as threatened or endangered under the ESA. Formerly, all populations of the loggerhead were determined threatened throughout its range (43 FR 32808, July 28, 1978b). In the 2011 final rule, four DPSs were listed as threatened and five as endangered under the ESA. The four threatened DPSs are located in the Northwest Atlantic Ocean, the South Atlantic Ocean, the Southeast Indo-Pacific Ocean, and the Southwest Indian Ocean. The five endangered DTSs are located in the Mediterranean Sea, the North Indian Ocean, the North Pacific Ocean, the Northeast Atlantic Ocean and the South Pacific Ocean. NMFS and USFWS also announced they intend to propose the designation of critical habitat for the two loggerhead sea turtle DPSs occurring within the U.S. (the Northwest Atlantic and North Pacific Oceans) in a future rulemaking. The proposal to designate critical habitat in the Northwest Atlantic was published in 2013 (78 FR 17999, March 25, 2013c). The proposed critical habitat is located in coastal counties in North Carolina, South Carolina, Georgia, Florida, Alabama, and Mississippi.

The loggerhead occurs in the open seas as far as 500 miles from shore, but mainly over the continental shelf, and in bays, estuaries, lagoons, creeks, and mouths of rivers. It favors warm temperate and subtropical regions not far from shorelines. The adults occupy various habitats, from turbid bays to clear waters of reefs. Subadults occur mainly in nearshore and estuarine waters. Hatchlings move directly to sea after hatching, and often float in masses of sargassum. They may remain associated with sargassum for perhaps 3 to 5 years (NMFS and USFWS, 1991b). Commensurate with their use of varied habitats, loggerheads consume a wide variety of both benthic and pelagic food items, which they crush before swallowing. Conches, shellfish, horseshoe crabs, prawns and other crustacea, squid, sponges, jellyfish, basket starts, fish (carrion or slow-moving species), and even hatchling loggerheads have all been recorded as loggerhead prey (Rebel, 1974; Hughes, 1974; Mortimer, 1982). Adults forage primarily on the bottom, but also take jellyfish from the surface. The young feed on prey concentrated at the surface, such as gastropods, fragments of crustaceans, and sargassum.

Nesting occurs usually on open sandy beaches above the high-tide mark and seaward of well-developed dunes. They nest primarily on high-energy beaches on barrier islands adjacent to continental land masses in warm-temperate and subtropical regions. Steeply sloped beaches with gradually sloped offshore approaches are favored. In Florida, nesting on urban beaches was strongly correlated with the presence of tall objects (trees or buildings), which apparently shield the beach from city lights (Salmon et al., 1995).

Recent analyses of nesting data from southeast Florida show the population is declining. Similarly, long-term nesting data show loggerhead nesting declines in North Carolina, South Carolina, and Georgia (NMFS, 2013c). The decline of the loggerhead, like that of most sea turtles, is the result of overexploitation by man, and inadvertent mortality associated with fishing and trawling activities. The most significant threats to its population are incidental capture in fishing gear, directed harvest, coastal development, increased human use of nesting beaches, and pollution (NMFS, 2013c). Incidental take of ridleys has been documented with hopper dredges.

The loggerhead is the most abundant turtle in Texas marine waters, preferring shallow inner continental shelf waters and occurring only very infrequently in the bays. It often occurs near offshore oil rig platforms, reefs, and jetties. Loggerheads are probably present year-round but are most noticeable in the spring when a favored food item, the Portuguese man-of-war (*Physalia physalis*), is abundant. Loggerheads constitute a major portion of stranded turtles on the Texas coast each year (STSSN, 2013). A large proportion of these deaths are the result of accidental capture by shrimp trawlers, where caught turtles drown and their bodies dumped overboard.

Before 1977, no positive documentation of loggerhead nests in Texas existed. Since that time, several nests have been recorded along the Texas coast. Two to five loggerhead nests were confirmed along the Texas Coast each year from 1999 through 2005 (USACE, 2007). During the last decade, nesting has remained relatively stable on the Texas coast, with 0-6 nests per year. Although nests have been found state-wide, the largest numbers have been located at the National Seashore (NPS, 2013c).

This species has been recorded in the study area. Loggerhead nests were recorded at South Padre Island in 2001, 2003, 2005, 2006, and 2007. In 2012, one nest was recorded at the PINS and one was recorded on South Padre Island (NPS, 2012). Since 1995, the BIH Entrance Channel has been dredged 12 times using hopper dredges; loggerhead turtles were killed by the dredge during five of these dredging events: one each in 1997, 2007 and 2008, and two in 2009 (USACE, 2013a). Between 2002 and 2009, pre-dredging and during-dredging relocation trawling was conducted in conjunction with BIH maintenance dredging projects. During the course of this trawling, 16 loggerhead turtles were tagged and released unharmed (USACE, 2013a).

2.11 HAWKSBILL SEA TURTLE

The hawksbill sea turtle (*Eretmochelys imbricata*) is circumtropical, occurring in tropical and subtropical seas of the Atlantic, Pacific, and Indian oceans (Witzell, 1983). This species is probably the most tropical of all marine turtles, although it does occur in many temperate regions. The hawksbill sea turtle is widely distributed in the Caribbean Sea and western Atlantic Ocean, with representatives of at least some life history stages regularly occurring in southern Florida and the northern Gulf (especially Texas), south to Brazil (NMFS, 2013d). In the continental U.S., the hawksbill largely nests in Florida where it is sporadic at best (NFWL, 1980). However, a major nesting beach exists on Mona Island, Puerto Rico. Elsewhere in the western Atlantic, hawksbills nest in small numbers along the Gulf Coast of Mexico, the West Indies, and along the Caribbean coasts of Central and South America (Musick, 1979).

The hawksbill sea turtle was Federally listed as endangered in 1970 on (35 FR 84952, June 2, 1970b). In 1998, NMFS and USFWS designated critical habitat near Mona Island and Isla Monito, Puerto Rico, seaward to 5.6 kilometers (km) (63 FR 46693, September 2, 1998).

Hawksbills generally inhabit coastal reefs, bays, rocky areas, passes, estuaries, and lagoons, where they occur at depths of less than 70 ft. Like some other sea turtle species, hatchlings are sometimes found floating in masses of marine plants (e.g., sargassum rafts) in the open ocean (NFWL, 1980). Hawksbills reenter coastal waters when they reach a carapace length of approximately 20 to 25 centimeters. Coral reefs are widely recognized as the resident foraging habitat of juveniles, subadults, and adults. This habitat association is undoubtedly related to their diet of sponges, which need solid substrate for attachment. Hawksbills also occur around rocky outcrops and high-energy shoals, which are also optimum sites for sponge growth.

While this species is omnivorous, it prefers invertebrates, especially encrusting organisms, such as sponges, tunicates, bryozoans, mollusks, corals, barnacles, and sea urchins. Pelagic species consumed include jellyfish and fish, and plant material such as algae, sea grasses and mangroves, (Carr, 1952; Rebel, 1974; Pritchard, 1977; Musick, 1979; Mortimer, 1982). The young are reported to be somewhat more herbivorous than adults (Ernst and Barbour, 1972). Terrestrial habitat is typically limited to nesting activities. The hawksbill, which is typically a solitary nester, nests on undisturbed, deep-sand beaches, from high-energy ocean beaches to tiny pocket beaches several meters wide bounded by crevices of cliff walls. Typically, the sand beaches are low energy, with woody vegetation, such as sea grape (*Coccoloba uvifera*), near the waterline (NRC, 1990).

The primary global threat to hawksbills is habitat loss of coral reef communities. Coral reefs are vulnerable to destruction and degradation caused by human activities. Historically, commercial exploitation was the primary cause of the decline of hawksbill sea turtles. There remains a continuing demand for the hawksbill's shell as well as other products, including leather, oil, perfume, and cosmetics. Additionally, hawksbills are harvested for their eggs and meat while whole stuffed turtles are sold as curios in the tourist trade. In addition to directed harvest, increased human presence is a threat to hawksbills. In particular, increased recreational and commercial use of nesting beaches, beach camping and fires, litter and other refuse, general harassment of turtles, and loss of nesting habitat from human activities negatively impact hawksbills. Incidental capture in fishing gear, primarily gillnets, and vessel strikes also adversely affect this species' recovery (NMFS, 2013d).

Texas is the only state outside of Florida where hawksbills are sighted with any regularity. Most of these sightings involve posthatchlings and juveniles, and are primarily associated with stone jetties. These small turtles are believed to originate from nesting beaches in Mexico (NMFS, 2013d). On 13 June 1998, the first hawksbill nest recorded on the Texas coast was found at PINS. This nest remains the only documented hawksbill nest on the Texas coast (NPS, 2013d). Stranding data from 2004 through 2007 show that 59 hawksbills were found along Texas waters or shorelines (STSSN, 2013). Of the hawksbill standings reported from 2004 through 2007 along the Texas Coast, 17 were from Zone 21, which extends from the mouth of the Rio Grande to the vicinity of Yarborough Pass (STSSN, 2013). No hawksbills have been killed or captured during relocation trawls during BIH maintenance dredging projects since record-keeping began in 1995 (USACE, 2013a).

2.12 LEATHERBACK SEA TURTLE

Leatherback sea turtles (*Dermochelys coriacea*) are named for their appearance. They do not have shells as other sea turtles do. Instead, their backs are covered by a slate black to bluish-black leathery skin with irregular white or pink patches. They are the largest turtles in the world, reaching over 6 feet in length and 650-1,200 pounds in weight (NPS, 2013e).

The leatherback sea turtle was listed as endangered throughout its range in 1970 (35 FR 84952, June 2, 1970), with critical habitat designated in the U.S. Virgin Islands in 1978 and 1979 (43 FR 43688, September 26, 1978 and 44 FR 17710, March 23, 1979, respectively). In 2011, USFWS announced that revision of the critical habitat to include the coastline and offshore waters of the Northeast Ecological Corridor of Puerto Rico may be warranted and that assessment of the need for revisions to critical habitat would be conducted during a future planned status review (76 FR 47133, August 4, 2011c).

The leatherback is probably the most wide-ranging of all sea turtle species. It occurs in the Atlantic, Pacific and Indian oceans; as far north as British Columbia, Newfoundland, Great Britain, and Norway; as far south as Australia, the Cape of Good Hope, and Argentina; and in other water bodies such as the Mediterranean Sea (NFWL, 1980). The leatherback migrates further and ventures into colder water than any other marine reptile. Adults appear to engage in routine migrations between boreal, temperate, and tropical waters, presumably to optimize both foraging and nesting opportunities. During the summer, leatherbacks tend to occur along the east coast of the U.S. from the Gulf of Maine south to the middle of Florida.

Leatherbacks nest primarily in tropical regions; major nesting beaches include Malaysia, Mexico, French Guiana, Surinam, Costa Rica, and Trinidad (Ross, 1982). Leatherbacks nest only sporadically in some of the Atlantic and Gulf states of the continental U.S., with one nesting reported as far north as North Carolina (Schwartz, 1976). The U.S. Caribbean, primarily Puerto Rico and the U.S. Virgin Islands, and southeast Florida support minor nesting colonies, but represent the most significant nesting activity within the United States (NMFS, 2013e).

The leatherback sea turtle is mainly pelagic, inhabiting the open ocean, and seldom approaches land except for nesting (Eckert, 1992). It is most often found in coastal waters only when nesting or when following concentrations of jellyfish, when it can be found in inshore waters, bays, and estuaries. It dives almost continuously, often to great depths. Despite their large size, the diet of leatherbacks consists largely of jellyfish and sea squirts. They also consume sea urchins, squid, crustaceans, fish, blue-green algae, and floating seaweed (NFWL, 1980). The leatherback typically nests on beaches with a deepwater approach (Pritchard, 1971).

Its decline is attributable to overexploitation by man and incidental mortality associated with commercial shrimping and fishing activities. Use of turtle meat for fish bait and the consumption of litter by turtles are also causes of mortality, the latter phenomenon apparently occurring when plastic is mistaken for jellyfish (Rebel, 1974). Nesting populations of leatherback sea turtles are especially difficult to estimate because the females frequently change nesting beaches; however, Spotila et al. (1996) estimated the 1995 worldwide population of nesting female leatherbacks at 26,000 to 42,000. Major threats include egg collecting and mortality associated with bycatch in longline, trawl and gillnet fisheries throughout their range although they are jeopardized to some extent by harvesting of adult females, destruction or degradation of nesting habitat, and ingestion of floating trash (Nature Serve, 2013d). This species is probably more susceptible than other turtles to drowning in shrimp trawlers equipped with turtle extruder devices (TEDs) because adult leatherbacks are too large to pass through the TED exit opening. Because leatherbacks nest in the tropics during hurricane season, a potential exists for storm-generated waves and wind to erode nesting beaches, resulting in nest loss (NMFS and USFWS, 1992).

Apart from occasional feeding aggregations such as the large one of 100 animals reported by Leary (1957) off Port Aransas in December 1956, or possible concentrations in the Brownsville Eddy in winter, leatherbacks are rare along the Texas coast, tending to keep to deeper offshore waters where their primary food source, jellyfish, occurs. In the Gulf, the leatherback is often associated with two species of jellyfish: the cabbagehead (*Stomolophus sp.*) and the moon jellyfish (*Aurelia sp.*) (NMFS and USFWS, 1992). According to USFWS (1981), leatherbacks never have been common in Texas waters. Leatherback nests were recorded on Padre Island in the 1930's-40's. One leatherback nest was located at PINS in 2008. Since then, no leatherback nests have been located anywhere in Texas (NPS, 2013e).

No leatherbacks have been taken by dredging activities in Texas (USACE, 2013a). No leatherback strandings were reported from 2004 through 2007 in Zone 21, which extends from the mouth of the Rio Grande to the vicinity of Yarborough Pass (STSSN, 2013). This species is unlikely to occur in the study area.

2.13 SOUTH TEXAS AMBROSIA

South Texas ambrosia (*Ambrosia cheiranthifolia*), a member of the aster family, is a herbaceous, perennial plant with erect stems. It is grayish-green in color with yellow flowers, 4 to 12 inches in height. It is also known as South Texas Ragweed, Rio Grande Ragweed (TPWD, 2013b). This plant was listed as endangered in 1994 (59 FR 43648, August 24, 1994). No critical habitat has been designated.

Historically, South Texas ambrosia is known from northern Tamaulipas in Mexico, Cameron, Jim Wells, Kleberg and Nueces Counties in Texas and the state of Tamaulipas, Mexico (TPWD, 2013a). In 1994, populations had been verified in eight populations, four in Nueces County, three in Kleberg County, and one overlapping both counties. It occurs at low elevations in open clay-loam to sandy-loam prairies and savannas. Associated native grasses found at the existing sites include Texas grama, buffalograss, Texas wintergrass, and tobosa. Native woody species found scattered throughout the existing sites include mesquite, huisache, huisachillo, brasil, granjeno, and lotebush (TPWD, 2013a). Much of the original native habitat for South Texas ambrosia has been converted to agricultural fields, improved pastures, or urban areas (59 FR 43648, August 24, 1994).

Loss and fragmentation of habitat has led to the decline of this species (59 FR 43648, August 24, 1994; TPWD, 2013a). Conversion of habitat to agricultural fields and urban areas has limited the amount of habitat available for colonization. In addition, introduced species such as buffelgrass and King Ranch bluestem compete with this and other natives of the coastal prairie. Invasion of grasslands by shrub and tree species also contributes to loss of available habitat, although the species does occur among scattered woody plants. Disturbance associated with activities occurring along road right-of-ways where the species is found may also be detrimental.

Today, the species occurs at six locations in Nueces and Kleberg counties (TPWD, 2013a). The current status of any populations in Mexico is unknown. The number of occurrences is about 15-20 occurrences in South Texas and Tamaulipas Mexico. However, one report notes that the species is, or may be, extirpated in Cameron County, Texas (NatureServe, 2013e). It is not known to occur in the study area.

2.14 TEXAS AYENIA

Texas ayenia, a member of the cacao family, is a thornless, medium-sized shrub, two to five feet tall (TPWD, 2013b). This species occupies dense subtropical thorn woodland or tall shrubland on soils ranging from heavy clay to fine sandy clay loam and fine sandy loam. The current known population in Texas is within the Texas Ebony-Anacua plant community, a closed-canopy community of riparian terraces that once covered much of the Rio Grande delta, but is now reduced to remnant fragments surrounded by agricultural fields, pastures, and urban areas with less than 5 percent of the original acreage remaining (NatureServe 2013f). It was listed as endangered in 1994 (59 FR 43648, August 24, 1994). No critical habitat has been designated.

Habitat loss is thought to be the major threat to the continued existence of this species (59 FR 43648, August 24, 1994; TPWD, 2013b). Much of the native woodland and brush within the historical range of Texas Ayenia has been converted to agricultural or urban use. Flood control may be of particular importance to this species and the ecosystem upon which it depends. Introduction and spread of non-native species such as guinea grass (Panicum maximum) also poses a serious threat to the species. The small size of the existing U. S. population makes this species very vulnerable.

Historically, Texas ayenia once occurred in Cameron and Hidalgo counties in south Texas, and in the states of Coahuila and Tamaulipas in Mexico. Available information on recent occurrences is conflicting. USFWS reports there are known populations ranging from Soto la Marina in east-central Tamaulipas to Cameron, Hidalgo and Willacy Counties (USFWS, 2013d). TPWD reports that Texas ayenia exists in the U.S. in only one small population of about 20 individuals in Hidalgo County (TPWD, 2013c). NatureServe (2013f) reports there is an extremely limited amount of native habitat remaining, with six known extant populations (four in south Texas and two in Mexico). These Texas populations are limited to the Rio Grande Valley in Cameron County. It is not likely to occur in the study area.

2.15 CANDIDATE SPECIES

2.15.1 Red Knot

Red knots of the *rufa* subspecies (*Calidris canutus rufa*) are medium-sized shorebirds that breed only in Arctic Canada and migrate approximately 18,500 miles annually between Arctic breeding grounds and primary wintering areas in Tierra Del Fuego, at the southern tip of South America. They also winter in three other distinct coastal areas of the Western Hemisphere: the southeastern United States (mainly Florida and Georgia, with smaller numbers in South Carolina), the Gulf of Mexico coast of Texas, and Maranhão in northern Brazil (USFWS, 2011a). The USFWS began proposing that this species be considered a Candidate for listing in 2008, and confirmed this finding in the most recent filing (77 FR 69993, November 21, 2012a). USFWS expected to publish a proposed listing rule within the next year.

In South American wintering areas, red knots are found principally in intertidal marine habitats, especially near coastal inlets, estuaries, and bays, or along intertidal earthen shelf formations. The Delaware Bay area (in Delaware and New Jersey) is the largest known spring migration stopover area, with far fewer migrants congregating elsewhere along the Atlantic coast. The concentration in the Delaware Bay area occurs from the middle of May to early June, corresponding to the spawning season of horseshoe crabs. The knots feed on horseshoe crab eggs, rebuilding energy reserves needed to complete migrations to the Arctic. Surveys at wintering areas and at Delaware Bay during spring migration indicate a substantial decline in the red knot in recent years. Research shows that since 1998, a high proportion of red knots leaving the Delaware Bay failed to achieve threshold departure masses needed to fly to breeding grounds and survive an initial few days of snow cover, and this corresponded to reduced annual survival rates (73 FR 75176, December 10, 2008).

The primary factor threatening the red knot is destruction and modification of its habitat, particularly the reduction in key food resources resulting from reductions in horseshoe crabs, which are harvested primarily for use as bait and secondarily to support a biomedical industry.
Counts of red knots within the principal wintering areas in Chile and Argentina declined by nearly 75 percent from 1985 to 2007 and declined by an additional 15 percent in the past year (2007 to 2008).

Along the Texas coast, red knots forage on beaches, oyster reefs, and exposed bay bottoms and roost on high sand flats, reefs, and other sites protected from high tides (NatureServe, 2013c). They have been reported to use the barrier island beaches, exposed tidal flats, washover passes, and mudflats associated with the Laguna Madre (Port Isabel Economic Development Corporation, 2013). In wintering and migration habitats, red knots commonly forage on bivalves, gastropods, and crustaceans. It has been reported that Coquina clams (Donax variabilis) serve as a frequent and often important food resource for red knots along Gulf beaches. Reports of the size of flocks of along the Gulf of Mexico coast vary considerably, from highs of about 2,800 to 700 (USFWS 2011a).

2.15.2 Red-Crowned Parrot

The red-crowned parrot (*Amazona viridigenalis*) is native to Mexico and is currently found in northeastern Mexico, inhabiting lush areas in arid lowlands and foothills, particularly gallery forests, deciduous woodlands, and dry, open, pine-oak woodlands. In Mexico, the species' distribution is confined to the lowland plains (Atlantic coastal plain) and the low eastern slopes of the Sierra Madre Oriental. In addition, several introduced populations occur in urban areas of the United States, Puerto Rico, and Mexico. Evidence suggests populations in the LRGV consist, at least partly, of naturally occurring populations. Therefore, USFWS treats the Lower Rio Grande Valley populations as native populations (76 FR 62016, October 6, 2011b).

USFWS initiated a status review in response to a petition filed in 2009 (74 FR 33957, July 14, 2009d) which resulted in the red-crowned parrot being considered a Candidate for listing. In 2011, USFWS found that listing was warranted but precluded by higher priority listing actions (76 FR 62016, October 6, 2011b). This finding was confirmed in 2012 (77 FR 69994, November 21, 2012b).

In the LRGV, red-crowned parrots occur primarily in urban areas. Although little information on urban habitat use specific to the LRGV is available, in cities where the species is introduced it is reported to prefer areas with large trees that provide both food and nesting sites. Red-crowned parrots are nonmigratory, but are apparently nomadic during the winter (non-breeding) season when large flocks range widely to forage. The red-crowned parrot usually forages in the crowns of trees, but will occasionally feed on low-lying bushes. Foraging appears to be opportunistic. Its diet includes a variety of primarily seeds and fruits, but also buds and flowers (76 FR 62016, October 6, 2011b).

The primary threats to the red-crowned parrot at this time include habitat loss, illegal capture for the pet trade, and the inadequacy of regulatory mechanisms that address those threats. It is estimated that the global population of red-crowned parrots is fewer than 5,000 individuals and the recent population trend is a decrease greater than or equal to 50 percent over 30 years. Numbers and trend of the species within Texas portion are largely unknown, and speculative. USFWS has no information indicating whether future urban growth may positively or negatively affect the red-crowned parrot population in the region (76 FR 62016, October 6, 2011b) .

2.15.3 Sprague's Pipit

The Sprague's pipit (*Anthus spragueii*) is a small passerine endemic to the Northern Great Plains and is one of the few bird species endemic to the North American prairie (75 FR 56028, September 15, 2010b). Sprague's pipits are strongly tied to native prairie throughout their life cycle but will utilize nonnative planted grassland. These birds are sensitive to fragmentation and require relatively large grassland patches to form breeding territories.

USFWS initiated a status review in response to a petition filed in 2009 (74 FR 63337, December 3, 2009e) which resulted in the Sprague's pipit being considered a Candidate for listing. In 2010, USFWS found that listing was warranted but precluded by higher priority listing actions (75 FR 56028, September 15, 2010b).

The Sprague's pipit breeding range extends throughout North Dakota, except for the easternmost counties, northern and central Montana east of the Rocky Mountains, northern portions of South Dakota, northwestern Minnesota, southeastern Alberta, the southern half of Saskatchewan, and into southwest Manitoba. It's wintering range includes south-central and southeast Arizona, Texas, southern Oklahoma, southern Arkansas, northwest Mississippi, southern Louisiana, and northern Mexico. Migration and wintering ecology are poorly known, but migrating and wintering Sprague's pipits are found in both densely and sparsely vegetated grassland, and pastures; they are rarely found in fallow cropland. Sprague's pipits exhibit a strong preference for grassland habitat during the winter and an avoidance of areas with too much shrub encroachment. They eat a wide variety of insects during the breeding season and a very small percentage of seeds (74 FR 63337, December 3, 2009e). Recent sightings have been reported outside of the study area upstream in the LRGV (Bird Treks, 2013).

The primary threats to the Sprague's pipit are habitat fragmentation on the breeding grounds, energy development, roads, and inadequacy of existing regulatory mechanisms. Native prairie is one of the most imperiled habitats worldwide, with loss rates approximating 70 percent in the United States and Canada, and prairie loss is accelerating. There is less specific information available on the wintering grounds, but the data available indicate that large areas of the wintering grounds are being converted from grassland habitat. The 40–year trend in Christmas Bird County data shows an annual decline of 2.54 percent of this species in Texas. Adequate regulations are not in place at the local, State, or Federal level to adequately minimize the threat of habitat degradation and fragmentation.

2.15.4 Scalloped Hammerhead Shark

The scalloped hammerhead shark (*Sphyrnea lewini*) is a moderately large shark with a global distribution (NMFS, 2013g). The eight or so species of hammerhead sharks are characterized by the flat, extended head or "cephalofoil." The cephalofoil of a scalloped hammerhead shark is characterized by an indentation located centrally on the front margin of the broadly arched head. Two more indentations flank the main central indentation, giving this hammerhead a "scalloped" appearance.

In response to a petition submitted by WildEarth Guardians and Friends of Animals to list the species as threatened or endangered, the NMFS completed a comprehensive status review for the scalloped hammerhead shark which determined that the species is comprised of six DPSs that qualify as species under the ESA: Northwest Atlantic and Gulf of Mexico (NW Atlantic and GOM); Central and Southwest Atlantic (Central and SW Atlantic); Eastern Atlantic DPS; Indo-West Pacific DPS; Central Pacific DPS; and Eastern Pacific DPS (78 FR 20717, April 5, 2013h). The NMFS further determined that two DPSs warrant listing as endangered, the Eastern Atlantic and Eastern Pacific DPSs; two DPSs warrant listing as threatened, the Central & SW Atlantic and Indo-West Pacific DPSs; and two DPSs do not warrant listing at this time, the NW Atlantic and GOM DPS and the Central Pacific DPS. The study area is located in the NW Atlantic and GOM DPS.

The scalloped hammerhead shark is a coastal pelagic species that can also be found in ocean waters and occurs over continental and insular shelves and adjacent to deeper water. It has been observed close inshore and even entering estuarine habitats, as well as offshore. They feed on crustaceans, teleosts, cephalopods and rays (NMFS, 2013g).

This species is highly desired for the shark fin trade because of its fin size and high fin ray count. They are valuable in the international fin and are often used to make shark fin soup. A recent stock assessment found that the northwestern Atlantic population has decreased from about 155,500 in 1981 to about 26,500 in 2005 (NMFS, 2013g).

The scalloped hammerhead shark may be found within the study area. However, the study area is located in the NW Atlantic and GOM DPS, and did not warrant listing at this time.

2.15.5 Corals

On October 20, 2009, NMFS received a petition from the Center for Biological Diversity to list 83 species of coral as either threatened or endangered under the ESA. In response, NMFS issued a 90-day finding (75 FR 6616, February 10, 2010a), which determined that the petition contained substantial information indicating listing may be warranted for all of the petitioned species except *Oculina varicosa*. NMFS convened a Coral Biological Review Team to assess the biological status and threats to each of the 82 corals. In addition, the Pacific Islands Regional Office staff developed a report on management actions relevant to the species across their range, including existing regulatory mechanisms and conservation efforts (NMFS, 2012).

Of the 82 coral species included in the status review, seven are located in the Caribbean region which includes the reef tract of south Florida and the Florida Keys, Puerto Rico, the U.S. Virgin Islands and all the islands of the wider Caribbean region (NMFS, 2012). The seven coral species are boulder star coral (*Montastraea annularis*), boulder star coral (*Montastraea franksi*), elliptical star coral (*Dichocoenia stokesii),* Lamarck's sheet coral (*Agaricia lamarcki*), mountainous star coral (*Montastraea faveolata*), pillar coral (*Dendrogyra cylindrus*), and rough cactus coral (*Mycetophyllia ferox*) (75 FR 6616, February 10, 2010a).

Relatively high human population densities and a long history of pervasive human impacts to coral reef systems exist across the Caribbean region (NMFS, 2012). Nearly two-thirds of Caribbean coral reefs are threatened by at least one form of human activity, with continuing threats of region-wide damage due to rising sea temperatures and disease. Additionally, none of the Caribbean's three keystone species indicative of reef health (the corals *Acropora palmata* and *A.cervicornis*, and the urchin *Diadema antillarum*) show significant recovery over decadal time scales. The region is also susceptible to strengthening storms and hurricanes, and suffers mass bleaching events, hampering ecosystem recovery.

The seven coral species current U.S. distribution is restricted to south Florida and the Florida Keys, Puerto Rico, the U.S. Virgin Islands. None are located within the study area.

2.16 SPECIES OF CONCERN

2.16.1 Dusty and Sand Tiger Sharks

NMFS identified two sharks as Species of Concern for the study area – the dusky shark (*Carcharhinus obscurus*) and the sand tiger shark (*Carcharias taurus*). Both dusky and sand tiger sharks could occur in the study area.

The dusky shark is also known as the bronze whaler or black whaler (NMFS, 2010b). It is a large, fairly slender shark with a low ridge between the dorsal fins. It occurs in both inshore and offshore waters at depths as low as 1300 feet. Adults of this species tend to avoid areas of low salinity and rarely enter estuaries. The young congregate in very shallow coastal water in estuaries and bays. Their diet includes bony fishes, cartilaginous fishes, and squid. In the western Atlantic, it occurs from southern Massachusetts and Georges Bank to Florida, Bahamas, and Cuba. It also occurs in the Northern Gulf of Mexico, and Nicaragua; Southern Brazil, Eastern Atlantic; and Southern California to the Gulf of California.

Today the dusky shark population in the northwestern Atlantic and Gulf of Mexico is probably at 15 to 20 percent of its mid-1970s abundance (NMFS, 2010b). Currently the principal threat to dusky sharks is from bycatch and illegal landings in commercial and recreational shark fisheries. Commercial and recreational possession was prohibited in 2000. However, despite being prohibited, dusky sharks are regularly caught in commercial longlines and incidentally caught on a variety of other gears. With life history traits such as slow growth, late maturity, and reproduction every three years, the dusky shark is susceptible to overfishing.

The sand tiger shark is a bulky, light brown shark with a maximum length of about 10.5 feet (NMFS, 2010c). It has a flattened conical snout and a long mouth. This shark occurs as solitary individuals, but aggregations of small to large schools may occur for feeding, courtship, mating and birth. They are present in all warm and temperate seas except the eastern Pacific. They range from the surf zone down to depths as great as 626 feet, preying on bony fishes, small sharks, rays, squid, crabs and lobsters.

Currently, the principal threat to sand tiger sharks is exploitation. It is highly regarded as a food fish in Japan and is also used for fishmeal, oil and the shark-fin trade. Increased exploitation along the U.S. east coast in the 1980s and 1990s resulted in declines of 90 percent. Their aggregating behavior, slow growth, late maturity and low productivity make them susceptible to population declines due to overexploitation.

2.16.2 Opossum Pipefish, Warwaw Grouper and Speckled Hind

NMFS identified three fishes as Species of Concern for the study area - Opossum pipefish (*Microphis brachyurus lineatus*), Warwaw grouper (*Epinenphelus nigritus*), and speckled hind (*Epinephelus drummondhayi*).

The oppossum pipefish is a relatively large pipefish, reaching a standard length of 7.6 inches (NMFS, 2009). It is carnivorous, preying on crustaceans and small fish as ambush predators in dense vegetation. It is a widespread species that spawns in brackish waters, with larvae moving quickly downstream to estuarine and marine environments. The smallest juveniles have only been captured in oceanic Sargassum rafts or coastal marine environments, while adults only occur in freshwater tributaries within 30 miles of the coast. This subspecies is known to range from New Jersey south through the Gulf of Mexico and Caribbean to Sao Paulo, Brazil, and also occurs on the Pacific Coast of Panama. The major threats to the opposum pipefish are habitat destruction, water control structures, declining water quality, and an increase in disease. The opposum pipefish occurs in the study area, having been reported in South Bay and tidal reaches the Rio Grande River (TPWD, no date).

The Warsaw grouper is a deepwater fish, inhabiting reefs or other growth-encrusted hard bottoms on the continental shelf break in waters 250 to 720 feet deep (IUCN, 2012a). Egg and larval phases occur offshore, but juveniles can be found in nearshore areas, occasionally seen on jetties and shallow water reefs. Adults are normally found on rough, rocky bottom in deep water. It is long-lived (up to 41 years) and has a slow growth rate, with a maximum size of about 440 pounds. The major threat to the Warsaw Grouper is mortality as a result of fishing or by-catch release mortality (due to barotraumas since it is deep-living). Landings have been reported in Alabama, Louisiana, North Carolina, South Carolina, Texas and Florida. The Florida west coast is the largest landing port; however, landings in Texas have been increasing. Warwaw grouper juveniles could be found in the study area.

The speckled hind is deepwater grouper which has its pelagic egg and larval stages offshore (IUCN, 2012b). Adults inhabit offshore rocky bottoms in depths of 82 to 600 feet. Juveniles are more commonly found in shallower portions of the depth range. Maximum weight is about 65 pounds. Prey include fishes, crabs, shrimp, lobster, and molluscs. The species occurs in the waters around Bermuda and along the U.S. coast from North Carolina to the Florida Keys, and in the northern and eastern Gulf of Mexico. The primary threat to the speckled hind is mortality as a result of fishing or bycatch. It is unlikely that speckled hinds would be found in the study area.

3.0 EFFECTS ON LISTED SPECIES

3.1 BROWN PELICAN

Foraging pelicans are common along the Texas Coast and may be found loafing or feeding in the project area. They would easily be able to avoid temporary construction sites. In addition, no nesting sites are located in the project area. Therefore, it is determined that the proposed project would have no effect on this species.

3.2 PIPING PLOVER

USACE PAs 2, 4A, and most of 4B are located within the piping plover's Critical Habitat Unit TX-01. These PAs are part of the environmental baseline, having been in use since before the first National Environmental Policy Act review of the BIH project in 1975 (USACE, 1975). PAs 4A and 4B contain sand and/or mud flats with sparse vegetation and little or no topographic relief which could be used by piping plovers for feeding, roosting and loafing. The sand and/or mud flats are the result of the periodic use of these areas for the placement of dredged material; after the water decants from the PAs, the sand and/or mudflats emerge after a few months and are again available as habitat. Without the disturbance of the periodic placement of material, vegetation would eventually grow in these areas, making the PAs unsuitable as habitat. Since the piping plovers naturally rely on a dynamic landscape in which habitats disappear, only to be replaced nearby, piping plovers would comfortably move to nearby sand or mud flats in the landscape mosaic while the PAs are in use. These flats are numerous in the study area. Therefore, it has been determined that the use of the PAs for the placement of dredged material would have no effect on piping plovers or their critical habitat.

Shoreline impact analyses of proposed channel improvements were conducted to determine the potential for wave field alterations to impact adjacent Gulf shorelines ten miles to the north and south of the BIH channel (HDR, 2011). The southern five miles of Critical Habitat Unit TX-3A are located within the ten-mile shoreline study area north of the channel. Proposed channel modifications were predicted to result in relatively minor alterations to the typical nearshore wave field. If the proposed channel modifications were constructed, net longshore sediment transport would continue to carry sand from the south towards the BIH channel along Brazos Island. This sand would continue to be primarily impounded by the south jetty and/or transported around the jetty and deposited within the ship channel. A significant decrease in net longshore sediment transport would be unlikely and the shoreline immediately south of the channel would be expected to remain stable to accretional.

North of the channel, shoreline change data and wave modeling indicate that interaction between the predominant southeast waves and the ship channel, jetties, and natural inlet at Brazos Santiago Pass influences the beaches along South Padre Island for several miles, with the most discernible changes historically occurring within about three miles of the ship channel (HDR, 2011). When waves are from the southeast, channel modifications would possibly cause a decrease in wave heights and angles along South Padre Island resulting in a slight decrease in net longshore transport to the north. This reduction would possibly provide some benefit in terms of shoreline stability. However, over the long term, positive impacts would likely be indistinguishable from background shoreline change because of the natural variability of coastal processes. Dredged material from maintenance of the channel would be regularly placed in the nearshore, submerged Feeder Berm, located from 1.5 to 2.5 miles north of the BIH channel in approximately 25 feet of water. Monitoring of dredged material placed in the Feeder Berm has shown that it moves toward the shoreline and is available for cross-shore transport and longshore sediment transport to the north (McLellan et al., 1997: USACE, 1989). Any sediment movement into the foreshore environment or onto the beach would be by natural processes. Overall, if the TSP were to be constructed, existing shoreline change trends would generally continue, with possible improvements in shoreline stability. Beaches adjacent to the BIH channel would not be expected to experience significant impacts from the proposed channel deepening. Therefore, it has been determined that deepening and extension of the BIH Entrance Channel would have no effect on piping plovers or their critical habitat. No other direct or indirect impacts on piping plover critical habitat are anticipated.

Studies were also conducted to determine the potential for improvements to the BIH channel to exacerbate the effects of future relative sea-level rise (RSLR) in the study area. USACE estimates that RSLR over the 50-year period of analysis could range between 0.6 feet and 2.4 feet. These studies have determined that construction of the TSP would not increase the effect of RSLR or storm surges on the study area (USACE, 2013d; Ratcliff and Massey, 2012).

All sediments from construction of the Main Channel would be placed in upland, confined PAs or in the existing New Work ODMDS site. Maintenance dredged material would be placed in the same areas as those used under existing conditions, i.e. in existing upland, confined PAs, the Feeder Berm, and if necessary, the existing Maintenance ODMDS site. The frequency and duration of maintenance dredging would be within the range occurring under existing maintenance dredging. Hydraulic pipelines may cross small, narrow stretches of sand flats along the BIH Main Channel shoreline in order to access PAs 4A and 4B, but these installations and their impacts would be temporary and affect a negligible portion of the habitat. The TSP does not include the direct placement of dredged materials on the beach or on critical habitat anywhere in the study area. No PAs or construction activities are planned in or adjacent to units TX-02, TX 3-A and 3-B.

While impacts of the disposal plan would generally be minor and temporary, hydraulic pipeline pumping of dredged material into upland PAs within designated piping plover critical habitat Unit TX-01 may affect but is not likely to adversely affect piping plovers in the following limited circumstances. Piping plovers may roost in these upland PAs to conserve energy and body reserves during combinations of certain adverse weather conditions, and disturbing the birds under these conditions could cause harm by stressing the birds. As identified in the CAR (USFWS 2013e), these conditions are cold temperatures (below 40° F), high winds (above 15-20 mph), and precipitation. If any two of these weather conditions occur in combination when the pumping of new work or maintenance material into PAs 2, 4A and 4B is ready to begin, Galveston District would survey unvegetated sand flats in these PAs for the presence of roosting piping plovers. If roosting piping plovers are identified, then pumping into affected PAs would be delayed until weather conditions ameliorate and two of these three weather conditions are no longer occurring in combination. With implementation of this conservation recommendation, it has been determined that the TSP may affect but is not likely to adversely affect piping plovers.

3.3 NORTHERN APLOMADO FALCON

While no northern aplomado falcon nests are known in the project area at this time, it is possible that aplomado falcons may use mesquite savannah and grassland areas south of the PAs for foraging and nesting. Nest structures that could be utilized by the aplomado falcon have been documented approximately 0.5 mile south of PAs 7 and 5A. All construction activities would occur within the footprint of existing PA levees, avoiding direct impacts to potential grassland and savannah habitat near the PAs. However, the activity and noise from construction activities on the PA levees or use of access roads south of the PAs may disturb birds in nests within 100 yards of these activities. Prior to commencing levee maintenance activities for new work and future maintenance during the months of March through June, areas within 100 yards of the PA levees and access roads would be examined from a distance of at least 100-300 yards for stick nests and signs of adult falcons incubating eggs or brooding chicks. If an actively utilized nest is found to exist within 100 yards of the levees or access roads, further surveys would be performed and USFWS would be contacted for a review of survey results and impact determinations. With implementation of this conservation recommendation (USFWS, 2013e), it has been determined that the TSP may affect but is not likely to adversely affect the Northern aplomado falcon.

3.4 GULF COAST JAGUARUNDI AND OCELOT

Although no recent sightings of the Gulf Coast Jaguarundi or ocelot have been reported in the study area, they are known to occur around the project area, and may use a variety of habitats for moving between preferred habitat sites. Lomas with dense brush cover in the study area have been known to facilitate the travel of endangered cats from Mexico to protected habitat in the LANWR north of the BIH channel (Reyes, 2012). Protection of habitat like that provided by these lomas is one goal of the USFWS recovery plans for each species (USFWS, 2010a and 2012b). None of these dense brush areas are located within upland PAs, but several lomas are located between the PAs. All impacts to these lomas would be avoided during construction to raise the levees for initial construction and to incrementally raise levees for maintenance dredging. A new levee would be constructed at least 30 feet from the edge of the loma in PA 4B to protect it from all construction impacts. Existing unpaved access roads pass through or adjacent to these lomas. These roads would be utilized for access during construction and maintenance of the PAs, as they are used under existing conditions. It is expected there would be no significant differences in the minor, temporary disturbances caused by these activities. To prevent possible harm to a jaguarundi or ocelot moving through the area during construction, USACE would require that construction activities for levee rehabilitation or construction be conducted during daylight hours only. This requirement would be incorporated into project construction and maintenance contract plans. With implementation of this conservation recommendation (USFWS, 2013e), it has been determined that the TSP may affect but is not likely to adversely affect the jaguarundi and ocelot.

3.5 WEST INDIAN MANATEE

Although sightings of West Indian manatees are rare along the Texas coast, they do occur. Manatees are slow moving animals and it is possible that dredges or their support vessels could adversely affect them. With implementation of this conservation recommendation (USFWS, 2013e), it has been determined that the TSP may affect but is not likely to adversely affect the manatee. To avoid potential impacts, USACE would incorporate the following education measures into construction and maintenance contracts for the TSP:

- Contractors and staff would be advised that manatees may be found in the Brazos Island Harbor Entrance Channel, the Brownsville Ship Channel, and adjacent areas of the Lower Laguna Madre and that boat operators should be cautious to avoid collisions with manatees.
- If a manatee is sighted, the Contractor would be instructed to contact the Texas Marine Mammal Stranding Network at 361-947-4313 or the group's hotline at (800) 962-6625.
- Training would be provided on avoiding potential impacts to the manatee for all personnel involved in construction and maintenance of in-water dredging activities.
- The training materials would include a poster to assist in identifying the mammal.
- The training materials would instruct personnel not to feed or water the animal.
- The training materials would include instructions to call the Corpus Christi Office of the Texas Coastal Ecological Services Field Office (TCESFO-CC) in the event a manatee is sighted in or near the project area.

3.6 WHALES

Whales occur in offshore waters and none of these species are likely to wander into shallow coastal estuaries. If a whale were to occur offshore in the project area during construction or maintenance dredging, it would be able to avoid from construction activities. Therefore, it is determined that the proposed project would have no effect on these species.

3.7 SEA TURTLES

3.7.1 Effects on Sea Turtles

Green, Kemp's ridley, loggerhead and hawsbill sea turtles are abundant in the study area throughout the year. Of the five species of sea turtle known to potentially occur in Texas waters, the leatherback is the least likely to occur due to its pelagic nature. The TSP would utilize both pipeline and hopper dredges. It has been well documented that hopper dredging activities occasionally result in sea turtle entrainment and death, even with seasonal dredging windows. To construct the TSP, one hopper dredge would be operated continuously for an estimated duration of seven months to remove approximately 2,066,300 cubic yards of new work material from the Entrance and Jetty Channels. Bed leveling may be performed at the conclusion of dredging by dragging a metal bar to smooth over high spots. All of the material would be placed at the existing New Work Ocean Dredged Material Disposal Site (ODMDS). It is estimated that five subsequent contracts would be awarded for cutterhead suction dredging of the Brownsville Main Channel through station 84+200 for a total length of 15.9 miles.. The remainder of the channel (the Turning Basin Extension and Turning Basin) would remain at existing depths. Two or three cutterhead dredges would be working simultaneously to remove approximately 12,079,700 cubic yards of new work material over an estimated 29 months. New work material from the Brownsville Main Channel (stations 0+000 through 84+200) would be pumped from the dredges through a combination of fully submerged and floating hydraulic pipelines into existing upland confined PAs managed by the Brownsville Navigation District (PAs 2, 4A, 4B, 5A, 5B, 7 and 8).

Between 1995 and 2012, a total of 31 turtles were taken as a result of hopper dredging of the BIH Entrance and Jetty Channels (Table 5). The takes were comprised of 23 green, 5 loggerhead, and 3 Kemp's ridley sea turtles. Hawksbills and leatherbacks are not known to have been caught in hopper dredges since monitoring began (USACE, 2013c). Sea turtles easily avoid pipeline cutterhead dredges due to the slow movement of the dredge. Restriction of hopper dredging activities to between December 1 and March 31, whenever possible, would reduce the likelihood of mortality. Any dredging activities outside of this window should be with hydraulic dredges, if possible, to reduce mortality.

It is generally accepted that hopper dredging impacts to sea turtles can also be reduced by having a trawler precede the dredges to capture turtles and relocate them away from the project. The history of the use of pre-dredge and relocation trawling for the BIH channel is also shown in Table 5. Relocation trawling was performed in the BIH Entrance and Jetty channels from 2003-

Table 5: Brownsville Island Harbor - History of Hopper Dredging and Sea Turtle Takes

Fiscal Year	Dates of Dredging Events (calendar)	BIH Channel Reach	Quantity of Material Dredged (cubic yards)	No. of Takes	Species Taken			Seasonal Restriction Observed	Pre-Dredge Trawling Conducted	Relocation Trawling Conducted	No. of Relocation Trawls	Species Relocated During Trawling			Placement Location
					Green	Loggerhead	Kemp's ridley					Green	Loggerhead	Kemp's ridley	
1995	Jan 24, 1995-Feb 26, 1995	Entrance Ch 0+000 to -13+000	755,301	5	4		1	yes							Feeder Berm (1A)
1997	Mar 30, 1997-Jun 14,1997	Entrance Ch -6+000 to -12+000	350,907	2		1	1								Maintenance ODMDS
1999	Jan 31, 1999-Mar 3, 1999	Entrance Ch -6+000 to -12+000	186,571	2	2			yes							Feeder Berm (1A)
2002	Mar 10, 2002-Mar 20, 2002	Entrance Ch -6+000 to -12+500	207,338	2	2			yes							Feeder Berm (1A)
2003	Dec 13, 2002-Dec 19, 2002	Con't Entrance Ch -6+000 to -12+500	121,549	2	2			yes	yes	yes 1 trawler	297	5	1		Feeder Berm (1A)
2004	Dec 1, 2003-Dec 18, 2003	Brownsville Ch 1+423 to 13+000	355,957	3	3			yes	yes	yes 1 trawler	437	13			Feeder Berm (1A)
2006	Feb 23, 2006-Mar 11, 2006	Entrance & Jetty -5+000 to 5+000	332,721	2	2			yes	yes	yes 2 trawlers	338	34			Feeder Berm (1A)
2007	Feb 20, 2007-Mar 15, 2007	Jetty Ch -0+600 to -4+600	443,000	6	5	1		yes	yes	yes 2 trawlers	961	64	1		Feeder Berm (1A)
2008	Jun 3, 2008-Jun 23, 2008	Jetty Ch -0+600 to -5+600	490,690	2	1	1			yes	yes 2 trawlers	1,304	1	11	2	Feeder Berms (1A&1B)
2008	Aug 30, 2008-Sept 5, 2008	Entrance Ch -6+400 to -13+000	130,933							yes 2 trawlers	411		2	1	Feeder Berm (1A)
2009	Oct 31, 2008-Nov 15, 2008	Con't Entrance Ch -6+400 to -13+000	237,772	4	1	2	1			yes 2 trawlers	820	1	1		Feeder Berm (1A)
2013	Oct 25, 2012-Dec 9, 2012	Jetty Ch -0+600 to -5+600	257,989	1	1										South Padre Island Beach
Total			**3,870,728**	**31**	**23**	**5**	**3**				**4,568**	**118**	**16**	**3**	

2009 in association with seven dredging events; no takes occurred in association with these trawling projects. Relocation trawling captured 137 turtles during 4,568 tows; catch per tow unit effort was 58 tows for each turtle relocated. With relocation trawling, this resulted in a total of 19 dredge takes over a total of 2,112,622 cubic yards (CYs) dredged. Restated as takes per CY, 9.0 takes per 1 million CYs occurred with relocation trawling. The five dredging events since 1995 in which no relocation trawling was conducted resulted in a total of 12 dredge takes over 1,758,106 CYs. Restated as takes per CY, 6.8 takes per 1 million CYs occurred without relocation trawling. This comparison indicates that relocation trawling in the BIH Entrance and Jetty Channels may not be as effective in reducing takes as commonly assumed. Rather than conducting relocation from the start of each dredging project, Galveston District proposes that trawling be initiated after the triggers outlined in the Terms and Conditions #12 are reached (see Section 3.7.2).

In addition to adverse impacts from hopper dredges, other impacts to sea turtles could result from project construction. The small increase in marine traffic predicted with the project could result in a higher incidence of collisions with sea turtles. Other potential impacts of the project include temporary affects by sedimentation and turbidity. However, these impacts have been determined to be insignificant.

The majority of takes in the BIH project area (23) since 1995 have been green sea turtles (USACE, 2013b). Similarly, relocations as a result of pre-dredging or relocation trawls are much higher for the green turtle than for both other species combined (118 compared to 19). Loggerheads, the most abundant sea turtle in the project area, have experienced five takes since 1995 with relocations totaling 16 over the same period. Three takes of Kemp's ridley turtles have occurred during dredging of the Entrance and Jetty channels (USACE, 2013). If dredging were to occur during the nesting season window (March 15–September 30), Kemp's ridley hatchlings, if present, could be adversely affected by disorientation from bright lights generated by hopper dredges or by temporarily elevated levels of total suspended solids (TSS) during Feeder Berm placement. Typically, hatchlings take the shortest route to water; however, bright lights can cause hatchlings to move toward the lights rather than the water, resulting in disorientation and increased danger from predators. Minor elevations of TSS would be temporary (lasting approximately two weeks) and similar to natural levels during periods of heavy wave action. No direct impacts to turtle nests on South Padre Island are expected since the TSP does not include typical beach nourishment which involves the placement of maintenance material directly onto the beach.

No direct impacts to turtle nests on South Padre Island are expected since the TSP does not include typical beach nourishment which involves the placement of new work or maintenance material directly onto the beach. While swimming sea turtles are abundant in the study area throughout the year, nesting turtles and nests of these species are not common but have been found sporadically in the study area. No impacts to the beaches where nests occur are expected with construction of the TSP. All dredging and placement activities associated with the Entrance and Jetty channels would be accomplished with hopper dredges, which would release material directly into open water at ODMDS. All placement activities along the Main Channel would be accomplished with hydraulic pipeline dredges pumping directly from the channel into adjacent upland PAs. No hydraulic pipelines or other construction equipment would be used along the Gulf shoreline in potential sea turtle nesting locations. Therefore, it has been determined that the BIH TSP would have no effect on nesting green, Kemp's ridley, loggerhead and hawsbill sea turtles in the project area.

Four sea turtle species (green, Kemp's ridley, loggerhead and hawksbill) could be adversely impacted by hopper dredging activities for the proposed TSP. Therefore, it has been determined that the TSP is likely to adversely affect these four sea turtle species. However, these impacts are not likely to jeopardize the continued existence or recovery of these species. The leatherback sea turtle is least likely to be affected by the proposed project because of its rare occurrence in the study area and pelagic nature. However, since the leatherback does occur within Texas waters, it has been determined that the TSP may affect but is not likely to adversely affect this species.

3.7.2 Reasonable and Prudent Measures to Minimize Sea Turtle Impacts

The NMFS Final Biological Opinion (BiOp) determined that the following reasonable and prudent measures (RPMs) are needed to minimize and monitor impacts of the incidental take of sea turtles during construction of the proposed project (NMFS F/SER/2013/11766, 2014).

RPM 1. The USACE shall implement best management measures, including use of temperature- and date-based dredging windows, sea turtle deflector dragheads, disengagement of dredging pumps when they are not on the bottom, limiting dredge lights seasonally, and relocation trawling to reduce the risk of injury or mortality of listed species and lessen the number of sea turtles killed by the proposed action.

RPM 2. The USACE shall have measures in place to detect and report all interactions with any protected species (ESA or Marine Mammal Protection Act) resulting from the proposed action. These measures include endangered species observers aboard the hopper dredge and relocation trawlers, screening of dredge material to allow discovery of any entrained turtles, and handling procedures for incidentally taken animals.

Compliance with the RPMs' implementing terms and conditions is mandatory in order for incidental takes not to be considered prohibited takings under the ESA. NMFS established that the incidental take for construction of the proposed project will consist of 13 sea turtle mortalities (2 loggerheads, 10 greens, or 1 Kemp's ridley). The Terms and Conditions under which hopper dredging will be conducted are:

1. Hopper Dredging (RPM 1): Hopper dredging activities shall be completed, whenever possible, between December 1 and March 31, when sea turtle abundance is lowest throughout Gulf coastal waters.

2. Non-hopper Type Dredging (RPM 1): Pipeline or hydraulic dredges, because they are not known to take turtles, must be used whenever possible between April 1 and November 30.

3. Operational Procedures (RPM 1): During periods in which hopper dredges are operating and NMFS-approved protected species observers are *not* required, (December 1 through March 31, if water temperatures are under 11°C), the USACE must:
    a. Advise inspectors, operators, and vessel captains about the prohibitions on taking, harming, or harassing sea turtles.
    b. Instruct the captain of the hopper dredge to avoid any turtles and whales encountered while traveling between the dredge site and offshore disposal area, and to immediately contact the USACE if sea turtles or whales are seen in the vicinity.
    c. Notify NMFS immediately by e-mail (takereport.nmfsser@noaa.gov with reference to this biological opinion - F/SER/2013/11766) if a sea turtle or other threatened or endangered species is taken by the dredge, and reference this biological opinion.

4. Dredging Pumps (RPM 1): Standard operating procedure shall be that dredging pumps shall be disengaged by the operator when the dragheads are not firmly on the bottom, to prevent impingement or entrainment of sea turtles within the water column. This precaution is especially important during the cleanup phase of dredging operations when the draghead frequently comes off the bottom and can suck in turtles resting in the shallow depressions between the high spots the draghead is trimming off.

5. Dredge Lighting (RPM 1): From May 1 through October 31, sea turtle nesting and emergence season, all lighting aboard hopper dredges and hopper dredge pumpout barges operating within 3 nautical miles of sea turtle nesting beaches shall be limited to the minimal lighting necessary to comply with U.S. Coast Guard and/or Occupational Safety

and Health Administration requirements. All non-essential lighting on the dredge and pumpout barge shall be minimized through reduction, shielding, lowering, and appropriate placement of lights to minimize illumination of the water to reduce potential disorientation effects on female sea turtles approaching the nesting beaches and sea turtle hatchlings making their way seaward from their natal beaches.

6. Sea Turtle Deflecting Draghead (RPM 1): A state-of-the-art solid, plow-type rigid deflector dragheads must be used on all hopper dredges at all times. The use of alternative, experimental dragheads is not authorized without prior written approval from NMFS, in consultation with USACE ERDC. Slotted draghead deflectors or chain-type deflectors are currently not authorized.

7. Training – Personnel on Hopper Dredges (RPM 1): The USACE must ensure that all contracted personnel involved in operating hopper dredges (whether privately-funded or federally-funded projects) receive thorough training on measures of dredge operation that will minimize takes of sea turtles. It shall be the goal of the hopper dredging operation to establish operating procedures that are consistent with those that have been used successfully during hopper dredging in other regions of the coastal United States, and which have proven effective in reducing turtle/dredge interactions. Therefore, USACE Engineering Research and Development Center experts or other persons with expertise in this matter shall be involved both in dredge operation training, and installation, adjustment, and monitoring of the rigid deflector draghead assembly.

8. Observers (RPM 2): The USACE shall arrange for NMFS-approved protected species observers to be aboard the hopper dredges to monitor the hopper bin, screening, and dragheads for sea turtles and their remains. Observer coverage sufficient for 100 percent monitoring (i.e., two observers) of hopper dredging operations is required aboard the hopper dredges between April 1 and November 30, or whenever surface water temperatures are 11°C or greater.

9. Screening (RPM 2): When sea turtle observers are required on hopper dredges, 100 % inflow screening of dredged material is required and 100 percent overflow screening is recommended. If conditions prevent 100 percent inflow screening, inflow screening may be reduced gradually, as further detailed in the following, but 100 percent overflow screening is then required.
   a. Screen Size: The hopper's inflow screens should have 4-inch by 4-inch screening. If the USACE, in consultation with observers and the draghead operator, determines that the draghead is clogging and reducing production substantially, other than in sand borrow areas the screens may be modified sequentially. Mesh size may be increased to 8-inch by 8-inch; if that fails to solve the clogging

problem, then 16-inch by 16-inch openings may be used. Clogging should be greatly reduced or eliminated with these options; however, further clogging may compel removal of the screening altogether, in which case effective 100% overflow monitoring and screening is mandatory. The USACE shall notify NMFS beforehand if inflow screening is going to be reduced or eliminated, what attempts were made to reduce the clogging problem, and provide details of how effective overflow screening will be achieved.

b. Need or Flexible, Graduated Screens: NMFS believes that this flexible, graduated-screen option is necessary, since the need to constantly clear the inflow screens will increase the time it takes to complete the project and therefore increase the exposure of sea turtles to the risk of impingement or entrainment. Additionally, there are increased risks to sea turtles in the water column when the inflow is halted to clear screens, since this results in clogged intake pipes, which may have to be lifted from the bottom to discharge the clay by applying suction.

10. Dredge Take Reporting and Final Report (RPM 2): Observer reports of incidental take by hopper dredges must be emailed to the Southeast Regional Office (takereport.nmfsser@noaa.gov with reference to this biological opinion - F/SER/2013/11766) by onboard NMFS-approved protected species observers, the dredging company, or the USACE within 24 hours of any sea turtle or other listed species take observed.

    A final report summarizing the results of the hopper dredging and any documented sea turtle or other listed species takes must be submitted to NMFS (takereport.nmfsser@noaa.gov with reference to this biological opinion - F/SER/2013/11766) within 60 working days of completion of the dredging project. The reports shall contain information on project location (specific channel/area dredged), start-up and completion dates, cubic yards of material dredged, problems encountered, incidental takes and sightings of protected species, mitigative actions taken (if relocation trawling, the number and species of turtles relocated), screening type (inflow, overflow) utilized, daily water temperatures, name of dredge, names of endangered species observers, percent observer coverage, and any other information the USACE deems relevant.

11. Sea Turtle Strandings (RPM 2): The USACE Project Manager or designated representative shall notify the STSSN state representative (contact information available at: http://www.sefsc.noaa.gov/seaturtleSTSSN.jsp) of the start-up and completion of hopper dredging operations and bed-leveler dredging operations and ask to be notified of any sea turtle strandings in the project area that, in the estimation of STSSN personnel,

bear signs of potential draghead impingement or entrainment, or interaction with a bed-leveling type dredge.

   a. Information on any such strandings shall be reported in writing within 30 days of project end to NMFS' Southeast Regional Office (takereport.nmfsser@noaa.gov with reference to this biological opinion - F/SER/2013/11766) with a report detailing incidents, with photographs when available, of stranded sea turtles that bear indications of draghead impingement or entrainment. Because the deaths of these turtles, if hopper dredge related, have already been accounted for in NMFS' jeopardy analysis, these strandings will not be counted against the USACE's take limit if they do not exceed the take limits set forth in this consultation.

12. Conditions Requiring Relocation Trawling (RPM 1): The USACE shall require trawling to start as soon as possible within 72 hours of either:
    a. Two or more turtles are taken by hopper dredges in a 24-hour period, or
    b. Total dredge takes in the project approach 75% (rounded-down) of any of the incidental take limits; i.e., 2 loggerheads, 10 greens, or 1 Kemp's ridley taken.

13. Relocation Trawling (RPM 1): Any relocation trawling conducted or contracted by the USACE to temporarily reduce abundance of these listed species during hopper dredging in order to reduce the possibility of lethal hopper dredge interactions, is subject to the following conditions:
    a. Trawl Time: Trawl tow-time duration shall not exceed 42 minutes (measured from the time the trawl doors enter the water until the time the trawl doors are out of the water) and trawl speeds shall not exceed 3.5 knots.
    b. Protected Species Handling During Trawling: Handling of sea turtles captured during relocation trawling in association with the dredging project shall be conducted by NMFSapproved protected species observers. Sea turtles captured pursuant to relocation trawling shall be handled in a manner designed to ensure their safety and viability, and shall be released over the side of the vessel, away from the propeller, and only after ensuring that the vessel's propeller is in the neutral, or disengaged, position (i.e., not rotating). Resuscitation guidelines are provided in Appendix B of the Biological Opinion.
    c. Captured Sea Turtle Holding Conditions: Sea turtles may be held briefly for the collection of important biological information, prior to their release. Captured sea turtles shall be kept moist, and shaded whenever possible, until they are released, according to the requirements of Term and Condition No. 13-e, below.
    d. Biological Data Collection: When safely possible, all turtles shall be measured (standard carapace measurements including body depth), tagged, weighed, and a tissue sample taken prior to release. Any external tags shall be noted and data recorded into the observers' log. Only NMFS-approved protected species

observers or observer candidates in training under the direct supervision of a NMFS-approved protected species observer shall conduct the tagging/measuring/weighing/tissues sampling operations.

e. Take and Release Time During Trawling – Turtles: Turtles shall be kept no longer than 12 hours prior to release and shall be released not less than 3 nautical miles from the dredge site. Turtles to which satellite tags will be affixed may be held up to 24 hours before release. If two or more released turtles are later recaptured, subsequent turtle captures shall be released not less than 5 nautical miles away. If it can be done safely, turtles may be transferred onto another vessel for transport to the release area to enable the relocation trawler to keep sweeping the dredge site without interruption.
f. Injuries: Injured sea turtles shall be immediately transported to the nearest sea turtle rehabilitation facility. Minor skin abrasions resulting from trawl capture are considered non-injurious. The USACE shall ensure that logistical arrangements and support to accomplish this are pre-planned and ready. The USACE shall bear the financial cost of all sea turtle transport, treatment, rehabilitation, and release.
g. Flipper Tagging: All sea turtles captured by relocation trawling shall be flipper-tagged prior to release with external tags which shall be obtained prior to the project from the University of Florida's Archie Carr Center for Sea Turtle Research. This Opinion serves as the permitting authority for any NMFS-approved protected species observer aboard these relocation trawlers to flipper-tag with external tags (e.g., Inconel tags) captured sea turtles. Columbus crabs or other organisms living on external sea turtle surfaces may also be sampled and removed under this Opinion's authority.
h. PIT-Tag: This opinion serves as the permitting authority for any NMFS-approved protected species observer aboard a relocation trawler to PIT-tag captured sea turtles. Tagging of sea turtles is not required to be done if the NMFS-approved protected species observer does not have prior training or experience in said activity; however, if the observer has received prior training in PIT tagging procedures, then the observer shall tag the animal prior to release (in addition to the standard external tagging):
    (1) Sea turtle PIT tagging must then be performed in accordance with the protocol detailed at NMFS' Southeast Fisheries Science Center's Web page: http://www.sefsc.noaa.gov/seaturtlefisheriesobservers.jsp. (See Appendix C on SEFSC's "Fisheries Observers" Web page);
    (2) PIT tags used must be sterile, individually-wrapped tags to prevent disease transmission. PIT tags should be 125-kHz, glass-encapsulated tags–the smallest ones made. Note: If scanning reveals a PIT tag and it was not difficult to find, then do not insert another PIT tag; simply record the tag number and location, and frequency, if known. If for some reason the tag

is difficult to detect (e.g., tag is embedded deep in muscle, or is a 400-kHz tag), then insert one in the other shoulder.

i. PIT-Tag Scanning and Data Submission Requirements: All sea turtles captured by relocation trawling or dredges shall be thoroughly scanned for the presence of PIT tags prior to release using a multi-frequency scanner powerful enough to read multiple frequencies (including 125-, 128-, 134-, and 400-kHz tags) and read tags deeply embedded in muscle tissue (e.g., manufactured by Trovan, Biomark, or Avid). Turtles whose scans show they have been previously PIT tagged shall nevertheless be externally flipper tagged. Sea turtle data collected (PIT tag scan data and external tagging data) shall be submitted to NOAA, National Marine Fisheries Service, Southeast Fisheries Science Center, Attn: Lisa Belskis, 75 Virginia Beach Drive, Miami, Florida 33149. All sea turtle data collected shall be submitted in electronic format within 60 days of project completion to Lisa.Belskis@noaa.gov. Sea turtle external flipper tag and PIT tag data generated and collected by relocation trawlers shall also be submitted to the Cooperative Marine Turtle Tagging Program (CMTTP), on the appropriate CMTTP form, at the University of Florida's Archie Carr Center for Sea Turtle Research.

j. Handling Fibropapillomatose Turtles: NMFS-approved protected species observers are not required to handle viral fibropapilloma tumors if they believe there is a health hazard to themselves and choose not to. When handling sea turtles infected with fibropapilloma tumors, observers must maintain a separate set of sampling equipment for handling animals displaying fibropapilloma tumors or lesions.

k. Additional Data Collection Allowed During the Handling of Sea Turtles and Other Incidentally-caught ESA-listed species: The USACE shall allow NMFS-approved protected species observers to conduct additional investigations that may include more invasive procedures (e.g., blood-letting, laparoscopies, external tumor removals, anal and gastric lavages, mounting satellite or radio transmitters, etc.) and partake in or assist in research projects but only if 1) the additional work does not interfere with any project operations (dredging activities, relocation trawling, etc), 2) the observer holds a valid federal research permit (and any required state permits) authorizing the activities, either as the permit holder, or as designated agent of the permit holder, 3) the additional work does not incur any additional expenses to the USACE or the USACE approves of the expense, and 4) the observer has first coordinated with USACE Galveston District and notified NMFS's Southeast Regional Office, Protected Resources Division (takereport.nmfsser@noaa.gov with reference to this biological opinion - F/SER/2013/11766).

14. Relocation Trawling Report (RPM 2): The USACE shall provide NMFS' Southeast Regional Office (takereport.nmfsser@noaa.gov with reference to this biological opinion - F/SER/2013/11766) with an end-of-project report within 30 days of completion of any relocation trawling. This report may be incorporated into the final report summarizing the results of the hopper dredging project.

15. Requirement and Authority to Conduct Tissue Sampling for Genetic Analyses (RPM 2): This opinion serves as the permitting authority for any NMFS-approved protected species observer aboard a relocation trawler or hopper dredge to tissue-sample live- or dead-captured sea turtles without the need for an ESA Section 10 permit. All live or dead sea turtles captured by relocation trawling and hopper dredging shall be tissue-sampled by a NMFS approved protected species observer prior to release.

Sea turtle tissue samples shall be taken in accordance with NMFS SEFSC's procedures for sea turtle genetic analyses (Appendix II of this opinion). The USACE shall ensure that tissue samples taken during the dredging project are collected, stored properly, and mailed no later than 60 days of completion of the dredging project to: NOAA, National Marine Fisheries Service, Southeast Fisheries Science Center, Attn: Lisa Belskis, 75 Virginia Beach Drive, Miami, Florida 33149.

Other conditions may also apply. A detailed outline of the conditions of the USACE's activities to minimize impacts of sea turtle takes during maintenance dredging project is included in the NMFS Biological Opinion for dredging of Gulf navigation channels and sand mining areas using hopper dredges (NMFS, 2003, as amended by Revisions Number 1 and 2 (USACE, 2006)).

3.8 SOUTH TEXAS AMBROSIA

This plant is not known to occur in the project area and may be extirpated in Cameron County. It is not known to occur in the study area. Therefore, it is determined that the proposed project would have no effect on this species.

3.9 TEXAS AYENIA

These Texas populations of the Texas ayenia are limited to specific vegetation communities along the Rio Grande in Cameron County. It is not likely to occur in the study area. Therefore, it is determined that the proposed project would have no effect on this species.

3.10 CANDIDATE SPECIES

Red knots have been reported to use the barrier island beaches, exposed tidal flats, washover passes, and mudflats associated with the Laguna Madre in the study area. Red-crowned parrots occur primarily in urban areas in the LRGV where there are large trees that provide both food and nesting sites. Wintering Sprague's pipits are found in both densely and sparsely vegetated grassland and pastures. They have been recently sighted in the LRGV outside the study area. None of three species are known to utilize the project area. Therefore, it is determined that the proposed project would have no effect on these species.

The scalloped hammerhead shark may be found within the study area. It has been observed close inshore and even entering estuarine habitats, as well as offshore in deep water. It is highly mobile, capable of moving away from any disturbance. Therefore, it is determined that the proposed project would have no effect on these species.

Known U.S. populations of the seven coral species (boulder star coral [two subspecies], elliptical star coral, Lamarck's sheet coral, mountainous star coral, pillar coral and rough cactus coral are all located in south Florida and the Florida Keys, Puerto Rico, the U.S. Virgin Islands. Therefore, it is determined that the proposed project would have no effect on these species.

3.11 SPECIES OF CONCERN

The dusky and sand tiger sharks may be found within the study area. Both are highly mobile, capable of moving away from any disturbance. Therefore, it is determined that the proposed project would have no effect on these species.

The opposum pipefish may occurs in the study area, having been reported in South Bay and tidal reaches the Rio Grande River. Juvenile Warsaw groupers can be found in the study area, nearshore and occasionally near the jetties. Dredging would create temporary, insignificant increases in turbidity, but would not cause any permanent changes in water quality or salinity. The speckled hind is deepwater grouper which spends all of its life phases in deep offshore waters; it is unlikely to occur in the study area. Therefore, it is determined that the proposed project would have no effect on these species.

4.0 SUMMARY OF EFFECT

This Biological Assessment has determined that the BIH TSP would have no effect on the following listed animal and plant species: blue whale, finback whale, humpback whale, sei whale, sperm whale, South Texas ambrosia, and Texas ayenia. Furthermore, it has been determined that the TSP would have no effect on designated piping plover critical habitat. The BIH TSP would also have no effect on the following Candidate species and Species of Concern: red knot, red-crowned parrot, Sprague's pipit, scalloped hammerhead shark, boulder star coral (subspecies *annularis* and *franksi*), elliptical star coral, Lamarck's sheet coral, mountainous star coral, pillar coral, rough cactus coral, dusky shark, sand tiger shark, opossum pipefish, warwaw grouper and speckled hind.

It has been determined that the construction of the TSP may affect, but is not likely to adversely affect the piping plover, Northern Aplomado falcon, Gulf Coast jaguarundi, ocelot, and West Indian manatee. Conservation recommendations from USFWS (USFWS, 2013e) that will minimize potential impacts to these species have been adopted as described in this document.

Five sea turtle species may be adversely affected by the proposed project. It is unlikely that leatherback sea turtles would be found in the study area but since they could potentially occur, it has been determined that the TSP may effect, but is not likely to adversely affect the leatherback sea turtle. Four sea turtle species (green, Kemp's ridley, loggerhead and hawksbill) could be adversely impacted by hopper dredging activities for the proposed BIH CIP. Therefore, it has been determined that the TSP is likely to adversely affect these four sea turtle species. However, these impacts are not likely to jeopardize the continued existence or recovery of these species. Reasonable and prudent measures, developed in consultation with NMFS will be be implemented to minimize impacts of incidental takes in accordance with the Terms and Conditions presented in the Final BiOp (NMFS, 2014).

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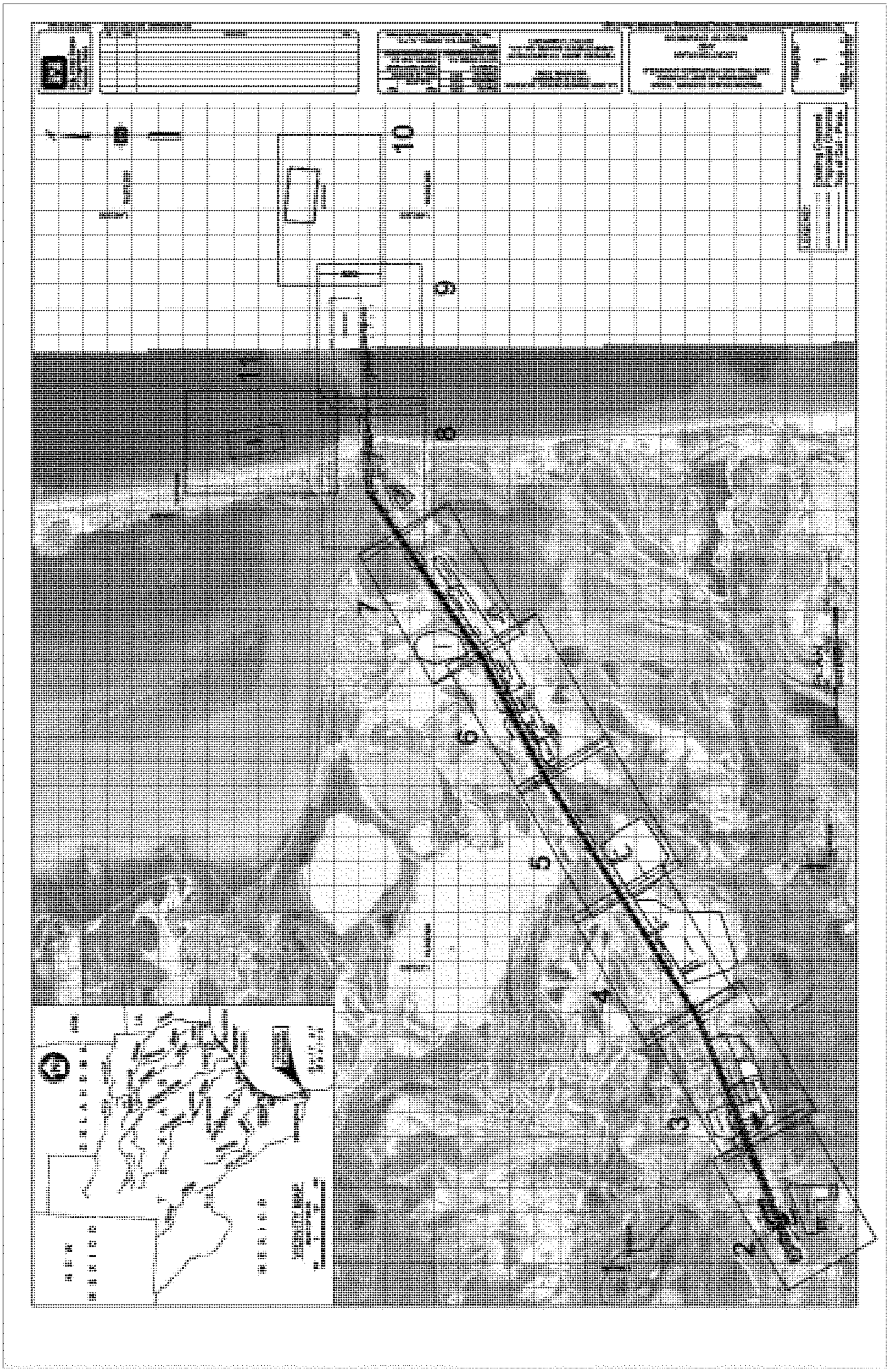
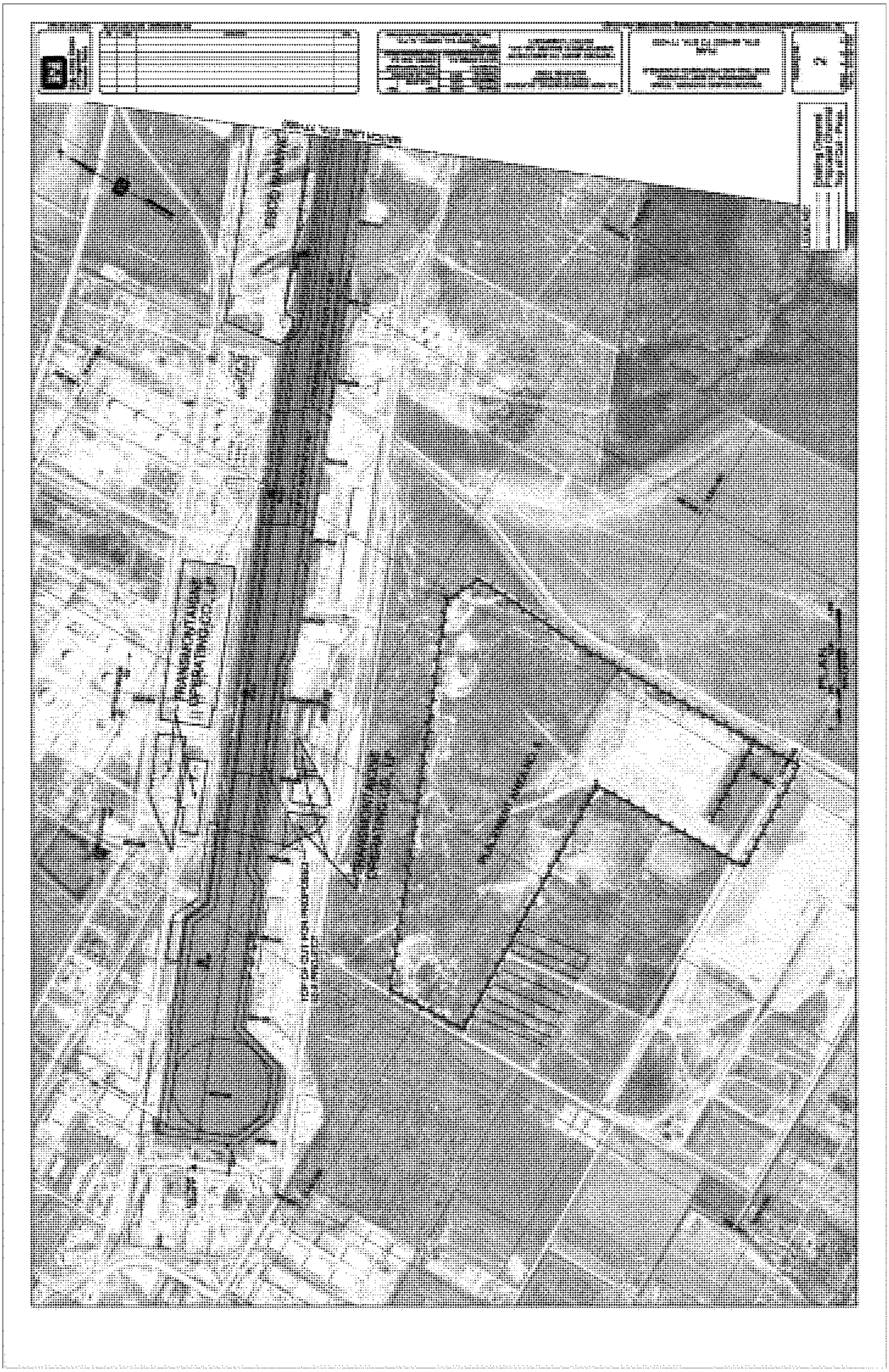
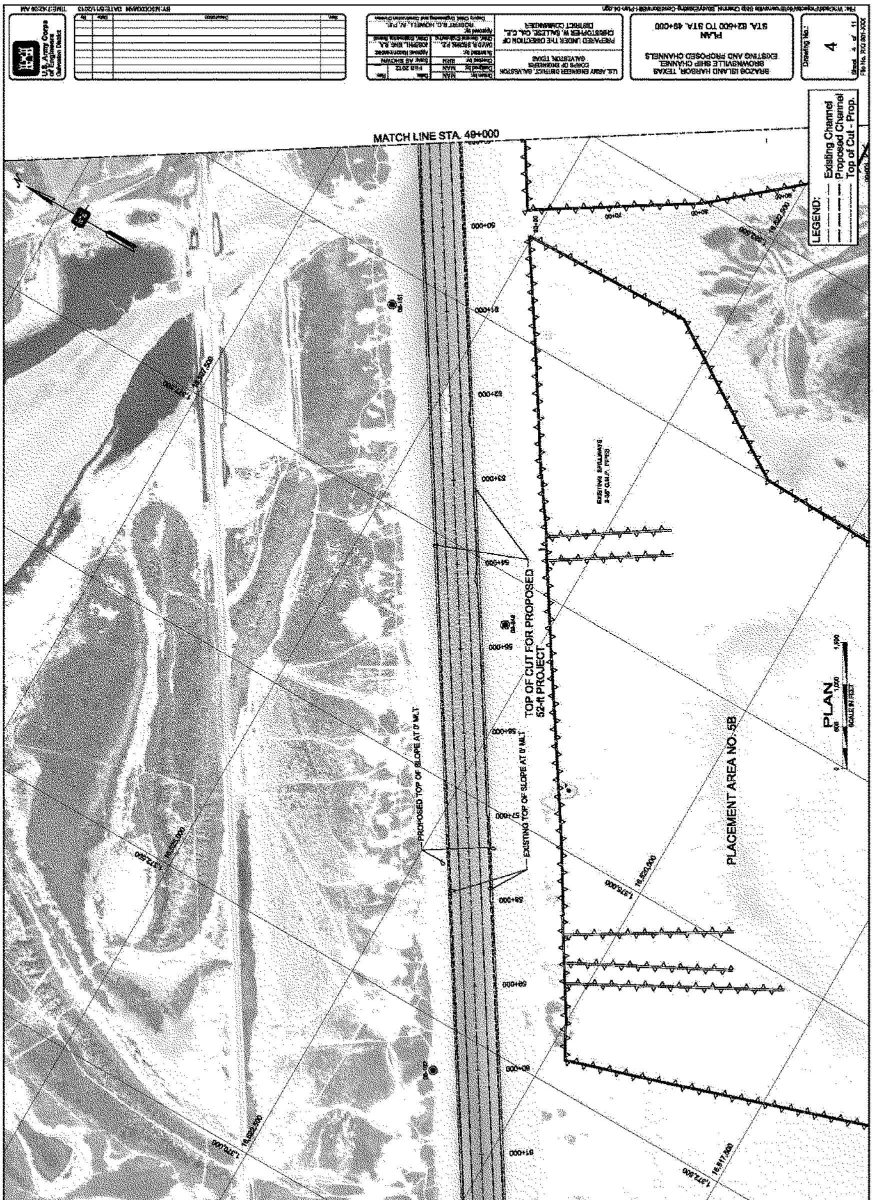
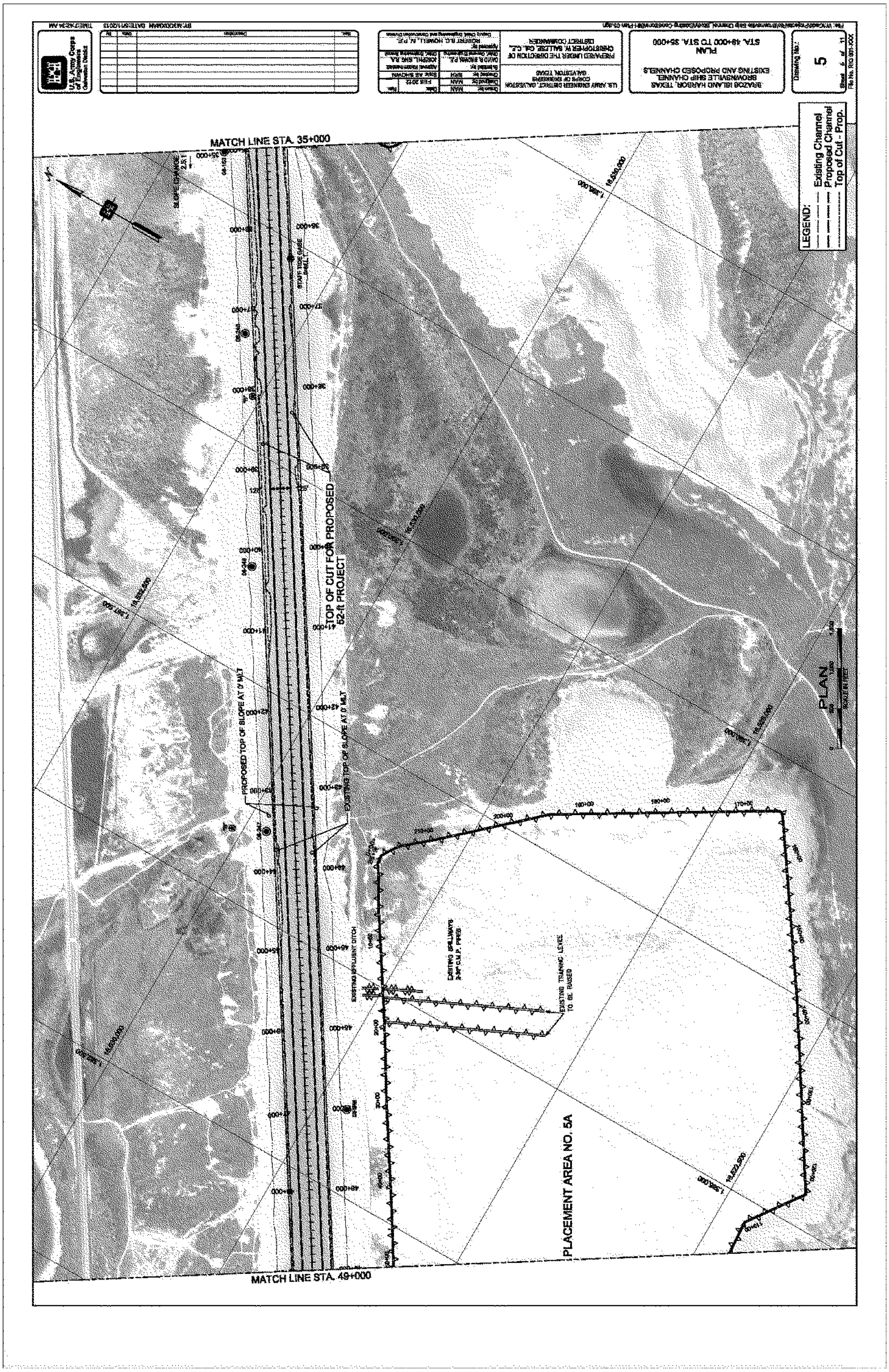
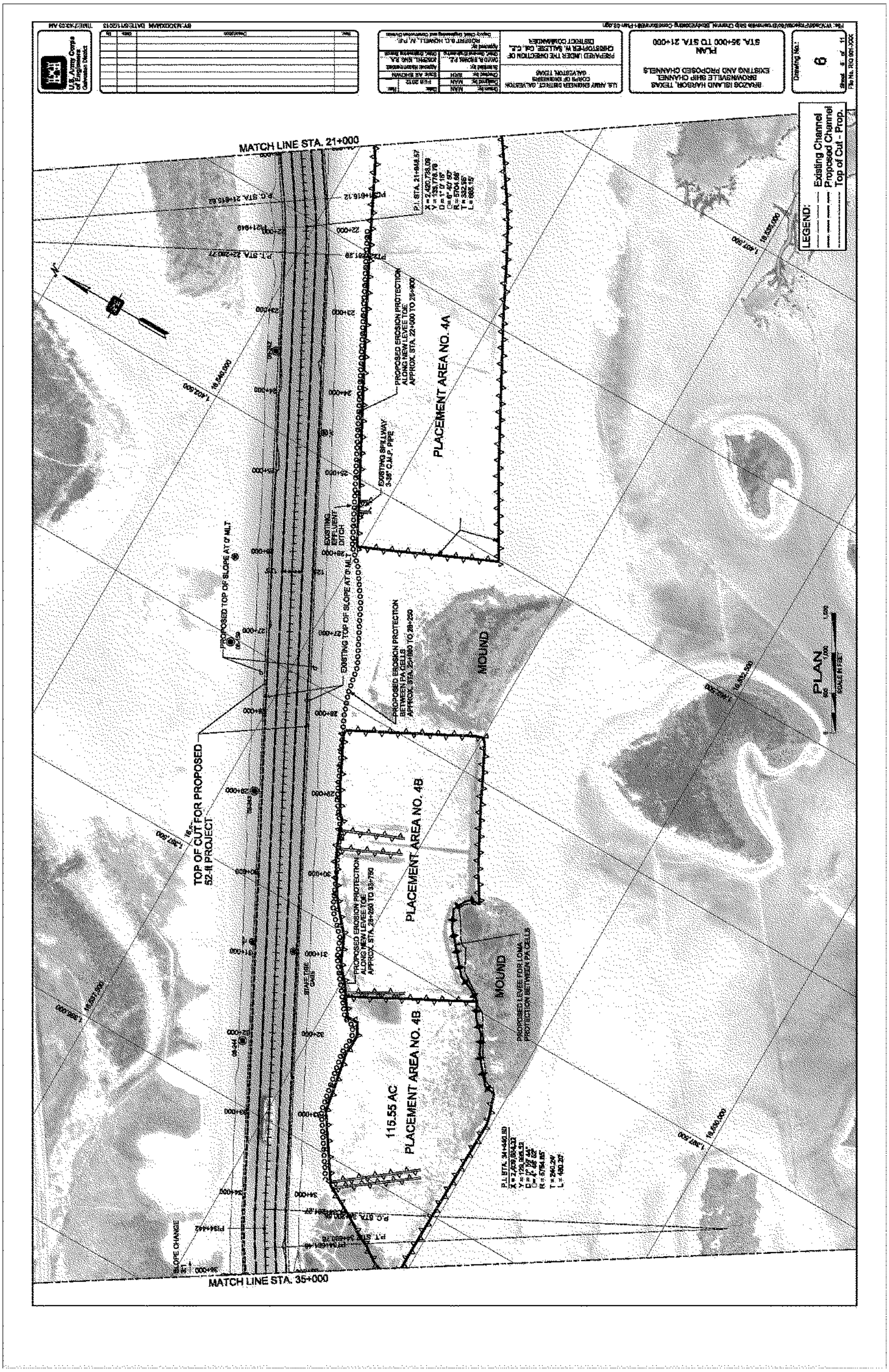
APPENDIX A
DRAFT ENGINEERING DRAWINGS FOR BIH TSP (52 X 250-FOOT PROJECT)

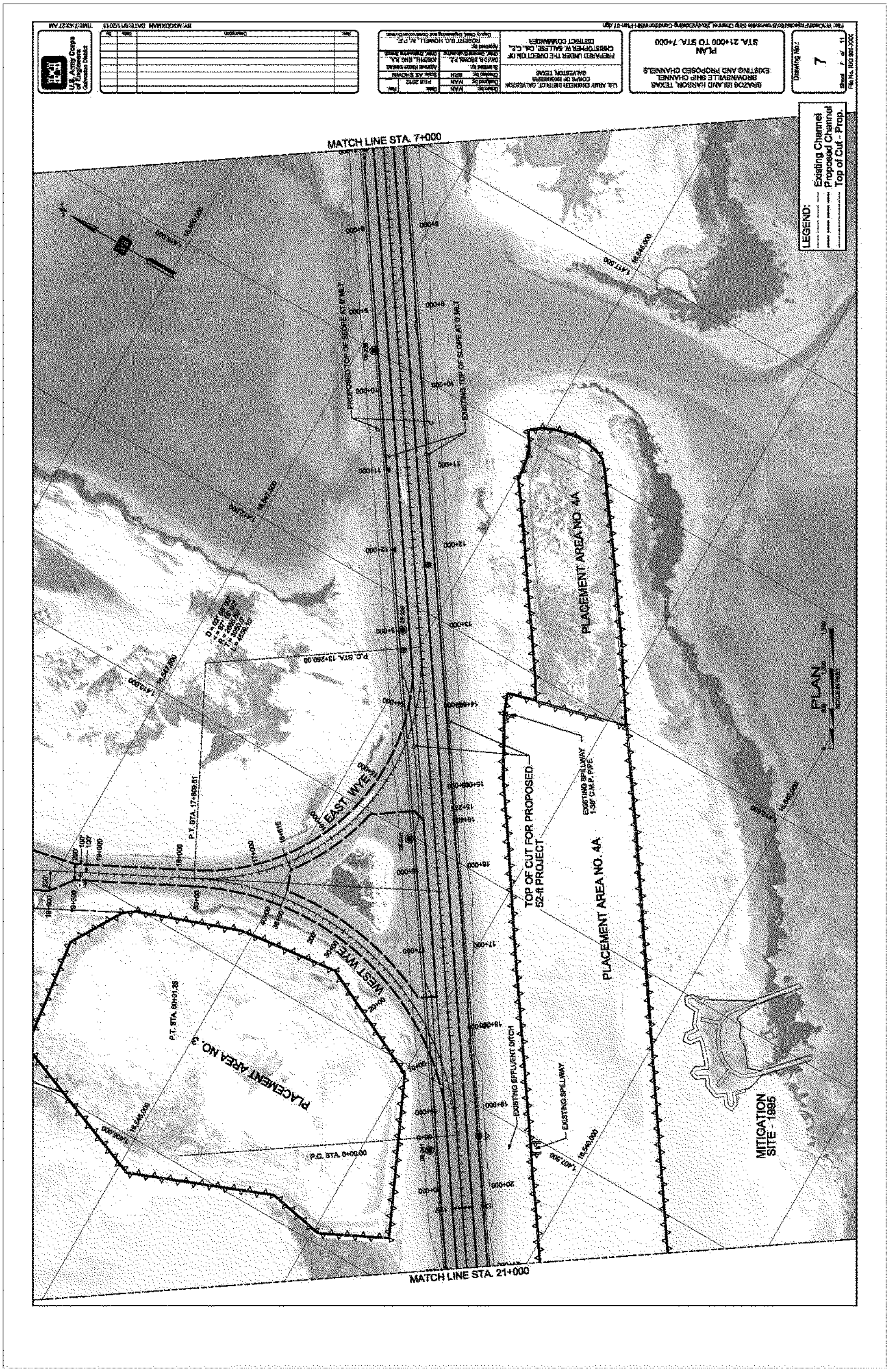


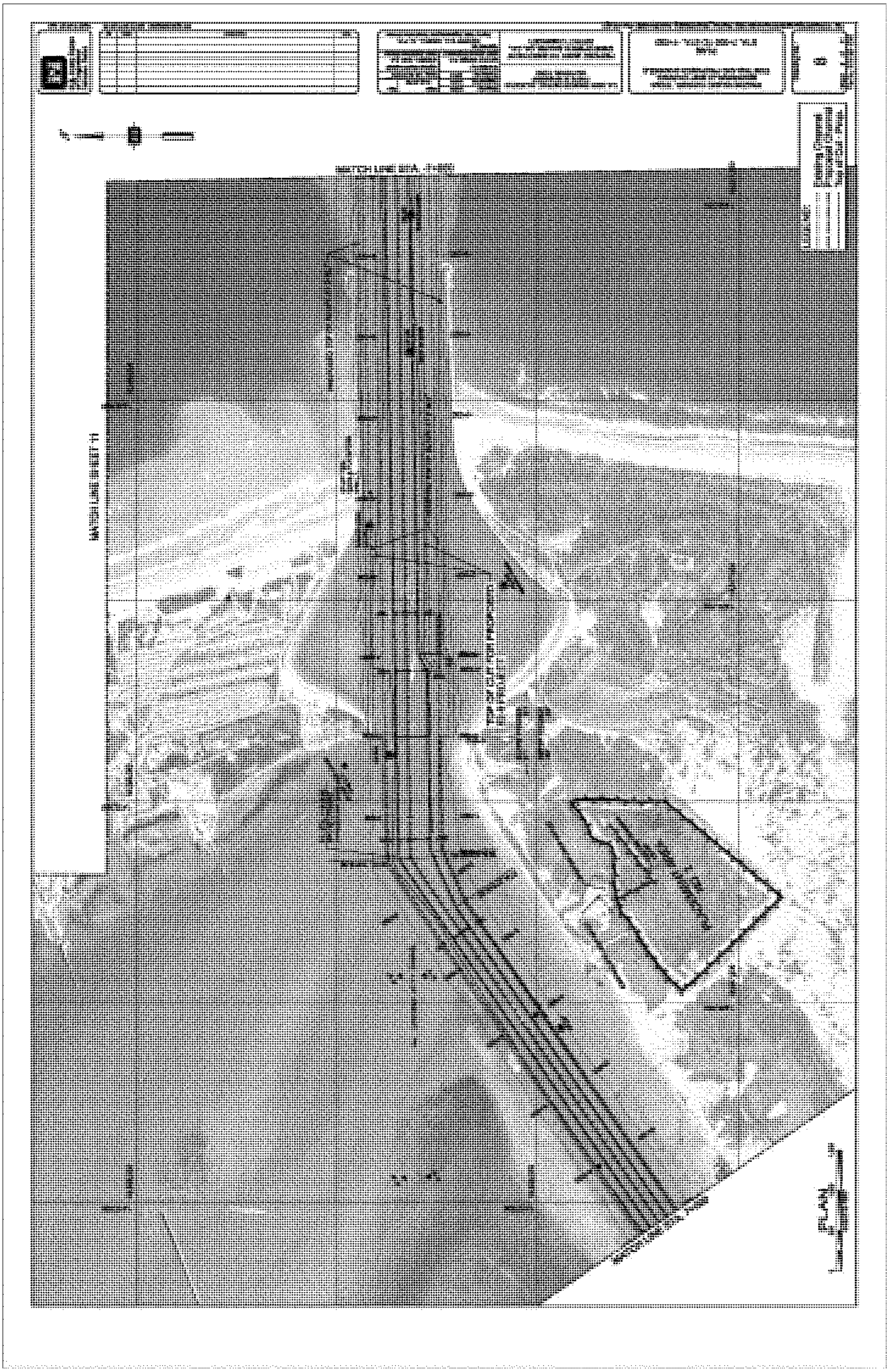


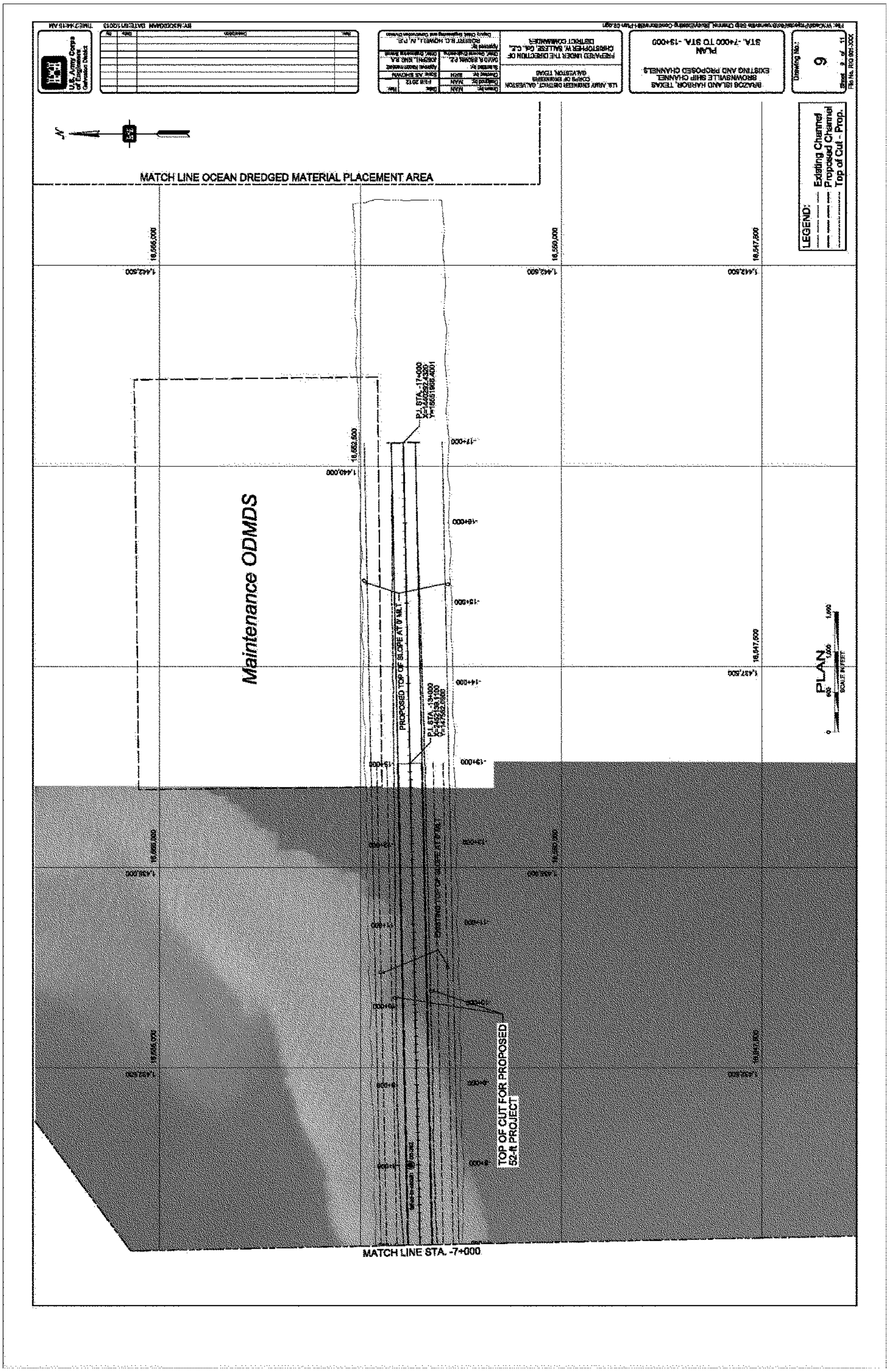

BRAZOS ISLAND HARBOR, TEXAS
BROWNSVILLE SHIP CHANNEL
EXISTING AND PROPOSED CHANNELS
PLAN
STA. 62+500 TO STA. 49+000
Drawing No.
4
MATCH LINE STA. 49+000
MATCH LINE STA. 62+500
LEGEND:
Existing Channel
Proposed Channel
Top of Cut - Prop.
TOP OF CUT FOR PROPOSED
52-ft PROJECT
PROPOSED TOP OF SLOPE AT 0' MLT
EXISTING TOP OF SLOPE AT 0' MLT
PLACEMENT AREA NO. 5B
PLAN

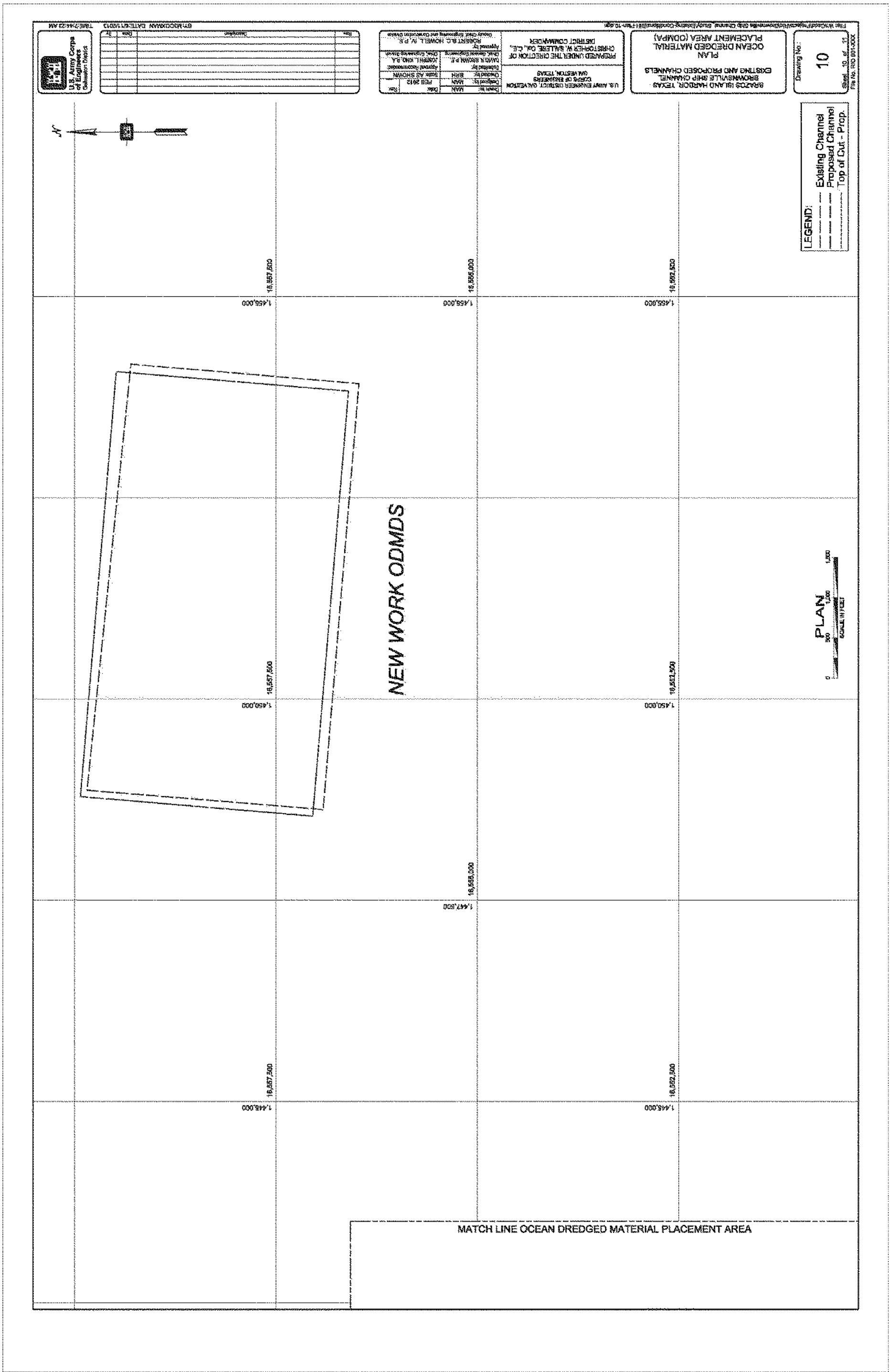

MATCH LINE STA. 35+000
MATCH LINE STA. 49+000
TOP OF CUT FOR PROPOSED
52-ft PROJECT
PROPOSED TOP OF SLOPE AT 0' MLT
EXISTING TOP OF SLOPE AT 0' MLT
EXISTING TRAINING LEVEE TO BE RAISED
PLACEMENT AREA NO. 5A
PLAN
LEGEND:
Existing Channel
Proposed Channel
Top of Cut - Prop.
BRAZOS ISLAND HARBOR, TEXAS
BROWNSVILLE SHIP CHANNEL
EXISTING AND PROPOSED CHANNELS
PLAN
STA. 49+000 TO STA. 35+000
Drawing No.: 5
U.S. Army Corps of Engineers
Galveston District


MATCH LINE STA. 21+000
MATCH LINE STA. 35+000
PLACEMENT AREA NO. 4A
PLACEMENT AREA NO. 4B
MOUND
115.55 AC
TOP OF CUT FOR PROPOSED
52-ft PROJECT
PLAN
LEGEND:
Existing Channel
Proposed Channel
Top of Cut - Prop.
BRAZOS ISLAND HARBOR, TEXAS
BROWNSVILLE SHIP CHANNEL
EXISTING AND PROPOSED CHANNELS
PLAN
STA. 35+000 TO STA. 21+000
Drawing No.:
6
U.S. Army Corps of Engineers
Galveston District


BRAZOS ISLAND HARBOR, TEXAS
BROWNSVILLE SHIP CHANNEL
EXISTING AND PROPOSED CHANNELS
PLAN
STA. 21+000 TO STA. 7+000
U.S. Army Corps of Engineers Galveston District
MATCH LINE STA. 7+000
MATCH LINE STA. 21+000
LEGEND:
Existing Channel
Proposed Channel
Top of Cut - Prop.
PROPOSED TOP OF SLOPE AT 0' MLT
EXISTING TOP OF SLOPE AT 0' MLT
PLACEMENT AREA NO. 4A
PLACEMENT AREA NO. 4A
TOP OF CUT FOR PROPOSED 52-ft PROJECT
EXISTING SPILLWAY 1-36" C.M.P. PIPE
EAST WYE
WEST WYE
PLACEMENT AREA NO. 3
EXISTING EFFLUENT DITCH
EXISTING SPILLWAY
MITIGATION SITE - 1995
PLAN




MATCH LINE OCEAN DREDGED MATERIAL PLACEMENT AREA
Maintenance ODMDS
PROPOSED TOP OF SLOPE AT 0' MLT
EXISTING TOP OF SLOPE AT 0' MLT
TOP OF CUT FOR PROPOSED
52-ft PROJECT
MATCH LINE STA. -7+000
PLAN
LEGEND:
Existing Channel
Proposed Channel
Top of Cut - Prop.
9


NEW WORK ODMDS
PLAN
SCALE IN FEET
MATCH LINE OCEAN DREDGED MATERIAL PLACEMENT AREA
LEGEND:
Existing Channel
Proposed Channel
Top of Cut - Prop.
BRAZOS ISLAND HARBOR, TEXAS
BROWNSVILLE SHIP CHANNEL
EXISTING AND PROPOSED CHANNELS
PLAN
OCEAN DREDGED MATERIAL PLACEMENT AREA (ODMPA)
Drawing No.:
10
U.S. Army Corps of Engineers
Galveston District

APPENDIX B

NMFS AND USFWS COORDINATION

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

REPLY TO
ATTENTION OF

March 18, 2013

Environmental Section

David M. Bernhart
Assistant RA for Protected Resources
Southeast Regional Office
National Marine Fisheries Service
263 13th Avenue South
St. Petersburg, FL 33701

Dear Mr. Bernhart:

This letter is in regard to proposed modification of the Brazos Island Harbor Navigation Project in Cameron County, Texas. The existing project is shown on the enclosed figure. The project is expected to include deepening and possibly widening of the Entrance Channel and Brownsville Ship Channel, to allow larger vessels and offshore oil rigs to more efficiently navigate to the Turning Basin located near Brownsville, Texas.

To facilitate compliance with the requirements of Section 7, subsection (a)(2) of the Endangered Species Act Amendments of 1978, a list of any species which is listed or proposed to be listed, that may be present in the area of the proposed action is requested.

If you or your staff have any questions regarding this activity, please contact Janelle Stokes at (409) 766-3039 or by email at Janelle.S.Stokes@usace.army.mil.

Sincerely,

Carolyn Murphy

Carolyn Murphy
Chief, Environmental Section

Enclosure

CF:

Mr. Rusty Swafford
National Marine Fisheries Service
Habitat Conservation Division
4700 Avenue U
Galveston, Texas 77551

From: Teletha Mincey - NOAA Federal
To: Stokes, Janelle S SWG
Cc: Hawk, Eric
Subject: Brazos Island Harbor Navigation Project in Cameron County, TX
Date: Friday, March 22, 2013 9:16:11 AM
Attachments: Texas.pdf

Good Morning Ms. Stokes:

This is in response to the COE's letter, dated March 18, 2013, referencing the above-mentioned subject. Attached is a listing of species under the jurisdiction of the National Marine Fisheries Service, for the state of Texas, which may be present in the proposed action area.

Thank you.

--

Teletha Mincey
Program Analyst
NOAA Fisheries
Southeast Region
263 13th Ave S
St. Petersburg, FL 33701-5505
(727) 824-5312 - Main Line
(727) 551-5772 - Direct Line
(727) 824-5309 - Fax
http://sero.nmfs.noaa.gov/pr/pr.htm

Endangered and Threatened Species and Critical Habitats
under the Jurisdiction of the NOAA Fisheries Service

Texas

Listed Species	Scientific Name	Status	Date Listed
Marine Mammals			
blue whale	*Balaenoptera musculus*	Endangered	12/02/70
finback whale	*Balaenoptera physalus*	Endangered	12/02/70
humpback whale	*Megaptera novaeangliae*	Endangered	12/02/70
sei whale	*Balaenoptera borealis*	Endangered	12/02/70
sperm whale	*Physeter macrocephalus*	Endangered	12/02/70
Turtles			
green sea turtle	*Chelonia mydas*	Threatened[1]	07/28/78
hawksbill sea turtle	*Eretmochelys imbricata*	Endangered	06/02/70
Kemp's ridley sea turtle	*Lepidochelys kempii*	Endangered	12/02/70
leatherback sea turtle	*Dermochelys coriacea*	Endangered	06/02/70
loggerhead sea turtle	*Caretta caretta*	Threatened[2]	09/22/11
Fish			
None			

[1] Green turtles are listed as threatened, except for breeding populations of green turtles in Florida and on the Pacific Coast of Mexico, which are listed as endangered

[2] Northwest Atlantic Ocean (NWA) DPS. On September 22, 2011, NMFS and USFWS issued a final rule changing the listing of loggerhead sea turtles from a single, threatened species to nine distinct population segments (DPSs) listed as either threatened or endangered (FR 76 58868). The NWA DPS was listed as threatened.

Texas

Candidate Species[3]	Scientific Name
Fish	
scalloped hammerhead shark	*Sphyrna lewini*
Invertebrates	
boulder star coral	*Montastraea annularis*
boulder star coral	*Montastraea franksi*
elliptical star coral	*Dichocoenia stokesii*
Lamarck's sheet coral	*Agaricia lamarcki*
mountainous star coral	*Montastraea faveolata*
pillar coral	*Dendrogyra cylindrus*
rough cactus coral	*Mycetophyllia ferox*

Species of Concern[4]	Scientific Name
Fish	
dusky shark	*Carcharhinus obscurus*
opossum pipefish	*Microphis brachyurus lineatus*
sand tiger shark	*Carcharias taurus*
speckled hind	*Epinephelus drummondhayi*
warsaw grouper	*Epinephelus nigritus*

[3] Candidate species are those petitioned species that are actively being considered for listing as endangered or threatened under the Endangered Species Act (ESA), as well as those species which NMFS has initiated an ESA status review.
[4] Species of Concern are not protected under the Endangered Species Act, but concerns about their status indicate that they may warrant listing in the future. Federal agencies and the public are encouraged to consider these species during project planning so that future listings may be avoided. For more information please visit: http://sero.nmfs.noaa.gov/pr/SOC.htm

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

REPLY TO
ATTENTION OF

March 18, 2013

Environmental Section

Allan M. Strand
Field Supervisor
U.S. Fish and Wildlife Ecological Services
6300 Ocean Drive
Corpus Christi, Texas 78412

Dear Mr. Strand:

This letter is in regard to proposed modification of the Brazos Island Harbor Navigation Project in Cameron County, Texas. The existing project is shown on the enclosed figure. The project is expected to include deepening and possibly widening of the Entrance Channel and Brownsville Ship Channel, to allow larger vessels and offshore oil rigs to more efficiently navigate to the Turning Basin located near Brownsville, Texas.

To facilitate compliance with the requirements of Section 7, subsection (a)(2) of the Endangered Species Act Amendments of 1978, a list of any species which is listed or proposed to be listed, that may be present in the area of the proposed action is requested.

If you or your staff have any questions regarding this activity, please contact Janelle Stokes at (409) 766-3039 or by email at Janelle.S.Stokes@usace.army.mil.

Sincerely,

Carolyn Murphy

Carolyn Murphy
Chief, Environmental Section

Enclosure

From: Pat Clements
To: Stokes, Janelle S SWG
Subject: RE: Endangered species list for Cameron Co - BIH project (UNCLASSIFIED)
Date: Friday, March 22, 2013 2:16:35 PM

That list looks good. It does not note, however, that the piping plover also has critical habitat designated.

Pat

-----Original Message-----
From: Stokes, Janelle S SWG [mailto:janelle.s.stokes@usace.army.mil]
Sent: Friday, March 15, 2013 4:04 PM
To: Pat Clements
Subject: Endangered species list for Cameron Co - BIH project (UNCLASSIFIED)

Classification: UNCLASSIFIED
Caveats: NONE

Pat,

I pulled down the attached ESA list for Cameron County from the Region 2 website. Should I use this for the BIH BA, or do you recommend that we send you a letter requesting a species list?

Jan

Classification: UNCLASSIFIED
Caveats: NONE

Southwest Region

Ecological Services

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USFWS Social Media Hub

◀ Back to Start

List of species by county for Texas:

Counties Selected: Cameron

Select one or more counties from the following list to view a county list:

Anderson
Andrews
Angelina
Aransas
Archer

View County List

Cameron County

Common Name	Scientific Name	Species Group	Listing Status	Species Image	Species Distribution Map	Critical Habitat	More Info
brown pelican	*Pelecanus occidentalis*	Birds	DM				P
green sea turtle	*Chelonia mydas*	Reptiles	E, T				P
Gulf Coast jaguarundi	*Herpailurus (=Felis) yagouaroundi cacomitli*	Mammals	E				P
hawksbill sea turtle	*Eretmochelys imbricata*	Reptiles	E				P
Kemp's ridley sea turtle	*Lepidochelys kempii*	Reptiles	E				P
leatherback sea turtle	*Dermochelys coriacea*	Reptiles	E				P
loggerhead sea turtle	*Caretta caretta*	Reptiles	T				P
northern aplomado falcon	*Falco femoralis septentrionalis*	Birds	E, EXPN				P
ocelot	*Leopardus (=Felis) pardalis*	Mammals	E				P
piping Plover	*Charadrius melodus*	Birds	E, T			Final	P
red knot	*Calidris canutus rufa*	Birds	C	No Image			P
red-crowned parrot	*Amazona viridigenalis*	Birds	C	No Image	No Map		P
south Texas ambrosia	*Ambrosia cheiranthifolia*	Flowering Plants	E				P
Sprague's pipit	*Anthus spragueii*	Birds	C	No Image			P
Texas ayenia	*Ayenia limitaris*	Flowering Plants	E				P
West Indian Manatee	*Trichechus manatus*	Mammals	E				P

Last updated: December 17, 2012

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

REPLY TO
ATTENTION OF

June 17, 2013

Environmental Section

David M. Bernhart
Assistant RA for Protected Resources
Southeast Regional Office
National Marine Fisheries Service
263 13th Avenue South
St. Petersburg, FL 33701

Dear Mr. Bernhart:

This letter is in regard to a proposed Federal project for improvements to the Brazos Island Harbor Project in Cameron County, Texas. The Galveston District is currently preparing a draft integrated feasibility report and environmental assessment which recommends deepening the existing navigation channel from 42 to 52 feet. A description of the proposed project, the Tentatively Selected Plan (52 by 250-foot project), is provided in the attached Biological Assessment (BA).

We have prepared a BA for the proposed project as both listed species and critical habitat are located within the affected area. We have concluded that the proposed project is likely to adversely affect the federally-listed endangered Kemp's ridley and hawksbill sea turtles, and the threatened green and loggerhead sea turtles. We have also concluded that the project may affect, but is not likely to adversely affect the endangered leatherback sea turtle. The proposed project will have no effect on the federally-listed piping plover, Northern Aplomado falcon, Gulf Coast jaguarundi, ocelot, West Indian manatee, blue whale, finback whale, humpback whale, sei whale, sperm whale, South Texas ambrosia, and Texas ayenia, and will have no effect on designated piping plover critical habitat.

Since the proposed project may affect federally-listed species, we request initiation of formal consultation pursuant to 50 CFR 402.14, to evaluate the effects of the proposed project on threatened and endangered sea turtles. Please notify us within 30 days of receipt of the letter if additional information beyond that provided in the Biological Assessment is required, and notify us when the 90-day preparation period for the draft Biological Opinion has begun. In accordance with Section 402.14(g)(5), we also request that a draft copy of the biological opinion be furnished for our review at the end of the 90-day preparation period.

We appreciate your continued cooperation in allowing us to fulfill our responsibilities under the Endangered Species Act. Should you require any additional information during review of the enclosed BA, please call Ms. Janelle Stokes at 409/766-3039.

Sincerely,

Carolyn Murphy

Carolyn Murphy
Chief, Environmental Section

Enclosure

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

REPLY TO
ATTENTION OF

June 17, 2013

Environmental Section

Edith Erfling
Field Supervisor
U.S. Fish and Wildlife Service
Clear Lake Ecological Services Field Office
17629 El Camino Real, Suite 211
Houston, Texas 77058

Dear Ms. Erfling:

This letter is in regard to a proposed Federal project for improvements to the Brazos Island Harbor Project in Cameron County, Texas. The Galveston District is currently preparing a draft integrated feasibility report and environmental assessment which recommends deepening the existing navigation channel from 42 to 52 feet. A description of the proposed project, the Tentatively Selected Plan (52 by 250-foot project), is provided in the attached Biological Assessment (BA).

We have prepared a BA for the proposed project as both listed species and critical habitat are located within the affected area. We have concluded that hopper dredging to construct the proposed project is likely to adversely affect federally-listed endangered, swimming Kemp's ridley and hawksbill sea turtles, and the threatened swimming green and loggerhead sea turtles. We have also concluded that the project may affect, but is not likely to adversely affect the endangered swimming leatherback sea turtle. The proposed project will have no effect on the federally-listed piping plover, Northern Aplomado falcon, Gulf Coast jaguarundi, ocelot, West Indian manatee, blue whale, finback whale, humpback whale, sei whale, sperm whale, South Texas ambrosia, and Texas ayenia, and will have no effect on designated piping plover critical habitat.

We are hereby requesting your written concurrence, pursuant to the informal consultation procedures prescribed in 50 CFR 402.13, that the proposed action will have no effect on federally-listed species or designated critical habitat under your agencies jurisdiction. We appreciate your continued cooperation in allowing us to fulfill our responsibilities under the Endangered Species Act. Should you require any additional information during review of the enclosed BA, please call Ms. Janelle Stokes at 409/766-3039.

Sincerely,

Carolyn Murphy

Carolyn Murphy
Chief, Environmental Section

Enclosure

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Texas Coastal Ecological Services Field Office
c/o TAMU-CC, Unit 5837
6300 Ocean Drive
Corpus Christi, Texas 78412-5837

July 25, 2013

Carolyn Murphy
Chief, Environmental Section
U. S. Army Corps of Engineers
Galveston District
P.O. Box 1229
Galveston, Texas 77553

Dear Ms. Murphy:

Enclosed is the U.S. Fish and Wildlife Service's (Service) Fish and Wildlife Coordination Act Report, Brazos Island Harbor Project, Texas July 2013. Both a printed and an electronic version have been provided with this letter.

The Service has been coordinating with the U. S. Army Corps of Engineers (USACE) as well as with the Port of Brownsville (POB) and other state and federal agency representatives on proposals to deepen the Brazos Island Harbor Entrance Channel, Brownsville Ship Channel and Turning Basin since 2007. Although driven, in part, by current federal economic restraints, the Service appreciates the considerable efforts of the USACE to avoid significant impacts to fish and wildlife resources, including federally listed, threatened and endangered species with the tentatively selected plan.

The Service looks forward to working with the USACE and the POB in the future as funding becomes available to proceed with final design and implementation of the BIH Project and, subsequent to project construction, coordination as needed for implementation of maintenance activities over the 50-year project life.

If you have any additional questions, or comments regarding this document, please contact Pat Clements at 361-994-9005 ext 225, or by email at pat_clements@fws.gov.

Sincerely,

E. Dawn Whitehead

for Edith Erfling
Field Supervisor

Enclosure

See Appendix J for full text of USFWS CAR Report (7-25-2013)

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

October 30, 2013

Environmental Section

Edith Erfling
Field Supervisor
U.S. Fish and Wildlife Service
Clear Lake Ecological Services Field Office
17629 El Camino Real, Suite 211
Houston, Texas 77058

Dear Ms. Erfling:

Based upon recommendations in the US Fish and Wildlife Service's (USFWS) July 25, 2013 Coordination Act Report (CAR) for the Brazos Island Harbor Channel Improvement Project 52 x 250-Foot Alternative, Cameron County, Texas, Galveston District would like to clarify or modify our assessment of effects for several protected species under USFWS jurisdiction in the project area. The Tentatively Selected Plan (TSP) improvements to the channel would consist of extending the Entrance Channel 4,000 feet farther into the Gulf of Mexico, deepening the Jetty and Entrance Channels to 54 feet mean lower low water (MLLW), and deepening the Main Channel to 52 feet MLLW. Material from construction of the TSP would be placed in the existing New Work Ocean Dredged Material Disposal Site (ODMDS), and in upland, confined PAs 2, 4A, 4B, 5A, 5B, 7 and 8. Dredged material from maintaining the channel would be placed in the same upland PAs, the existing Maintenance ODMDS, and an existing Feeder Berm.

The CAR states that the Galveston District's Biological Assessment (BA) did not provide a specific assessment of potential project effects to nesting sea turtles. The BA did describe project impacts to the Gulf beaches and included the following statement "No direct impacts to turtle nests on South Padre Island are expected since the TSP does not include typical beach nourishment which involves the placement of maintenance material directly onto the beach." Additional information is provided here to clarify anticipated project effects to green (*Chelonia mydas*), Kemp's ridley (*Lepidochelys kempii*), loggerhead (*Caretta caretta*) and hawsbill (*Eretmochelys imbricata*) nesting sea turtles. While swimming sea turtles are abundant in the study area throughout the year, nesting turtles and nests of these species are not common but have been found sporadically in the study area. No impacts to the beaches where nests occur are expected with construction of the TSP. All dredging and placement activities associated with the Entrance and Jetty channels would be accomplished with hopper dredges, which would release material directly into the open water the Feeder Berm or ODMDS. All placement activities along the Main Channel would be accomplished with hydraulic pipeline dredges pumping directly from the channel into adjacent upland PAs. No hydraulic pipelines or other construction equipment would be used along the Gulf shoreline in potential sea turtle nesting locations.

While the Maintenance ODMDS would be available for use if needed, maintenance material from the first 11,000 feet of the Main Channel, and the entire Jetty and Entrance Channels would be regularly placed in the Feeder Berm located between 1.5 and 2.5 miles from the north jetty and from 0.4 to 0.9 miles from shore. Sediment removed by maintenance dredging would therefore be regularly placed back into the littoral system, available for natural cross-shore and longshore sediment transport to the beaches of South Padre Island. Gulf beaches would not be expected to experience significant impacts from the proposed channel deepening. Existing shoreline change trends would generally continue, with possible improvements in shoreline stability. Therefore, it has been determined that the BIH TSP would have no effect on nesting green, Kemp's ridley, loggerhead and hawsbill sea turtles in the project area.

The CAR also provided information regarding the potential for the TSP to impact federally-listed threatened and endangered species, and specific conservation recommendations for the following species - piping plover (*Charadrius melodus*), northern aplomado falcon (*Falco femoralis septentrionalis*), ocelot (*Leopardus pardalis*), jaguarundi (*Herpailurus yagouaroundi cacomitli*), and West Indian manatee (*Trichechus manatus*). Based on this new information and on a subsequent telephone consultation, Galveston District has reevaluated its effects determinations for these species and the conservation recommendations, as follows:

Piping plover. Hydraulic pipeline pumping of dredged material into upland PAs within designated piping plover critical habitat Unit TX-01 may affect but is not likely to adversely affect piping plovers in the following limited circumstances. Piping plovers may roost in these upland PAs to conserve energy and body reserves during combinations of certain adverse weather conditions, and disturbing the birds under these conditions could cause harm by stressing the birds. As identified in the CAR, these conditions are cold temperatures (below 40° F), high winds (above 15-20 mph), and precipitation. If any two of these weather conditions occur in combination when the pumping of new work or maintenance material into PAs 2, 4A and 4B is ready to begin, Galveston District would survey unvegetated sand flats in these PAs for the presence of roosting piping plovers. If roosting piping plovers are identified, then pumping into affected PAs would be delayed until weather conditions ameliorate and two of these three weather conditions are no longer occurring in combination. With implementation of this conservation recommendation, it has been determined that the TSP may affect but is not likely to adversely affect piping plovers.

Northern aplomado falcon. While no nests are known in the project area at this time, it is possible that aplomado falcons may use mesquite savannah and grassland areas south of the PAs for foraging and nesting. Nest structures that could be utilized by the aplomado falcon have been documented approximately 0.5 mile south of PAs 7 and 5A. All construction activities would occur within the footprint of existing PA levees, avoiding direct impacts to potential grassland and savannah habitat near the PAs. However, the activity and noise from construction activities on the PA levees or use of access roads south of the PAs may disturb birds in nests within 100 yards of these activities. Prior to commencing levee maintenance activities for new work and future maintenance during the months of March through June, areas within 100 yards of the PA levees and access roads would be examined from a distance of at least 100-300 yards for stick nests and signs of adult falcons incubating eggs or brooding chicks. If an actively utilized nest is found to exist within 100 yards of the levees or access roads, further surveys would be performed and USFWS would be contacted for a review of survey results and impact determinations. With implementation of this conservation recommendation, it has been determined that the TSP may affect but is not likely to adversely affect the Northern aplomado falcon.

Gulf Coast jaguarundi and ocelot. While rare, these cats are known to occur around the project area, and may use a variety of habitats for moving between preferred habitat sites. All TSP construction activities would occur within the footprint of existing PA levees, avoiding direct impacts to lomas and brush habitat adjacent to PAs 4A and 4B. A new levee would be constructed at least 30 feet from the outer edge of the loma on the south side of PA 4B to protect that landform and its brush habitat. To prevent possible harm to a jaguarundi or ocelot moving through the area during construction, USACE would require that construction activities for levee rehabilitation or construction be conducted during daylight hours only. This requirement would be incorporated into project construction and maintenance contract plans. With implementation of this conservation recommendation, it has been determined that the TSP may affect but is not likely to adversely affect the jaguarundi and ocelot.

West Indian Manatee. Although sightings of West Indian manatees are rare along the Texas coast, they do occur. To avoid potential impacts to the West Indian manatee, USACE would incorporate the following education measures into construction and maintenance contracts for the TSP:

- Contractors and staff would be advised that manatees may be found in the Brazos Island Harbor Entrance Channel, the Brownsville Ship Channel, and adjacent areas of the Lower Laguna Madre and that boat operators should be cautious to avoid collisions with manatees.
- If a manatee is sighted, the Contractor would be instructed to contact the Texas Marine Mammal Stranding Network at 361-947-4313 or the group's hotline at (800) 962-6625.
- Training would be provided on avoiding potential impacts to the manatee for all personnel involved in construction and maintenance of in-water dredging activities.
- The training materials would include a poster to assist in identifying the mammal.
- The training materials would instruct personnel not to feed or water the animal.
- The training materials would include instructions to call the Corpus Christi Office of the Texas Coastal Ecological Services Field Office (TCESFO-CC) in the event a manatee is sighted in or near the project area.

We appreciate the time and expertise your staff have provided to assist our efforts to avoid significant impacts to federally-listed threatened and endangered species by the Brazos Island Harbor TSP. If you or your staff have any further questions, please contact Ms. Janelle Stokes at 409/766-3039 or janelle.s.stokes@usace.army.mil.

Sincerely,

Carolyn Murphy

Carolyn Murphy
Chief, Environmental Section

CF: E. Dawn Whitehead
Texas Coastal Ecological Services Field Office
c/o TAMU-CC, Unit 5837
6300 Ocean Drive
Corpus Christi, Texas 78412-5837

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Coastal Ecological Services Field Office
TAMU-CC, Unit 5837, 6300 Ocean Drive
Corpus Christi, Texas 78412
361/994-9005/ (Fax) 361/994-8262

In Reply Refer To:
FWS/R2/CCES/

December 4, 2013

Carolyn Murphy
Chief, Environmental Section
U. S. Army Corps of Engineers
P.O. Box 1229
Galveston, TX 77553-1229

Consultation No. 02ETCC00-2013-I-0211

Dear Ms. Murphy:

Thank you for your October 30, 2013, letter to clarify or modify the U.S. Army Corps of Enginners's (Corps) assessment of effects for nine species under U.S. Fish and Wildlife Service (Service) jurisdiction in the project area for the Brazos Island Harbor Channel Improviement 52 X 250-foot Alternative, Cameron County, Texas.

Your letter provides additional information regarding the potential for affects of the proposed project to the green sea turtle *Chelonia mydas*, Kemp's ridley sea turtle *Lepidochelys kepii*, loggerhead sea turtle *Caretta caretta*, and hawksbill sea turtle *Eretmocheleys imbricata*, which could nest on the Gulf of Mexico beaches in the project area. The Corps clarified that material dredged from the entrance and jetty channels of the project, during construction and maintenance phases, would be removed by hopper dredge and discharged into the project's open water feeder berm, located 0.4 to 0.9 mile from shore, or into the ocean dredged material placement site located 4 miles from shore. Material dredged from the main channel would be accomplished using hydraulic dredges and discharged into adjacent upland placement areas (PAs). No construction or dredging equipment is proposed to be used along Gulf beaches. The Corps determined that because dredged material would not significantly impact Gulf beaches during dredging operations the project, as proposed, would not affect nesting green, Kemp's ridley, loggerhead, or hawksbill sea turtles.

The Service does not provide concurrence on no effect calls; however, we believe your agency has complied with section 7(a)(2) of the Endangered Species Act by making a determination on these 4 species of sea turtles. Should project plans change, or if additional information on the distribution of listed or proposed species becomes available, this determination should be reconsidered.

With regard to effects of the project on the piping plover *Charadrius melodus* which could potential occur in the upland PAs, the Corps will institute conservation measures. Piping plovers may roost during adverse weather conditions, and disturbance of roosting piping plovers during inclement weather could result in harm to the birds. Adverse weather conditions include temperatures below 40 degrees fahrenheit, winds above 15 to 20 miles per hour, and precipitation. If two or more of these weather conditions occur together when placement of dredge material is planned, the Corps will survey the affected PAs for roosting piping plovers. If piping plovers are identified, pumping of dredge material would be delayed until weather conditions ameleorate and two of the 3 weather conditions are no longer occurring together. With the implementation of these conservation measures, the Corps has determined that the project may affect, but is not likely to adversely affect the piping plover.

The northern aplomado falcon *Falco femoralis septentrionalis* has, to date, not documented nesting in the project area. Nest structures suitable for the aplomado falcon have geen documented approximately 0.5 mile sout the PA 7 and PA 5. All construction and dredge material placement activites will be contained with the the footprint of the existing PA levees. Since activity and noise from construction activities could disturb nesting falcons, prior to commencing levee maintenance activities from March through June, areas within 100 yards of the PA levees and access roads would be examing from a distance of at least 100-300 yards for the presence of stick nests and signs of adult falcons. If an activiely utilized nest is documented within 100 yards of a levee or access road additional surveys would be conducted and the Service would be contacted for review of survey results and impact determination prior to proceeding with work. With the implementation of these conservation measures, the Corps has determined that the project may affect, but is not likely to adversely affect the northern aplomado falcon.

The ocelot *Leopardus pardalis* and the Gulf Coast jaguarundi *Herpailurus yagouaroundi cacomitli* have been documented around the project area and use a variety of habitats, particularly for traveling among preferred habitat sites. All construction activites would be containted within existing levees and avoid direct impacts to lomas and brush habitat adjacent to PA 4A and PA 4B. A new levee segment to be constructed on the south side of PA 4B would be at least 30 feet from the outer edge of the nearby loma. All levee rehabilitation and contruction work would be conducted during daylight hours only. With the implementation of these conservation measures, the Corps has determined that the project may affect, but is not likely to adversely affect the ocelot and the Gulf Coast jaguarundi.

The West Indian manatee *Trichechus manatus* occurs rarely along the Texas coast. To avoid and minimize impacts to manatees during construction and maintenance, the Corps will establish education measures which would prepare contractors and other personnel for responding to the appearance of a manatee. These include identification materials, boat operation guidance, response measures such as avoiding feeding, watering, or other physical contact with a manatee, and contact instructions in the event of a sighting. With the implementation of these conservation measures, the Corps has determined that the project may affect, but is not likely to adversely affect the manatee.

The Service agrees that with the implementation of the conservation, avoidance and minimization measures noted above, the likelihood of an impact occurring to the piping plover, northern aplomado falcon, ocelot, Gulf Coast jaguarundi, or West Indian manatee is insignificant and discountable. The Service, therefore, concurs with the Corps's determination that the project may affect, but is not likely to adversely affect these 5 species.

Should project plans change, or if additional information on the distribtution of listed or proposed species becomes available, this determination can be reconsidered. If you have any questions or need further assistance, please contact Pat Clements at (361) 994-9005, ext. 225 or by email at pat_clements@fws.gov, or Mary Orms at (361) 994-9005, ext. 246 or by email at mary_orms@fws.gov.

Sincerely,

Edith Erfling

Edith Erfling
Field Supervisor

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southeast Regional Office
263 13th Avenue South
St. Petersburg, Florida 33701-5505
http://sero.nmfs.noaa.gov

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SER-2013-11766

MAY 13 2014

Mrs. Carolyn Murphy
Chief, Environmental Section
Department of the Army
Galveston District, Corps of Engineers
P.O. Box 1229
Galveston, Texas 77553-1229

Ref.: U.S. Army Corps of Engineers Brazos Island Harbor Channel Improvement Project, Cameron County, Texas

Dear Mrs. Murphy:

NOAA's National Marine Fisheries Service (NMFS) provides the attached Biological Opinion ("Opinion") on species listed under the Endangered Species Act (ESA) of 1973. NMFS is providing the U.S. Army Corps of Engineers (USACE) with this Opinion pursuant to 50 CFR 402.14(h). This document is based on our review of impacts associated with the proposed federal navigational channel dredging activities for the Brazos Island Harbor Channel Improvement Project (BIH) to be conducted by the Galveston District USACE.

Information concerning the proposed action was obtained by our review of the Biological Assessment for the BIH in Cameron County, Texas. This Opinion concludes that the proposed action is likely to adversely affect, but is not likely to jeopardize, loggerhead, green, or Kemp's ridley sea turtles listed under the ESA under NMFS's purview and provides reasonable and prudent measures, along with their implementing terms and conditions.

We appreciate the USACE's efforts in working together with NMFS to identify methods and measures to address complex conservation issues that when implemented will provide protection for endangered species under NMFS's authority.

Our primary contact for endangered species issues is Karla Reece. She may be reached by phone at (727) 824-5312 or by email at Karla.Reece@noaa.gov.

Sincerely,

Miles M. Croom

for Roy E. Crabtree, Ph.D.
Regional Administrator

Endangered Species Act – Section 7 Consultation
Final Biological Opinion

Action Agency:	U.S. Army Corps of Engineers (USACE), Galveston District
Activity:	Brazos Island Harbor Channel Improvement Project
Consulting Agency:	National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NMFS), Southeast Regional Office, Protected Resources Division, St. Petersburg, Florida NMFS Consultation No. SER-2013-11766
Approved By:	Miles M. Croom for Roy E. Crabtree, Ph.D., Regional Administrator NMFS, Southeast Regional Office St. Petersburg, Florida
Date Issued:	MAY 13 2014

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Acronyms

BA	Biological Assessment
BIH	Brazos Island Harbor Chanel Improvement Project
BND	Brownsville Navigation District
CCL	Curved Carapace Length
CPUE	Catch Per Unit Effort
cy	Cubic yards
DPS	Distinct Population Segment
DTRU	Dry Tortugas Recovery Unit
DWH	Deepwater Horizon
EPA	Environmental Protection Agency
ESA	Endangered Species Act of 1973
EWS	Early Warning System
F/SER3	Southeast Regional Office Protected Resources Division
FP	Fibropapillomatosis
GCRU	Greater Caribbean Recovery Unit
GRBO	Gulf of Mexico Regional Biological Opinion
HMS	Highly Migratory Species
ITS	Incidental Take Statement
mcy	million cubic yards
MMPA	Marine Mammal Protection Act of 1972
MRFSS	Marine Recreational Fishing Statistical Survey
NARW	North Atlantic right whale
NCWRC	North Carolina Wildlife Resources Commission
NGMRU	Northern Gulf of Mexico Recovery Unit
nm	nautical mi
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NRU	Northern Recovery Unit
NWA	Northwest Atlantic
ODMDS	Ocean Dredged Material Disposal Site
PA	Placement Area
PFRU	Peninsular Florida Recovery Unit
POB	Port of Brownsville
RBO	Regional Biological Opinion
RPAs	Reasonable and Prudent Alternatives
RPMs	Reasonable and Prndent Measures
SAD	South Atlantic Division
SARBO	South Atlantic Regional Biological Opinion
SCDNR	South Carolina Department of Natural Resources
SCL	Straight Carapace Length
SEFSC	Southeast Fisheries Science Center
SERO	Southeast Regional Office
STDW	Sea Turtle Data Warehouse
STSSN	Sea Turtle Stranding and Salvage Network
TEDs	Turtle Excluder Devices
TSP	tentatively selected plan
USACE	United States Army Corps of Engineers
USFWS	United States Fish and Wildlife Service

Introduction

Section 7(a)(2) of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. § 1531 et seq.), requires that each federal agency ensure that any action authorized, funded, or carried out by such agency is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of critical habitat of such species. To fulfill this obligation, Section 7(a)(2) requires federal agencies to consult with the appropriate Secretary on any action that "may affect" listed species or designated critical habitat. The National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (USFWS) share responsibilities for administering the ESA. Consultations on most listed marine species and their designated critical habitat are conducted between the action agency and NMFS.

Consultation is required when a federal action agency determines that a proposed action "may affect" listed species or designated critical habitat. Consultation is concluded after NMFS determines that the action is not likely to adversely affect listed species or critical habitat or issues a Biological Opinion (Opinion) that identifies whether a proposed action is likely to jeopardize the continued existence of a listed species, or destroy or adversely modify critical habitat. If either of those circumstances is expected, the Opinion identifies reasonable and prudent alternatives (RPAs) to the action as proposed that can avoid jeopardizing listed species or resulting in the destruction/adverse modification of critical habitat. The Opinion states the amount or extent of incidental take of the listed species that may occur, develops reasonable and prudent measures (RPMs) to reduce the effect of take and monitoring to validate the expected effects of the action, and recommends conservation measures to further conserve the species.

This document represents NMFS's Opinion based on our review of impacts associated with the proposed Brazos Island Harbor Chanel Improvement Project (BIH) to be conducted by the Galveston USACE. The Opinion analyzes project effects on sea turtles (Northwest Atlantic loggerhead distinct population segment [DPS], Kemp's ridley, leatherback, hawksbill, and green) and whales (blue, fin, humpback, sei, and sperm).

Information for this Opinion was provided by the USACE, or was obtained from a variety of sources including published and unpublished literature cited herein.

1 CONSULTATION HISTORY

June 17, 2013: NMFS received the Galveston USACE request for ESA consultation and Biological Assessment (BA) (USACE 2013) for the BIH. The USACE determined that the proposed action was likely to adversely affect all five ESA-listed sea turtle species, and would have no effects on ESA-listed whales. The incoming request for consultation was considered complete so consultation was initiated.

February 20, 2014: NMFS requested confirmation about the Sea Turtle Impact Avoidance Plan. The USACE proposed using outdated conditions from a previous consultation (No. F/SER/2000-01287) as their Sea Turtle Impact Avoidance Plan. The USACE subsequently established a protocol (2006) for hopper dredging in the Gulf of Mexico (Appendix A), but did not mention in the project description of this project if they would comply with the 2006 protocol. The USACE confirmed they will use the 2006 protocol the same day.

2 DESCRIPTION OF THE PROPOSED ACTION AND ACTION AREA

2.1 Proposed Action

The existing BIH navigation project services the Port of Brownsville (POB), which is situated at the western end of the man-made BIH navigation channel in Cameron County, Texas (Figure 1). The non-federal sponsor for the study is the Brownsville Navigation District (BND). The existing project includes the BIH Entrance-Jetty Channel which extends about 2.5 mi (mi) into the Gulf of Mexico, and the Brownsville Main Channel which terminates at a turning basin about 17 mi inland from the Gulf of Mexico (Table 1). The POB is located at the turning basin, about 3 mi north of the Rio Grande (the international border with Mexico) and 5 mi east of the city of Brownsville.

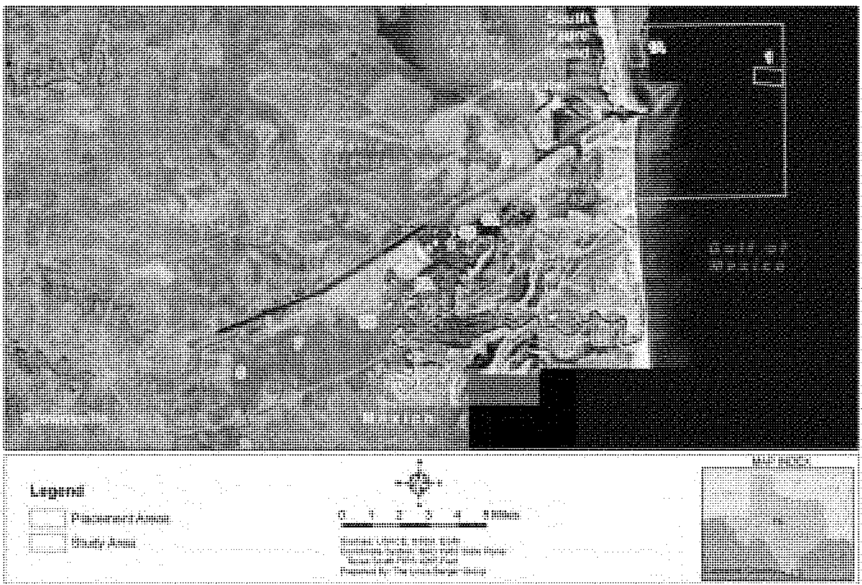

Figure 1: BIH project vicinity map

The proposed federal action is a channel improvement project for the Brazos Island Harbor (BIH) Project, an existing federal deep-draft navigation project in Cameron County, Texas (USACE 1990). The tentatively selected plan (TSP) would deepen the existing 42-foot authorized project to an authorized depth of 52-feet (ft) mean lower low water (MLLW). All information below describing the project activities is taken from the USACE draft BA (USACE 2013).

The 52- by 250-ft TSP for the BIH channel improvement project would (summarized in Table 1):

- extend the Brazos Island Harbor (BIH) Entrance Channel 0.75 mi farther into the Gulf of Mexico (station -17+000 to -13+000) at a depth of -54 ft mean lower low water (MLLW) and a width of 300 ft
- deepen the existing BIH Entrance Channel from station -13+000 to -6+000 to a depth of -54 ft MLLW at the existing width of 300 ft
- deepen the BIH Jetty Channel to -54 ft MLLW from station -6+000 to -1+026 at the existing width of 300 ft, transitioning to the existing 400-ft width through station 0+000
- deepen the Brownsville Main Channel to a depth of -52 ft MLLW at the existing 400-ft width from station 0+000 to 1+517, transitioning to the existing 250-ft width at station 2+329
- deepen 15.5 mi of the Brownsville Main Channel to a depth of -52 ft MLLW at existing widths ranging from 250 to 400 ft from station 2+239 to station 84+200; and maintain existing depth of -42 ft MLLW and width of 325 ft from station 84+200 to 86+000, and existing depth of -36 ft MLLW and width ranging from 325 to 1200 ft from station 86+000 through the end of the channel and turning basin at station 89+500

Table 1. Dimensions of Existing and Proposed Brazos Island Harbor Project (USACE 2013)

Channel Reach	Constructed Depth (ft, MLLW)	Proposed Depth (ft, MLLW)	Constructed Bottom Width (ft)	Proposed Bottom Width (ft)	Dredge type	Channel Length (mi)
Entrance Channel Extension		54		300	Hopper	0.75
Entrance Channel (GOM to offshore end of jetties)	44	54	300	same as existing	Hopper	1.3
Jetty Channel (GOM to Laguna Madre)	44	54	Transitions from 300 to 400	same as existing	Hopper	1.1
Main Channel (Laguna Madre to Turning Basin Extension)	42	52	Varies from 250 to 400	same as existing	Cutterhead	15.1
Turning Basin Extension	Transitions from 42 to 36	same as existing	Transitions from 400 to 325	same as existing	Cutterhead	1.3
Turning Basin	36	same as existing	Transitions from 325 - 1,200	same as existing	Cutterhead	0.6
				Total project length		20.15

New work material from channel deepening would be distributed among the existing New Work ODMDS and upland, confined PAs as shown in Table 2. Under the first construction contract, a hopper dredge would be used to construct the Entrance and Jetty Channels, with a total length (after extension of the Entrance Channel) of approximately 3.2 mi. Although the authorized depth of the offshore channels would be -54 ft MLLW, the potential dredging depth of the Entrance and Jetty Channels could actually be -58 ft MLLW, after accounting for 2 ft of advance maintenance and 2 ft of allowable overdepth. One hopper dredge would be operated continuously for an estimated duration of 7 months to remove approximately 2,066,300 cubic yards of new work material from the Entrance and Jetty Channels. Bed leveling may be performed at the conclusion of dredging by dragging a metal bar to smooth over high spots. All of the material would be placed at the existing New Work Ocean Dredged Material Disposal Site (ODMDS) (EPA 1991) (EPA, 1991). This site is located in a dispersive offshore environment and has unlimited capacity. It is located approximately 4 mi from shore in 60-70 ft of water (Figure 1, see placement areas). The 350-acre ODMDS site is large enough to contain the all new work material that would be placed there during construction.

Table 2. BIH TSP - New Work Quantities and Placement Area Dike Elevations

Channel Stations		Placement Area (PA)	Current PA Acreage	Deepening Dredge Quantity in Cubic Yards (CY)	Existing PA Dike Elevation in Feet (NAVD 88)	New Work Dike Elevation in Feet (NAVD 88)
-17+000	00+000	New Work ODMDS	350	2,066,300[1]		
00+000	07+000	2	71	937,200	27	36
07+000	25+000	4B	243	2,688,800	7	19
25+000	50+000	5A	704	3,611,800	6	12
50+000	70+000	5B	1020	2,599,000	12	15
70+000	82+000	7	257	1,804,000	20	26
82+000	89+500	8	288	438,900	22	25
			Total CY	14,146,000		

It is estimated that 5 subsequent contracts would be awarded for cutterhead suction dredging of the Brownsville Main Channel through station 84+200 for a total length of 15.9 mi. The remainder of the channel (the Turning Basin Extension and Turning Basin) would remain at existing depths. The authorized depth for the inland Main Channel would be -52 ft MLLW, but the potential dredging depth could actually be -55 ft MLLW, after accounting for 2 ft of advance

[1] Dredged by hopper. All other dredging is expected to be non-hopper.

maintenance and 1 ft of allowable overdepth. Two or three cutterhead dredges would be working simultaneously to remove approximately 12,079,700 cubic yards (cy) of new work material over an estimated 29 months. New work material from the Brownsville Main Channel (stations 0+000 through 84+200) would be pumped from the dredges through a combination of fully submerged and floating hydraulic pipelines into existing upland confined Placement Areas (PAs) managed by the Brownsville Navigation District (PAs 2, 4B, 5A, 5B, 7, and 8). In addition, new work material may be placed in PA 3, a PA managed by the San Benito Navigation District and generally used for Port Isabel Channel material. The clay new work material would be stockpiled and used to raise the PA 3 dikes for later, unrelated maintenance dredging of the Port Isabel Channel. Specific quantities going to PA 3 are unknown at this time; should PA 3 be utilized, quantities going to PA 2 and/or 4B would be reduced. None of the existing PAs would need to be expanded and no new PAs would be needed. Construction to raise the containment dikes to heights needed to accommodate new work quantities would be done within the footprints of the existing PAs. The resulting elevations of the PA dikes for the new work placement activities are also shown in Table 3. The dikes would range from a total elevation of 12 feet NAVD 88 around PA 5A to a total elevation of 36 feet around PA 2. Armoring of the exterior toe of the PA 4A and 4B dikes on the side facing the channel would be necessary from station 22+000 to 33+800.

Maintenance dredging would generally be conducted by hopper and cutterhead dredges, with material being distributed among a nearshore Feeder Berm or the existing Maintenance ODMDS, and upland, confined PAs as shown in Table 2 of the Draft Biological Assessment (USACE 2013). Maintenance dredging would utilize the same placement areas as those utilized for existing conditions, and the duration and frequency of dredging events would be within the range occurring under current conditions. Dredging of the Entrance and Jetty Channels and the first 11,000 feet of the Main Channel (+11+000 to -17+000) would generally be performed by a hopper dredge, and material would be placed in the nearshore Feeder Berm Site 1A, located between 1.5 and 2.5 mi from the north jetty and from 0.4 to 0.9 mi from shore (USACE 1988). Sediment removed by maintenance dredging would therefore be regularly placed back into the littoral system, available for cross-shore and longshore sediment transport to the beaches of South Padre Island. Monitoring of material placed at the Feeder Berm has demonstrated that it moves toward the beach and disperses with the major movement being in the alongshore direction (McLellan et al. 1997; USACE-CETN 1989). If for some reason the Feeder Berm cannot be used, maintenance material from the Entrance and Jetty Channels (station -17+000 to 0+000) could be placed in the Maintenance ODMDS which is located approximately 2.5 nautical mi from shore and north of the channel (USACE 1975; USACE 1999). The ODMDS and Feeder Berm are located in dispersive environments and have unlimited capacities.

Maintenance material from the remainder of the Main Channel (stations 11+000 through 89+500) would be placed in existing PAs 4A, 4B, 5A, 5B, 7 and 8. Upland PAs and containment dikes are sized to accommodate total quantities over the 50-year period of analysis. None of the existing PAs would need to be expanded and no new PAs would be needed. Construction to raise the containment dikes to heights needed to accommodate the 50-year maintenance quantities would be done within the footprints of the existing PAs. Dikes would be raised incrementally as needed to contain maintenance quantities. The resulting elevations of the PA dikes for the 50-year placement plan are also shown in Table 3. They range from a total elevation of 17 feet NAVD 88 around PA 5A to a total elevation of 38 feet around PA 7. Benthos in the project area is comprised of a mix of sand, mud, and clay.

Table 3. BIH TSP - O&M Quantities and Placement Area Dike Elevations

Stations		Shoaling Rate in Cubic Yards/ Year (CY/YR)	Placement Area	Dredge Cycle (Years)	Number of Cycles in 50 Years	Quantity per Cycle (CY/Cycle)	Total O&M Quantity in 50 Years (CY)	Total Dike Elevation in 50 Years (feet NAVD88)
-17+000	0+00	470,630	Nearshore Feeder Berm Site 1A	5	10	2,353,150	23,531,500	N/A
0+00	11+000	161,595	Nearshore Feeder Berm Site 1A	3	16	484,785	7,756,600	N/A
11+000	28+000	183,995	4A	4	12	735,980	8,831,800	35
28+000	34+000	43,047	4B	4	12	172,188	2,066,300	24
34+000	50+000	123,527	5A	4	12	494,108	5,929,300	17
50+000	65+000	143,577	5B	5	10	717,885	7,178,900	19
65+000	79+000	98,637	7	6	8	591,822	4,734,600	38
79+000	89+500	30,377	8	7	7	212,639	1,488,500	28
					Total CY	5,762,557	61,517,500	

2.2 Sea Turtle Impact Avoidance Plan

An avoidance plan has been developed to avoid and minimize adverse impacts to sea turtles from hopper dredging during construction of the TSP. This avoidance plan includes reasonable and prudent measures that have largely been incorporated in USACE regulatory and civil works projects throughout the Gulf for more than two decades. These measures are:

- *Training*: All contracted personnel involved in operating hopper dredges must receive thorough training (as specified by NMFS) on measures of dredge operation that will minimize sea turtle takes.
- *Seasonal Hopper Dredging Window*: Hopper dredging activities in Gulf waters up to one mile into rivers shall be completed, whenever possible, between December 1 and March 31, when sea turtle abundance is lowest throughout Gulf coastal waters.
- *Non-Hopper-Type Dredging*: Pipeline or hydraulic dredges, which are not known to take turtles, must be used whenever possible between April 1 and November 30 in Gulf waters up to one mile into rivers.
- *Observers*: The USACE will arrange for NMFS-approved protected species observers to be aboard the hopper dredges to monitor the hopper bin, screening, and dragheads for sea

turtles and their remains. Observer coverage sufficient for 100% monitoring (i.e., 2 observers) of hopper dredging operations will be implemented between April 1 and November 30, or if the surface water temperatures are 11°C or greater.

- *Screening*: 100% 4-in inflow screening of dredged material is required. If conditions prevent 100% inflow screening using 4-in mesh, the Galveston District, observers, and draghead operator must consult, and USACE must notify NMFS before reducing or eliminating inflow screening and provide details regarding effective overflow screening. If deemed necessary, screening may be modified gradually (increasing mesh size to 6-in by 6-in, then 9-in by 9-in, then 12-in by 12-in). If clogging is still an issue after gradual changes, then effective 100% overflow screening is required.
- *Sea Turtle Deflecting Draghead and Dredging Pumps*: A state-of-the-art rigid-deflector draghead will be used on all hopper dredges at all times of the year. Dredging pumps will be disengaged by the operator when the dragheads are not firmly on the bottom, to prevent impingement or entrainment of sea turtles within the water column (especially important during dredging cleanup).
- *Dredge Lighting*: From March 15 through September 30, sea turtle nesting and emergence season, all lighting aboard hopper dredges and hopper dredge pumpout barges operating within 3 nautical mi of sea turtle nesting beaches shall be limited to the minimal lighting necessary to comply with U.S. Coast Guard and/or Occupational Safety and Health Administration requirements. Non-essential lighting shall be minimized through reduction, shielding, lowering, and appropriate placement.
- *Dredge Take Reporting*: Observer reports of incidental take by hopper dredges will be submitted by email (to *takereport.nmfsser@noaa.gov*) to NMFS Southeast Regional Office by onboard protected species observers within 24 hours of any observed sea turtle take. An end-of-project summary report of the hopper dredging results and any documented sea turtle takes will be submitted to NMFS Southeast Regional Office within 30 working days of completion of the dredging project. The USACE will submit an annual report to NMFS Southeast Regional Office summarizing hopper dredging projects and documented incidental takes. This report must include a complete explanation why alternative dredges (other than hopper dredges) were not used for maintenance dredging, if that activity occurs between April and November.
- *Sea turtle stranding and salvage network (STSSN) notification*: USACE or its representative will notify the STSSN state representative of start-up and completion of dredging, bed-leveling, and relocation trawling operations and ask to be notified of any turtle strandings in the project area that may bear the signs of draghead impingement or entrainment or interaction with a bed-leveling type dredge. Dredge relevant stranding information will be reported in the end-of-project summary report and end of year annual report (these strandings will not be counted against USACE take limit during maintenance).
- *Relocation Trawling*: Relocation trawling will be undertaken by the USACE where any of the following conditions are met: (a) 2 or more turtles are taken in a 24-hour period in the project; (b) 4 or more turtles are taken in the project; or, (c) when 75% of a District's sea turtle species fiscal year quota for a particular species has previously been met[2]. Handling of sea turtles captured during relocation trawling in association with hopper

[2] For this consultation, relocation trawling will be undertaken when 75% of the 'take' for any species is met.

dredging project in Gulf navigation channels and sand mining areas shall be conducted by NMFS-approved endangered species observers.

The USACE will also implement the USACE Management Protocol for Effective Implementation of the NMFS Regional Biological Opinion for Hopper Dredging Gulf of Mexico, dated December 29, 2009 (Appendix A)(USACE 2006).

2.3 Action Area

50 CFR 404.02 defines action area as "all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action." The action area for the project includes all areas to be dredged from the turning basin of the navigation channel to the entrance channel extension (approximately 20.15 mi) to the PA offshore and all waters in between (shown in Figure 1).

3 SPECIES AND CRITICAL HABITAT OCCURRING IN THE ACTION AREA

Species and Critical Habitat:

Table 4 below lists the endangered (E) and threatened (T) species, and actual and proposed critical habitats under the jurisdiction of NMFS that may occur in the action area. These are limited to the sea turtles (loggerhead [Northwest Atlantic loggerhead distinct population segment (DPS)], Kemp's ridley, leatherback, hawksbill, and green) and whales (blue, fin, humpback, sei, and sperm).

Table 4. Status of Listed Species in the Action Area (E= Endangered, T=Threatened)

Species		**Scientific Name**	**Status**	**USACE Effect Determination**	**NMFS Effect Determination**
Sea Turtles	Loggerhead sea turtle, Northwest Atlantic (NWA) distinct population segment (DPS)	*Caretta caretta*	T	LAA (Likely to Adversely Affect)	LAA
	Green	*Chelonia mydas*	E/T[3]	LAA	LAA
	Kemp's ridley	*Lepidochelys kempii*	E	LAA	LAA
	Leatherback	*Dermochelys coriacea*	E	LAA	NLAA (Not Likely to Adversely Affect)
	Hawksbill	*Eretmochelys imbricata*	E	LAA	NLAA
Whales	Sei	*Balaenoptera borealis*	E	NE (No Effect)	NLAA
	Blue	*Balaenoptera musculus*	E	NE	NLAA
	Finback	*Balaenoptera physalus*	E	NE	NLAA
	Humpback	*Megaptera novaeangliae*	E	NE	NLAA
	Sperm	*Physeter macrocephalus*	E	NE	NLAA

[3] Green sea turtles in U.S. waters are listed as threatened except for the Florida breeding population, which is listed as endangered.

3.1 Analysis of Species and Critical Habitats Not Likely to be Adversely Affected
We have determined that the proposed action being considered in this Opinion is not likely to adversely affect leatherback and hawksbill sea turtles, and whales (sei, blue, finback, humpback, and sperm). These species are excluded from further analysis and consideration in this Opinion. The following discussion summarizes our rationale for this determination.

3.1.1 Leatherback Sea Turtle
Leatherback sea turtles may be found in the action area, particularly when onshore winds and/or currents push jellyfish, their preferred prey, into inshore waters. However, leatherbacks are primarily a pelagic species, preferring deeper waters than those of the action area (the deepest portions of the offshore action area are less than 60 ft deep). No takes of leatherback sea turtles by hopper dredging activities have ever been reported in POB or the BIH navigation channel. Furthermore, only one leatherback sea turtle was captured, tagged, and released during relocation trawling operations in Texas (July 2003), however, this occurred in Port Aransas, approximately 120 miles to the north, as documented in the on-line Sea Turtle Data Warehouse[4] (STDW). The USACE STDW was created to centralize and archive historical and future data regarding sea turtle impacts from hopper dredging activities for long-term continuity and evaluation of these data. Because of the very few documented encounters with leatherback sea turtles during dredging operations, the turtles' very large size (compared to hopper dredge dragheads or mechanical dredge equipment), pelagic nature (surface and mid-water), preference for deeper waters located beyond the project area further offshore, and feeding habits (which make it unlikely they would ever encounter a bottom-hugging hopper dredge draghead or be exposed to any project blasting which will occur upriver), NMFS believes the possibility that leatherback sea turtles would be adversely affected by a hopper dredge is discountable.

3.1.2 Hawksbill Sea Turtle
NMFS believes the proposed project may affect, but is not likely to adversely affect, hawksbill sea turtles, as described below. Texas is the only state outside of Florida where hawksbills are sighted with any regularity. Most of these sightings involve post-hatchlings and juveniles, and are primarily associated with stone jetties. These small turtles are believed to originate from nesting beaches in Mexico[5] (NMFS, 2013d). On June 13, 1998, the first hawksbill nest recorded on the Texas coast was found at Padre Island National Seashore. This nest remains the only documented hawksbill nest on the Texas coast.[6] STSSN data from 2004–2007 show that 59 hawksbills were found along Texas waters or shorelines and that no hawksbills have been killed or captured during relocation trawls or maintenance dredging projects in the BIH area since record-keeping began in 1995. Hawksbill life history consists of an open ocean stage that lasts from the time they leave the nesting beach as hatchlings until they are approximately 22–25 cm in straight carapace length (Meylan 1988; Meylan and Donnelly 1999), followed by residency in developmental habitats (foraging areas where immature turtles reside and grow) in coastal waters, which may include inlets, bays, seagrass areas, coastal lagoons, coral reefs, and hard-bottom habitats. Adult foraging habitat, which may or may not overlap with developmental habitat, is typically coral reefs, although other hard-bottom communities and mangrove fringed bays may occasionally be occupied. Adult hawksbills show fidelity to their foraging areas over

[4] http://el.erdc.usace.army.mil/seaturtles/index.cfm
[5] http://www.nmfs.noaa.gov/pr/species/turtles/hawksbill.htm (accessed June 6, 2013)
[6] http://www.nps.gov/pais/naturescience/hawksbill.htm (accessed June 6, 2013)

periods of time as great as several years (van Dam and Díez 1998). Hawksbills have a specialized diet consisting primarily of sponges (Meylan 1988), although other food items, notably corallimorphs and zooanthids, have been documented to be important in some areas of the Caribbean (León and Díez 2000; Mayor et al. 1998; van Dam and Díez 1997). Therefore, hawksbills are unlikely to forage in the mixed sand, mud, and clay project area, and NMFS believes it is extremely unlikely that hawksbill sea turtles will be present in the action area. As well, no takes of hawksbill sea turtles by hopper dredging activities have ever been reported in POB or the BIH navigation channel. Thus, we consider the potential for impacts to hawksbill sea turtles to be discountable.

3.1.3 Whales (sei, blue, fin, humpback, and sperm)

NMFS identifies 5 endangered whale species of potential occurrence in the Gulf. These are the sei whale (*Balaenoptera borealis*), blue whale (*Balaenoptera musculus*), finback whale (*Balaenoptera physalus*), humpback whale (*Megaptera novaeangliae*), and sperm whale (*Physeter macrocephalus*). These species are generally restricted to deeper offshore waters, while the project disposal area (the deepest portion of the proposed action) is located just 4 mi from shore in 60 feet of water; therefore, it is extremely unlikely that any of these 5 species would regularly occur in the project area (NMFS, 2003). Further, these species are not likely to be impacted by hopper dredges because of slow speed of these vessels. Thus, we conclude that the risk to these species is discountable.

Summary

NMFS has determined that leatherback and hawksbill sea turtles, and whales (sei, blue, fin, humpback, and sperm) are not likely to be adversely affected. These species will not be considered further in this opinion.

3.2 Species Likely to be Adversely Affected

NMFS believes the proposed action is likely to adversely affect loggerhead, green, and Kemp's ridley sea turtles. The status of these species is discussed in the following sections.

3.2.1 Loggerhead Sea Turtle – NW Atlantic DPS

The loggerhead sea turtle was listed as a threatened species throughout its global range on July 28, 1978. NMFS and USFWS published a final rule designating 9 DPSs for loggerhead sea turtles (76 FR 58868, September 22, 2011, effective October 24, 2011). The DPSs established by this rule include (1) Northwest Atlantic Ocean (threatened), (2) Northeast Atlantic Ocean (endangered), (3) South Atlantic Ocean (threatened), (4) Mediterranean Sea (endangered), (5) North Pacific Ocean (endangered), (6) South Pacific Ocean (endangered), (7) North Indian Ocean (endangered), (8) Southeast Indo-Pacific Ocean (endangered), and (9) Southwest Indian Ocean (threatened). The Northwest Atlantic (NWA) DPS is the only one that occurs within the action area and therefore is the only one considered in this Opinion.

Species Description and Distribution

Loggerheads are large sea turtles with the mean straight carapace length (SCL) of adults in the southeast United States being approximately 3 ft (92 cm). The corresponding mass is approximately 255 lb (116 kg) (Ehrhart and Yoder 1978). Adult and subadult loggerhead sea turtles typically have a light yellow plastron and a reddish brown carapace covered by non-overlapping scutes that meet along seam lines. They typically have 11 or 12 pairs of marginal scutes, 5 pairs of costals, 5 vertebrals, and a nuchal (precentral) scute that is in contact with the first pair of costal scutes (Dodd 1988).

The loggerhead sea turtle inhabits continental shelf and estuarine environments throughout the temperate and tropical regions of the Atlantic, Pacific, and Indian Oceans (Dodd 1988). Habitat uses within these areas vary by life stage. Juveniles are omnivorous and forage on crabs, mollusks, jellyfish and vegetation at or near the surface (Dodd 1988). Subadult and adult loggerheads are primarily found in coastal waters and prey on benthic invertebrates such as mollusks and decapod crustaceans in hard-bottom habitats.

The majority of loggerhead nesting occurs at the western rims of the Atlantic and Indian Oceans concentrated in the north and south temperate zones and subtropics (NRC 1990). In the western North Atlantic, loggerhead nesting is concentrated along the coasts of the United States from southern Virginia to Alabama. Additional nesting beaches are found along the northern and western Gulf of Mexico, eastern Yucatán Peninsula, at Cay Sal Bank in the eastern Bahamas (Addison 1997; Addison and Morford 1996), off the southwestern coast of Cuba (Gavilan 2001), and along the coasts of Central America, Colombia, Venezuela, and the eastern Caribbean Islands.

Non-nesting, adult female loggerheads are reported throughout the United States and Caribbean Sea. Little is known about the distribution of adult males who are seasonally abundant near nesting beaches although aerial surveys suggest that loggerheads in U.S. waters are distributed as a whole in the following proportions: 54% in the southeast U.S. Atlantic, 29% in the northeast U.S. Atlantic, 12% in the eastern Gulf of Mexico, and 5% in the western Gulf of Mexico (TEWG 1998).

Within the NWA, most loggerhead sea turtles nest from North Carolina to Florida and along the Gulf coast of Florida. Previous Section 7 analyses have recognized at least 5 Western Atlantic subpopulations, divided geographically as follows: (1) a Northern nesting subpopulation, occurring from North Carolina to Northeast Florida at about 29°N; (2) a South Florida nesting subpopulation, occurring from 29°N on the east coast of the state to Sarasota on the west coast; (3) a Florida Panhandle nesting subpopulation, occurring at Eglin Air Force Base and the beaches near Panama City, Florida; (4) a Yucatán nesting subpopulation, occurring on the Eastern Yucatán Peninsula, Mexico (Márquez M 1990; TEWG 2000a); and (5) a Dry Tortugas nesting subpopulation, occurring in the islands of the Dry Tortugas, near Key West, Florida (NMFS-SEFSC 2001). The recovery plan for the Northwest Atlantic population of loggerhead sea turtles concluded, based on recent advances in genetic analyses, that there is no genetic distinction between loggerheads nesting on adjacent beaches along the Florida Peninsula and that specific boundaries for subpopulations could not be designated based on genetic differences alone. Thus, the plan uses a combination of geographic distribution of nesting densities, geographic separation, and geopolitical boundaries, in addition to genetic differences, to identify recovery units. The recovery units are (1) the Northern Recovery Unit (Florida/Georgia border north through southern Virginia), (2) the Peninsular Florida Recovery Unit (Florida/Georgia border through Pinellas County, Florida), (3) the Dry Tortugas Recovery Unit (islands located west of Key West, Florida), (4) the Northern Gulf of Mexico Recovery Unit (Franklin County, Florida, through Texas), and (5) the Greater Caribbean Recovery Unit (Mexico through French Guiana, the Bahamas, Lesser Antilles, and Greater Antilles) (NMFS and USFWS 2008a). The recovery plan concluded that all recovery units are essential to the recovery of the species. Although the recovery plan was written prior to the listing of the NWA DPS, the recovery units for what was then termed the Northwest Atlantic population apply to the NWA DPS.

Life History Information
The Northwest Atlantic Loggerhead Recovery Team defined the following 8 life stages for the loggerhead life cycle, including the ecosystems those stages generally use: (1) egg (terrestrial zone), (2) hatchling stage (terrestrial zone), (3) hatchling swim frenzy and transitional stage (neritic zone[7]), (4) juvenile stage (oceanic zone), (5) juvenile stage (neritic zone), (6) adult stage (oceanic zone), (7) adult stage (neritic zone), and (8) nesting female (terrestrial zone) (NMFS and USFWS 2008). Loggerheads are long-lived organisms that reach sexual maturity between 20 and 38 years of age, although this varies widely among populations (Frazer and Ehrhart 1985; NMFS and SEFSC 2001). The annual mating season for loggerhead sea turtles occurs from late March to early June, and eggs are laid throughout the summer months. Female loggerheads deposit an average of 4.1 nests within a nesting season (Murphy and Hopkins 1984) but an individual female only nests every 3.7 years on average (Tucker 2010). Along the southeastern United States, loggerheads lay an average of 100–126 eggs per nest (Dodd 1988) which incubate for 42–75 days before hatching (NMFS and USFWS 2008b).

As post-hatchlings, loggerheads hatched on U.S. beaches migrate offshore and become associated with Sargassum habitats,[8] driftlines, and other convergence zones (Carr 1986) (Witherington 2002). Loggerheads originating from the NWA DPS are believed to lead a pelagic existence in the North Atlantic Gyre for a period as long as 7–12 years (Bolten et al. 1998) before moving to more coastal habitats. Recent studies have suggested that not all loggerhead sea turtles follow the model of circumnavigating the North Atlantic Gyre as pelagic juveniles, followed by permanent settlement into benthic environments (Bolten and Witherington 2003; Laurent et al. 1998). These studies suggest some turtles may either remain in the pelagic habitat in the North Atlantic longer than hypothesized or move back and forth between pelagic and coastal habitats interchangeably (Witzell 2002). Stranding records indicate that when immature loggerheads reach 15–24 in (40-60 cm) SCL, they begin to occur in coastal inshore waters of the continental shelf throughout the U.S. Atlantic and Gulf of Mexico (Witzell 2002).

After departing the oceanic zone, neritic juvenile loggerheads in the Northwest Atlantic inhabit continental shelf waters from Cape Cod Bay, Massachusetts, south through Florida, The Bahamas, Cuba, and the Gulf of Mexico. Estuarine waters of the United States, including areas such as Long Island Sound, Chesapeake Bay, Pamlico and Core Sounds, Mosquito and Indian River Lagoons, Biscayne Bay, Florida Bay, and numerous embayments fringing the Gulf of Mexico, comprise important inshore habitat. Along the Atlantic and Gulf of Mexico shoreline, essentially all shelf waters are inhabited by loggerheads.

Like juveniles, non-nesting adult loggerheads also use the neritic zone. However, these adult loggerheads use the relatively enclosed shallow-water estuarine habitats with limited ocean

[7] Neritic refers to the inshore marine environment from the snrface to the sea floor where water depths do not exceed 200 meters.
[8] Sargassum is a type of free floating seaweed sometimes occurring in extensive rafts that provides habitat for distinctive communities of organisms adapted to the buoyant Sargassum habitat.

access are less frequently than the juveniles. Areas such as Pamlico Sound, North Carolina, and the Indian River Lagoon, Florida, are regularly used by juveniles but not adult loggerheads. In comparison, adult loggerheads tend to use estuarine areas with more open ocean access, such as Chesapeake Bay in the U.S. Mid-Atlantic. Shallow-water habitats with large expanses of open ocean access, such as Florida Bay, provide year-round resident foraging areas for significant numbers of male and female adult loggerheads. Offshore, adults primarily inhabit continental shelf waters, from New York south through Florida, The Bahamas, Cuba, and the Gulf of Mexico. Seasonal use of Mid-Atlantic shelf waters, especially offshore New Jersey, Delaware, and Virginia during summer months, and offshore shelf waters, such as Onslow Bay (off the North Carolina coast), during winter months has also been documented (Hawkes et al. 2007a; Georgia Department of Natural Resources, unpublished data; South Carolina Department of Natural Resources, unpublished data). Satellite telemetry has identified the shelf waters along the west Florida coast, The Bahamas, Cuba, and the Yucatán Peninsula as important resident areas for adult female loggerheads that nest in Florida (Foley et al. 2008; Girard et al. 2009; Hart et al. 2012). The southern edge of the Grand Bahama Bank is important habitat for loggerheads nesting on the Cay Sal Bank in The Bahamas, but nesting females are also resident in the bights of Eleuthera, Long Island, and Ragged Islands as well as Florida Bay in the United States, and the north coast of Cuba (A. Bolten and K. Bjorndal, University of Florida, unpublished data). Moncada et al. (2010) report the recapture in Cuban waters of 5 adult female loggerheads originally flipper tagged in Quintana Roo, Mexico, indicating that Cuban shelf waters likely also provide foraging habitat for adult females that nest in Mexico.

Status and Population Dynamics
A number of stock assessments and similar reviews (Conant et al. 2009; Heppell et al. 2003; NMFS-SEFSC 2009a; NMFS and SEFSC 2001; NMFS and USFWS 2008a; TEWG 1998; TEWG 2000a; TEWG 2009) have examined the stock status of loggerheads in the Atlantic Ocean, but none have been able to develop a reliable estimate of absolute population size.

Numbers of nests and nesting females can vary widely from year to year. However, nesting beach surveys can provide a reliable assessment of trends in the adult female population, due to the strong nest site fidelity of female loggerhead sea turtles, as long as such studies are sufficiently long and effort and methods are standardized (e.g., NMFS and USFWS (2008a). NMFS and USFWS (2008a) concluded that the lack of change in 2 important demographic parameters of loggerheads, remigration interval and clutch frequency, indicate that time series on numbers of nests can provide reliable information on trends in the female population.

<u>Peninsular Florida Recovery Unit</u>
The Peninsular Florida Recovery Unit (PFRU) is the largest loggerhead nesting assemblage in the Northwest Atlantic. A near-complete nest census (all beaches including index nesting beaches[9]) undertaken from 1989 to 2007 showed a mean of 64,513 loggerhead nests per year, representing approximately 15,735 nesting females per year (NMFS and USFWS 2008a). The statewide estimated total for 2012 was 98,601 nests (FWRI nesting database).

[9] The index survey uses standardized data-collection criteria to measure seasonal nesting at specific locations to ensure accurate comparisons between beaches and between years.

In addition to the total nest count estimates, the Florida Fish and Wildlife Research Institute (FWRI) uses an index nesting beach survey method. The index survey uses standardized data-collection criteria to measure seasonal nesting and allow accurate comparisons between beaches and between years. This provides a better tool for understanding the nesting trends (Figure 2). FWRI performed a detailed analysis of the long-term loggerhead index nesting data (1989–2012[10]). Three distinct trends over that time period were identified. From 1989-1998 there was a 23% increase, that was then followed by a sharp decline over the subsequent decade. However, recent large increases in loggerhead nesting occurred since then. FWRI examined the trend from the 1998 nesting high through 2012 and found the decade-long post-1998 decline had reversed and there was no longer a demonstrable trend. Looking at the data from 1989 through 2012, FWRI concluded that there was an overall positive change in the nest counts.

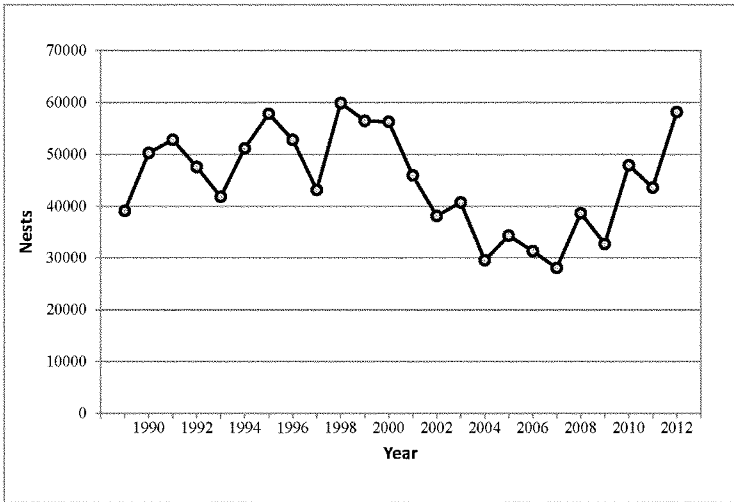

Figure 2. Loggerhead sea turtle nesting at Florida index beaches since 1989

<u>Northern Recovery Unit</u>

Annual nest totals from beaches within the Northern Recovery Unit (NRU) averaged 5,215 nests from 1989-2008, a period of near-complete surveys of NRU nesting beaches (Georgia Department of Natural Resources (GDNR) unpublished data, North Carolina Wildlife Resources Commission (NCWRC) unpublished data, South Carolina Department of Natural Resources (SCDNR) unpublished data), and represent approximately 1,272 nesting females per year, assuming 4.1 nests per female (Murphy and Hopkins 1984). The loggerhead nesting trend from daily beach surveys showed a significant decline of 1.3% annually from 1989-2008. Nest totals from aerial surveys conducted by SCDNR showed a 1.9% annual decline in nesting in South Carolina from 1980 through 2008. Overall, there is strong statistical data to suggest the NRU had experienced a long-term decline over that period of time.

[10] http://myfwc.com/research/wildlife/sea-turtles/nesting/loggerhead-trends

Data since that analysis (Table 5) are showing improved nesting numbers and a departure from the declining trend. Georgia nesting has rebounded to show the first statistically significant increasing trend since comprehensive nesting surveys began in 1989 (Mark Dodd, Georgia Department of Natural Resources (GADNR) press release, http://www.georgiawildlife.com/node/3139). South Carolina and North Carolina nesting have also begun to show a shift away from the past declining trend.

Table 5. Total Number of NRU Loggerhead Nests (GADNR, SCDNR, and NCWRC nesting datasets)

Nests Recorded	**2008**	**2009**	**2010**	**2011**	**2012**
Georgia	1,649	997	1,761	1,992	2,218
South Carolina	4,500	2,183	3,141	4,015	4,615
North Carolina	841	276	846	948	1,069
Total	6,990	3,456	5,748	6,955	7,902

South Carolina also conducts an index beach nesting survey similar to the one described for Florida. Although the survey only includes a subset of nesting, the standardized effort and locations allow for a better representation of the nesting trend over time. Increases in nesting were seen for the period from 2009–2012, with 2012 showing the highest index nesting total since the start of the program (Figure 3).[11]

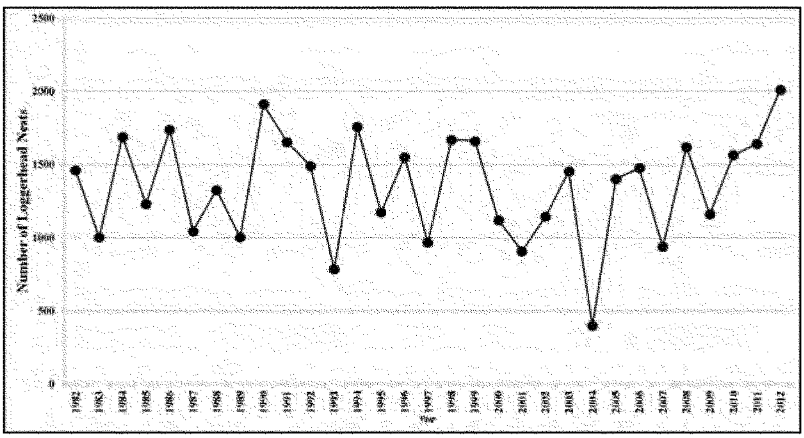

Figure 3. South Carolina Index nesting beach counts for loggerhead sea turtles

Other NW Atlantic DPS Recovery Units

The remaining 3 recovery units—Dry Tortugas (DTRU), Northern Gulf of Mexico (NGMRU), and Greater Caribbean (GCRU)—are much smaller nesting assemblages but still considered essential to the continued existence of the species. Nesting surveys for the DTRU are conducted as part of Florida's statewide survey program. Survey effort was relatively stable during the 9-year period from 1995–2004 (although the 2002 year was missed). Nest counts ranged from

[11] SCDNR website, http://www.dnr.sc.gov/seaturtle/nest.htm

168–270, with a mean of 246, but with no detectable trend during this period (NMFS and USFWS 2008a). Nest counts for the NGMRU are focused on index beaches rather than all beaches where nesting occurs. Analysis of the 12-year dataset (1997–2008) of index nesting beaches in the area shows a statistically significant declining trend of 4.7% annually (NMFS and USFWS 2008a). Nesting on the Florida Panhandle index beaches, which represents the majority of NGMRU nesting, had shown a large increase in 2008, but then declined again in 2009 and 2010 before rising back to a level similar to the 2003–2007 average in 2011. Nesting survey effort has been inconsistent among the GCRU nesting beaches and no trend can be determined for this subpopulation. Zurita et al. (2003) found a statistically significant increase in the number of nests on 7 of the beaches on Quintana Roo, Mexico, from 1987–2001, where survey effort was consistent during the period. However, nesting has declined since 2001, and the previously reported increasing trend appears to not have been sustained (NMFS and USFWS 2008a).

In-Water Trends

Nesting data are the best current indicator of sea turtle population trends; however, in-water data also provide some insight. Such research suggests the abundance of neritic juvenile loggerheads is steady or increasing. Although Ehrhart et al. (2007) found no significant regression-line trend in a long-term dataset, researchers have observed notable increases in catch per unit effort (CPUE) over the past several years (Ehrhart et al. 2007; Epperly et al. 2007; Arendt et al. 2009). Researchers believe that this increase in CPUE is likely linked to an increase in juvenile abundance, though it is unclear whether this increase in abundance represents a true population increase among juveniles or merely a shift in spatial occurrence. Bjorndal et al. (2005)cited in NMFS and USFWS (2008a), caution about extrapolating localized in-water trends to the broader population and relating localized trends in neritic sites to population trends at nesting beaches. The apparent overall increase in the abundance of neritic loggerheads in the southeastern United States may be due to increased abundance of the largest oceanic/neritic juveniles (historically referred to as small benthic juveniles), which could indicate a relatively large number of individuals around the same age may mature in the near future (TEWG 2009). However, in-water studies throughout the eastern United States also indicate a substantial decrease in the abundance of the smallest oceanic/neritic juvenile loggerheads, a pattern corroborated by stranding data (TEWG 2009).

Population Estimate

The NMFS Southeast Fishery Science Center developed a preliminary stage/age demographic model to help determine the estimated impacts of mortality reductions on loggerhead sea turtle population dynamics (NMFS-SEFSC 2009a). The model uses the range of published information for the various parameters including mortality by stage, stage duration (years in a stage), and fecundity parameters such as eggs per nest, nests per nesting female, hatchling emergence success, sex ratio, and remigration interval. Resulting trajectories of model runs for each individual recovery unit, as well as the western North Atlantic population as a whole, were found to be very similar. The model run estimates, from the adult female population size for the western North Atlantic (from the 2004-2008 time frame), suggests the adult female population size approximately 20,000 to 40,000 individuals, with a low likelihood of being up to 70,000 (NMFS-SEFSC 2009a). A less robust estimate for total benthic females in the western North Atlantic was also obtained, yielding approximately 30,000-300,000 individuals, up to less than 1 million (NMFS-SEFSC 2009a).

Threats

The threats faced by loggerhead sea turtles are well-summarized in the general discussion of threats in Section 3.2.4. However, the impact of fishery interactions is a point of further emphasis for this species. The Loggerhead Biological Review Team determined that the greatest threats to the NWA DPS of loggerheads result from cumulative fishery bycatch in neritic and oceanic habitats (Conant et al. 2009). Domestic fishery operations often capture, injure, and kill sea turtles at various life stages. Loggerheads in the pelagic environment are exposed to U.S. Atlantic pelagic longline fisheries. Although loggerhead sea turtles are most vulnerable to pelagic longlines during their immature life history stage, there is some evidence that benthic juveniles may also be captured, injured, or killed by pelagic fisheries (Lewison 2004). Southeast U.S. shrimp fisheries have historically been the largest fishery threat to benthic sea turtles in the southeastern United States, and continue to interact with and kill large numbers of turtles each year. Loggerheads in the benthic environment in waters off the coastal United States are exposed to a suite of other fisheries in federal and state waters including trawl, gillnet, purse seine, hook-and-line, including bottom longline and vertical line (e.g., bandit gear, handline, and rod-reel), pound net, and trap fisheries (refer to the Environmental Baseline section of this opinion for more specific information regarding federal and state managed fisheries affecting sea turtles within the action area). In addition to domestic fisheries, sea turtles are subject to incidental capture in numerous foreign fisheries, further exacerbating the ability of sea turtles to survive and recover on a global scale. For example, pelagic, immature loggerhead sea turtles circumnavigating the Atlantic are exposed to international longline fisheries including the Azorean, Spanish, and various other fleets (Aguilar et al. 1995; Bolten et al. 1994; Crouse 1999). Bottom set lines in the coastal waters of Madeira, Portugal, are reported to take an estimated 500 pelagic immature loggerheads each year (Dellinger and Encarnaçâo 2000)and gillnet fishing is known to occur in many foreign waters, including (but not limited to) the northwest Atlantic, western Mediterranean, South America, West Africa, Central America, and the Caribbean. Shrimp trawl fisheries are also occurring off the shores of numerous foreign countries and pose a significant threat to sea turtles similar to the impacts seen in U.S. waters. Many unreported takes or incomplete records by foreign fleets, making it difficult to characterize the total impact that international fishing pressure is having on listed sea turtles. Nevertheless, international fisheries represent a continuing threat to sea turtle survival and recovery throughout their respective ranges.

Regarding the impacts of pollution, loggerheads may be particularly affected by organochlorine[12] contaminants as they were observed to have the highest organochlorine concentrations in sampled tissues (Storelli et al. 2008). It is thought that dietary preferences were likely to be the main differentiating factor among species. Storelli et al. (2008) analyzed tissues from stranded loggerhead sea turtles and found that mercury accumulates in sea turtle livers while cadmium accumulates in their kidneys, as has been reported for other marine organisms like dolphins, seals, and porpoises (Law et al. 1991a).

Specific information regarding potential climate change impacts on loggerheads is also available. Modeling suggests an increase of 2°C in air temperature would result in a sex ratio of over 80% female offspring for loggerheads nesting near Southport, North Carolina. The same increase in air temperatures at nesting beaches in Cape Canaveral, Florida, would result in close to 100%

[12] compouuds that contain carbon, chlorine, and hydrogen

female offspring. Such highly skewed sex ratios could undermine the reproductive capacity of the species. More ominously, an air temperature increase of 3°C is likely to exceed the thermal threshold of most clutches, leading to death (Hawkes et al. 2007). Warmer sea surface temperatures have also been correlated with an earlier onset of loggerhead nesting in the spring (Hawkes et al. 2007; Weishampel et al. 2004), as well as short inter-nesting intervals (Hays et al. 2002) and shorter nesting season (Pike et al. 2006).

3.2.2 Green Sea Turtle

The green sea turtle was listed as threatened under the ESA on July 28, 1978, except for the Florida and Pacific coast of Mexico breeding populations, which were listed as endangered.

Species Description and Distribution

The green sea turtle is the largest of the hardshell marine turtles, growing to a weight of 350 lb (159 kg) and a straight carapace length of greater than 3.3 ft (1 m). Green sea turtles have a smooth carapace with 4 pairs of lateral (or costal) scutes and a single pair of elongated prefrontal scales between the eyes. They typically have a black dorsal surface and a white ventral surface, although the carapace of green sea turtles in the Atlantic Ocean has been known to change in color from solid black to a variety of shades of grey, green, or brown and black in starburst or irregular patterns (Lagueux 2001).

With the exception of post-hatchlings, green sea turtles live in nearshore tropical and subtropical waters where they generally feed on marine algae and seagrasses. They have specific foraging grounds and may make large migrations between these forage sites and natal beaches for nesting (Hays et al. 2001). Green sea turtles nest on sandy beaches of mainland shores, barrier islands, coral islands, and volcanic islands in more than 80 countries worldwide (Hirth and USFWS 1997). The 2 largest nesting populations are found at Tortuguero, on the Caribbean coast of Costa Rica, and Raine Island, on the Pacific coast of Australia along the Great Barrier Reef.

Differences in mitochondrial DNA properties of green sea turtles from different nesting regions indicate there are genetic subpopulations (Bowen et al. 1992; Fitzsimmons et al. 2006). Despite the genetic differences, sea turtles from separate nesting origins are commonly found mixed together on foraging grounds throughout the species' range. However, such mixing occurs at extremely low levels in Hawaiian foraging areas, perhaps making this central Pacific population the most isolated of all green sea turtle populations occurring worldwide (Dutton et al. 2008).

In U.S. Atlantic and Gulf of Mexico waters, green sea turtles are distributed in inshore and nearshore waters from Texas to Massachusetts. Principal benthic foraging areas in the southeastern United States include Aransas Bay, Matagorda Bay, Laguna Madre, and the Gulf inlets of Texas (Doughty 1984; Hildebrand 1982; Shaver 1994), the Gulf of Mexico off Florida from Yankeetown to Tarpon Springs (Caldwell and Carr 1957; Carr 1984), Florida Bay and the Florida Keys (Schroeder and Foley 1995), the Indian River Lagoon system in Florida (Ehrhart 1983), and the Atlantic Ocean off Florida from Brevard through Broward Counties (Guseman and Ehrhart 1992; Wershoven and Wershoven 1992). The summer developmental habitat for green sea turtles also encompasses estuarine and coastal waters from North Carolina to as far north as Long Island Sound (Musick and Limpus 1997). Additional important foraging areas in the western Atlantic include the Culebra archipelago and other Puerto Rico coastal waters, the south coast of Cuba, the Mosquito ("Miskito") Coast of Nicaragua, the Caribbean coast of

Panama, scattered areas along Colombia and Brazil (Hirth 1971), and the northwestern coast of the Yucatan Peninsula.

The complete nesting range of green sea turtles within the southeastern United States includes sandy beaches between Texas and North Carolina, as well as the U.S.V.I. and Puerto Rico (Dow et al. 2007; NMFS and USFWS 1991). However, the vast majority of green sea turtle nesting within the southeastern United States occurs in Florida (Johnson and Ehrhart 1994; Meylan et al. 1995). Principal U.S. nesting areas for green sea turtles are in eastern Florida, predominantly Brevard through Broward counties. For more information on green sea turtle nesting in other ocean basins, refer to the 1991 *Recovery Plan for the Atlantic Green Turtle* (NMFS and USFWS 1991) or the 2007 *Green Sea Turtle 5-Year Status Review* (NMFS and USFWS 2007a).

Life History Information

Green sea turtles reproduce sexually, and mating occurs in the waters off nesting beaches. Mature females return to their natal beaches (i.e., the same beaches where they were born) to lay eggs (Balazs 1982; Frazer and Ehrhart 1985) every 2-4 years while males are known to reproduce every year (Balazs 1983). In the southeastern United States, females generally nest between June and September, and peak nesting occurs in June and July (Witherington and Ehrhart 1989). During the nesting season, females nest at approximately 2-week intervals, laying an average of 3-4 clutches (Johnson and Ehrhart 1996). Clutch size often varies among subpopulations, but mean clutch size is around 110-115 eggs. In Florida, green sea turtle nests contain an average of 136 eggs (Witherington and Ehrhart 1989). Eggs incubate for approximately 2 months before hatching. Survivorship at any particular nesting site is greatly influenced by the level of anthropogenic stressors, with the more pristine and less disturbed nesting sites (e.g., along the Great Barrier Reef in Australia) showing higher survivorship values than nesting sites known to be highly disturbed (e.g., Nicaragua)(Campbell and Lagueux 2005; Chaloupka and Limpus 2005).

After emerging from the nest, hatchlings swim to offshore areas and go through a post-hatchling pelagic stage where they are believed to live for several years. During this life stage, green sea turtles feed close to the surface on a variety of marine algae and other life associated with drift lines and debris. This early oceanic phase remains one of the most poorly understood aspects of green sea turtle life history (NMFS and USFWS 2007b). Green sea turtles exhibit particularly slow growth rates of about 1-5 centimeters per year (Green 1993; McDonald-Dutton and Dutton 1998), which may be attributed to their largely herbivorous, low-net energy diet (Bjorndal 1982). At approximately 20-25 cm carapace length, juveniles leave the pelagic environment and enter nearshore developmental habitats such as protected lagoons and open coastal areas rich in sea grass and marine algae. Growth studies using skeletochronology[13] indicate that green sea turtles in the western Atlantic shift from the oceanic phase to nearshore developmental habitats after approximately 5-6 years (Bresette et al. 2006; Zug and Glor 1998). Within the developmental habitats, juveniles begin the switch to a more herbivorous diet, and by adulthood feed almost exclusively on seagrasses and algae (Rebel and Ingle 1974). However, some populations are known to also feed heavily on invertebrates (Carballo et al. 2002). Green sea turtles reach sexual

[13] Skeletochronology is used to determine the chronological age of a species of animal by counting the concentric growth rings found in a cross section of bone.

maturity at 20-50 years of age (Chaloupka and Musick 1997; Hirth and USFWS 1997), which is considered one of the longest ages to maturity of any sea turtle species.

While in coastal habitats, green sea turtles exhibit site fidelity to specific foraging and nesting grounds, and it is clear they are capable of "homing in" on these sites if displaced (McMichael et al. 2003). Reproductive migrations of Florida green sea turtles have been identified through flipper tagging and/or satellite telemetry. Based on these studies, the majority of adult female Florida green sea turtles are believed to reside in nearshore foraging areas throughout the Florida Keys and in the waters southwest of Cape Sable, with some post-nesting turtles also residing in Bahamian waters as well (NMFS and USFWS 2007b).

Status and Population Dynamics

Population estimates for marine turtles do not exist because of the difficulty in sampling turtles over their geographic ranges and within their marine environments. However, researchers have used nesting data to study trends in reproducing sea turtles over time. A summary of nesting trends is provided in the most recent 5-year status review for the species (NMFS and USFWS 2007b) organized by ocean region (i.e., Western Atlantic Ocean, Central Atlantic Ocean, Eastern Atlantic Ocean, Mediterranean Sea, Western Indian Ocean, Northern Indian Ocean, Eastern Indian Ocean, Southeast Asia, Western Pacific Ocean, Central Pacific Ocean, and Eastern Pacific Ocean) shows trends at 23 of the 46 nesting sites found that 10 appeared to be increasing, 9 appeared to be stable, and 4 appeared to be decreasing. With respect to regional trends, the Pacific, the Western Atlantic, and the Central Atlantic regions appeared to show more positive trends (i.e., more nesting sites increasing than decreasing) while the Southeast Asia, Eastern Indian Ocean, and possibly the Mediterranean Sea regions appeared to show more negative trends (i.e., more nesting sites decreasing than increasing). These regional determinations should be viewed with caution since trend data was only available for about half of the total nesting concentration sites examined in the review and that site specific data availability appeared to vary across all regions.

The Western Atlantic region (i.e., the focus of this Opinion) was one of the best performing in terms of abundance in the entire review as there were no sites that appeared to be decreasing. The 5-year status review for the species identified 8 geographic areas considered to be primary sites for green sea turtle nesting in the Atlantic/Caribbean and reviewed the trend in nest count data for each (NMFS and USFWS 2007a). These sites were: (1) Yucatán Peninsula, Mexico; (2) Tortuguero, Costa Rica; (3) Aves Island, Venezuela; (4) Galibi Reserve, Suriname; (5) Isla Trindade, Brazil; (6) Ascension Island, United Kingdom; (7) Bioko Island, Equatorial Guinea; and (8) Bijagos Archipelago, Guinea-Bissau. Nesting at all of these sites was considered to be stable or increasing with the exception of Bioko Island and the Bijagos Archipelago where the lack of sufficient data precluded a meaningful trend assessment for either (NMFS and USFWS 2007a). Seminoff (2004) likewise reviewed green sea turtle nesting data for 8 sites in the western, eastern, and central Atlantic Ocean, including all of the above with the exception that nesting in Florida was reviewed in place of Isla Trindade, Brazil. Seminoff (2004) concluded that all sites in the central and western Atlantic showed increased nesting, with the exception of nesting at Aves Island, Venezuela, while both sites in the eastern Atlantic demonstrated decreased nesting. These sites are not inclusive of all green sea turtle nesting in the Atlantic; however, other sites are not believed to support nesting levels high enough that would change the overall status of the species in the Atlantic (NMFS and USFWS 2007a). More information about site-specific trends for the other major ocean regions can be found in the most recent 5-year status review for the species (see NMFS and USFWS (2007a)).

By far, the largest known nesting assemblage in the Western Atlantic region occurs at Tortuguero, Costa Rica. According to monitoring data on nest counts, as well as documented emergences (both nesting and non-nesting events), there appears to be an increasing trend in this nesting assemblage since monitoring began in the early 1970s. For instance, from 1971-1975 there were approximately 41,250 average annual emergences documented and this number increased to an average of 72,200 emergences from 1992-1996 (Bjorndal et al. 1999). Troëng and Rankin (Troëng and Rankin 2005) collected nest counts from 1999-2003 and also reported increasing trends in the population consistent with the earlier studies, with nest count data suggesting 17,402-37,290 nesting females per year (NMFS and USFWS 2007a). Modeling by Chaloupka et al. (2008) using data sets of 25 years or more resulted in an estimate of the Tortuguero, Costa Rica, population growing at 4.9% annually.

In the continental United States, green sea turtle nesting occurs along the Atlantic coast, primarily along the central and southeast coast of Florida where an estimated 200-1,100 females nest each year (Meylan et al. 1994; Weishampel et al. 2003). Occasional nesting has also been documented along the Gulf coast of Florida (Meylan et al. 1995). More recently, green sea turtle nesting has occurred in North Carolina on Bald Head Island, just east of the mouth of the Cape Fear River, on Onslow Island, and on Cape Hatteras National Seashore. In 2010, a total of 18 nests were found in North Carolina, 6 nests in South Carolina, and 6 nests in Georgia (nesting databases maintained on www.seaturtle.org).

In Florida, index beaches were established to standardize data collection methods and effort on key nesting beaches. Since establishment of the index beaches in 1989, the pattern of green sea turtle nesting has generally shown biennial peaks in abundance with a positive trend during the recent years of regular monitoring (Figure 4). According to data collected from Florida's index nesting beach survey from 1989-2012, green sea turtle nest counts across Florida have increased approximately ten-fold from a low of 267 in the early 1990s to a high of 10,701 in 2011. Two consecutive years of nesting declines in 2008 and 2009 caused some concern, but this was followed by increases in both 2010 and 2011, a decrease in 2012, and another significant increase in 2013 (Figure 6). While the nest count for 2013 was more than twice the count from the next highest year, it is not a guarantee of future years so additional surveys are necessary. Modeling by Chaloupka et al. (2008) using data sets of 25 years or more has resulted in an estimate of the Florida nesting stock at the Archie Carr National Wildlife Refuge growing at an annual rate of 13.9%.

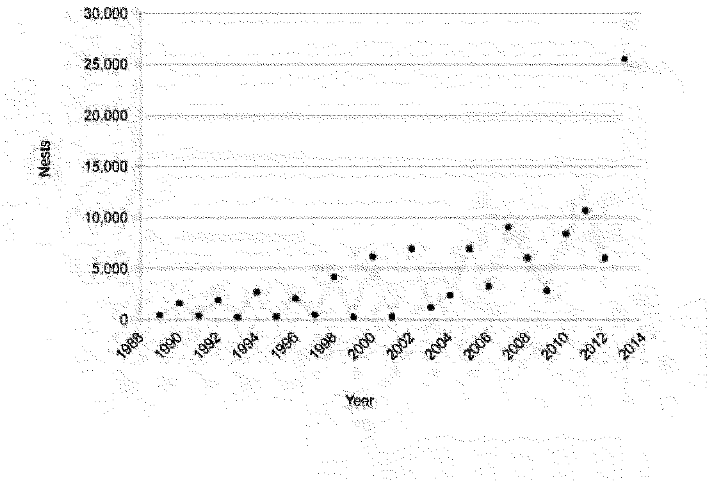

Figure 4. Green sea turtle nesting at Florida index beaches since 1989

Threats

The principal cause of past declines and extirpations of green sea turtle assemblages has been the overexploitation of the species for food and other products. Although intentional take of green sea turtles and their eggs is not extensive within the southeastern United States, green sea turtles that nest and forage in the region may spend large portions of their life history outside the region and outside U.S. jurisdiction, where exploitation is still a threat. Green sea turtles also face many of the same threats as other sea turtle species, including destruction of nesting habitat from storm events, oceanic events such as cold-stunning, pollution (e.g., plastics, petroleum products, petrochemicals, etc.), ecosystem alterations (e.g., nesting beach development, beach nourishment and shoreline stabilization, vegetation changes, etc.), poaching, global climate change, fisheries interactions, natural predation, and disease. A discussion on general sea turtle threats can be found in Section 3.2.4.

In addition to general threats, green sea turtles are susceptible to natural mortality from Fibropapillomatosis (FP) disease. FP results in the growth of tumors on soft external tissues (flippers, neck, tail, etc.), the carapace, the eyes, the mouth, and internal organs (gastrointestinal tract, heart, lungs, etc.) of turtles (Aguirre et al. 2002; Herbst 1994; Jacobson et al. 1989). These tumors range in size from 0.1 cm to greater than 30 cm in diameter and may affect swimming, vision, feeding, and organ function (Aguirre et al. 2002; Herbst 1994; Jacobson et al. 1989). Presently, scientists are unsure of the exact mechanism causing this disease, though it is believed to be related to both an infectious agent, such as a virus (Herbst et al. 1995), and environmental conditions (e.g., habitat degradation, pollution, low wave energy, and shallow water (Foley et al. 2005). Presently, FP is cosmopolitan, but has been found to affect large numbers of animals in specific areas, including Hawaii and Florida (Herbst 1994; Jacobson 1990; Jacobson et al. 1991).

Cold-stunning is another natural threat to green sea turtles. Although it is not considered a major source of mortality in most cases, as temperatures fall below 8°-10°C, turtles may lose their ability to swim and dive, often floating to the surface. The rate of cooling that precipitates cold-stunning appears to be the primary threat, rather than the water temperature itself (Milton and Lutz 2003). Sea turtles that overwinter in inshore waters are most susceptible to cold-stunning because temperature changes are most rapid in shallow water (Witherington and Ehrhart 1989). During January 2010, an unusually large cold-stunning event in the southeastern United States resulted in around 4,600 sea turtles, mostly greens, found cold-stunned, with hundreds found dead or dying. A large cold-stunning event occurred in the western Gulf of Mexico in February 2011, resulting in approximately 1,650 green sea turtles being found cold-stunned in Texas. Of these, approximately 620 were found dead or died after stranding, and approximately 1,030 were rehabilitated and released. Additionally, during this same time frame, approximately 340 green sea turtles were found cold-stunned in Mexico, though approximately 300 of those were subsequently rehabilitated and released.

3.2.3 Kemp's Ridley Sea Turtle

The Kemp's ridley sea turtle was listed as endangered on December 2, 1970, under the Endangered Species Conservation Act of 1969, a precursor to the ESA. Internationally, the Kemp's ridley is considered the most endangered sea turtle (Groombridge 1982; TEWG 2000b; Zwinenberg 1977).

Species Description

The Kemp's ridley sea turtle is the smallest of all sea turtles. Hatchlings generally range from 1.65-1.89 in (42-48 mm) SCL, 1.26-1.73 in (32-44 mm) in width, and 0.3-0.4 lb (15-20 g) in weight. Adults generally weigh less than 100 lb (45 kg) and have a carapace length of around 2.1 ft (65 cm). Adult Kemp's ridley shells are almost as wide as they are long. Coloration changes significantly during development from the grey-black dorsum and plastron of hatchlings, a grey-black dorsum with a yellowish-white plastron as post-pelagic juveniles, and then to the lighter grey-olive carapace and cream-white or yellowish plastron of adults. There are 2 pairs of prefrontal scales on the head, 5 vertebral scutes, usually 5 pairs of costal scutes, and generally 12 pairs of marginal scutes on the carapace. In each bridge adjoining the plastron to the carapace, there are 4 scutes, each of which is perforated by a pore.

Kemp's ridley habitat largely consists of sandy and muddy areas in shallow, nearshore waters less than 120 ft (37 m) deep, although they can also be found in deeper offshore waters. These areas support the primary prey species of the Kemp's ridley sea turtle, which consist of swimming crabs, but may also include fish, jellyfish, and an array of mollusks.

The primary range of Kemp's ridley sea turtles is within the Gulf of Mexico basin, though they also occur in coastal and offshore waters of the U.S. Atlantic Ocean. Juvenile Kemp's ridley sea turtles, possibly carried by oceanic currents, have been recorded as far north as Nova Scotia. Historic nesting records range from Mustang Island, Texas, in the north, to Veracruz, Mexico, in the south. Kemp's ridley sea turtles have recently been nesting along the Atlantic Coast of the United States, with nests recorded from beaches in Florida, Georgia, and the Carolinas. In 2012, the first Kemp's ridley sea turtle nest was recorded in Virginia. The Kemp's ridley nesting population is exponentially increasing, which may indicate a similar increase in the population as a whole (NMFS et al. 2011a; NMFS et al. 2011b).

Life History Information
Kemp's ridley sea turtles share a general life history pattern similar to other sea turtles. Females lay their eggs on coastal beaches where the eggs incubate in sandy nests. After 45-58 days of embryonic development, the hatchlings emerge and swim offshore into deeper, ocean water where they feed and grow until returning at a larger size. The return to nearshore coastal habitats typically occurs around 2 years of age (Ogren 1989), although the time spent in the oceanic zone may vary from 1-4 years or perhaps more (TEWG 2000). Juvenile Kemp's ridley sea turtles use these nearshore coastal habitats from April through November, but move towards more suitable overwintering habitat in deeper offshore waters (or more southern waters along the Atlantic coast) as water temperature drops.

The average rates of growth may vary by location, but generally fall within 2.2-2.9 ± 2.4 in per year (5.5-7.5 ± 6.2 cm/year) (Schmid and Barichivich 2006; Schmid and Woodhead 2000). Age to sexual maturity ranges greatly from 5-16 years, though NMFS et al. (2011a) determined the best estimate of age to maturity for Kemp's ridley sea turtles was 12 years. It is unlikely that most adults grow very much after maturity. While some sea turtles nest annually, the weighted mean remigration rate for Kemp's ridley sea turtles is approximately 2 years. Nesting generally occurs from April to July and females lay approximately 2.5 nests per season with each nest containing approximately 100 eggs (Márquez M 1994).

Population Dynamics
Of the 7 species of sea turtles in the world, the Kemp's ridley has declined to the lowest population level. Most of the population of adult females nest on the beaches of Rancho Nuevo, Mexico (Pritchard 1969). When nesting aggregations at Rancho Nuevo were discovered in 1947, adult female populations were estimated to be in excess of 40,000 individuals (Hildebrand 1963). By the mid-1980s, however, nesting numbers from Rancho Nuevo and adjacent Mexican beaches were below 1,000 (with a low of 702 nests in 1985). Yet, nesting steadily increased through the 1990s, and then accelerated during the first decade of the 21st century (Figure 5), indicating the species is recovering. It is worth noting that when the Bi-National Kemp's Ridley Sea Turtle Population Restoration Project was initiated in 1978, only Rancho Nuevo nests were recorded. In 1988, nesting data from southern beaches at Playa Dos and Barra del Tordo were added, in 1989, data from the northern beaches of Barra Ostionales and Tepehuajes were added, and, most recently in 1996, data from La Pesca and Altamira beaches were recorded. Currently, nesting at Rancho Nuevo accounts for just over 81% of all recorded Kemp's ridley nests in Mexico. Following a significant, unexplained 1-year decline in 2010, Kemp's ridley nests in Mexico reached a record high of 21,797 in 2012 (Gladys Porter Zoo nesting database 2013). A small nesting population is also emerging in the United States, primarily in Texas, rising from 6 nests in 1996 to 42 in 2004, to a record high of 209 nests in 2012.[14]

[14] National Park Service data, http://www.nps.gov/pais/naturescience/strp.htm, http://www.nps.gov/pais/naturescience/current-season.htm

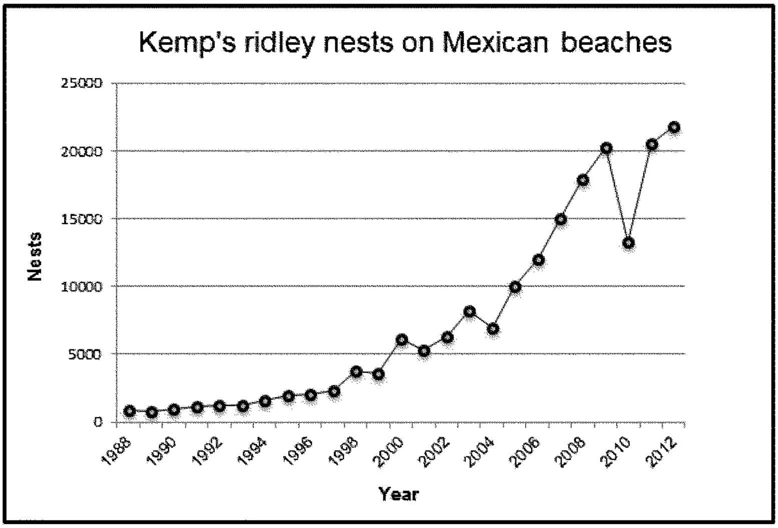

Figure 5. Kemp's ridley nest totals from Mexican beaches (Gladys Porter Zoo nesting database 2013)

Heppell et al. (2005) predicted in a population model that the population is expected to increase at least 12-16% per year and that the population could attain at least 10,000 females nesting on Mexico beaches by 2015. NMFS et al. (2011a) produced an updated model that predicted the population to increase 19% per year and attain at least 10,000 females nesting on Mexico beaches by 2011. Approximately 25,000 nests would be needed for an estimate of 10,000 nesters on the beach, based on an average 2.5 nests/nesting female. While counts did not reach 25,000 nests by 2012, it is clear that the population is steadily increasing. The recent increases in Kemp's ridley sea turtle nesting seen in the last 2 decades is likely due to a combination of management measures including elimination of direct harvest, nest protection, the use of turtle excluder devices (TED), reduced trawling effort in Mexico and the United States, and possibly other changes in vital rates (TEWG 1998; TEWG 2000b). While these results are encouraging, the species limited range as well as low global abundance makes it particularly vulnerable to new sources of mortality as well as demographic and environmental randomness, all of which are often difficult to predict with any certainty.

Threats

Kemp's ridley sea turtles face many of the same threats as other sea turtle species, including destruction of nesting habitat from storm events, oceanic events such as cold-stunning, pollution (plastics, petroleum products, petrochemicals, etc.), ecosystem alterations (nesting beach development, beach nourishment and shoreline stabilization, vegetation changes, etc.), poaching, global climate change, fisheries interactions, natural predation, and disease. A discussion on general sea turtle threats can be found in Section 3.2.4; the remainder of this section will expand on a few of the aforementioned threats and how they may specifically impact Kemp's ridley sea turtles.

As Kemp's ridley sea turtles continue to recover and nesting arribadas[15] are increasingly established, bacterial and fungal pathogens in nests are also likely to increase. Bacterial and fungal pathogen impacts have been well documented in the large arribadas of the olive ridley at Nancite in Costa Rica (Mo 1988). In some years, and on some sections of the beach, the hatching success can be as low as 5% (Mo 1988). As the Kemp's ridley nest density at Rancho Nuevo and adjacent beaches continues to increase, appropriate monitoring of emergence success will be necessary to determine if there are any density dependent effects on emergence success.

Over the past 3 years, NMFS has documented (via the Sea Turtle Stranding and Salvage Network data[16], elevated sea turtle strandings in the Northern Gulf of Mexico, particularly throughout the Mississippi Sound area. In the first 3 weeks of June 2010, over 120 sea turtle strandings were reported from Mississippi and Alabama waters, none of which exhibited any signs of external oiling to indicate effects associated with the Deepwater Horizon (DWH) oil spill event. A total of 644 sea turtle strandings were reported in 2010 from Louisiana, Mississippi, and Alabama waters, 561 (87%) of which were Kemp's ridley sea turtles. During March through May of 2011, 267 sea turtle strandings were reported from Mississippi and Alabama waters alone. A total of 525 sea turtle strandings were reported in 2011 from Louisiana, Mississippi, and Alabama waters, with the majority (455) occurring from March through July, 390 (86%) of which were Kemp's ridley sea turtles. During 2012, a total of 428 sea turtles were reported from Louisiana, Mississippi, and Alabama waters, though the data is incomplete. Of these reported strandings, 301 (70%) were Kemp's ridley sea turtles. These stranding numbers are significantly greater than reported in past years; Louisiana, Mississippi, and Alabama waters reported 42 and 73 sea turtle strandings for 2008 and 2009, respectively; however, it should be noted that stranding coverage has increased considerably due to the Deepwater Horizon (DWH) oil spill event. Nonetheless, considering that strandings typically represent only a small fraction of actual mortality, these stranding events potentially represent a serious impact to the recovery and survival of the local sea turtle populations. While a definitive cause for these strandings has not been identified, necropsy results indicate a significant number of stranded turtles from these events likely perished due to forced submergence, which is commonly associated with fishery interactions (B. Stacy, NMFS, personal communication to M. Barnette, March NMFS, 2012). Yet, available information indicates fishery effort was extremely limited during the stranding events. The fact that in both 2010 and 2011 approximately 85% of all Louisiana, Mississippi, and Alabama stranded sea turtles were Kemp's ridleys is notable; however, this statistic could simply be a function of the species' preference for shallow, inshore waters coupled with increased population abundance as reflected in recent Kemp's ridley nesting increases.

In response to these strandings, and due to speculation that fishery interactions may be the cause, fishery observer effort was shifted to evaluate the inshore skimmer trawl fishery during the summer of 2012. During May-July, observers reported 24 sea turtle interactions in the skimmer trawl fishery, all but one of which were identified as Kemp's ridleys (one sea turtle was an unidentified hardshell turtle). Encountered sea turtles were all very small, juvenile specimens ranging from 7.6-19.0 in (19.4-48.3 cm) curved carapace length (CCL), and all sea turtles were

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[15] Arribada is the Spanish word for "arrival" and is the term used for massive synchronized nesting within the genus *Lepidochelys*.

[16] http://www.sefsc.noaa.gov/species/turtles/strandings.htm

released alive. The small average size of encountered Kemp's ridleys introduces a potential conservation issue, as over 50% of these reported sea turtles could potentially pass through the maximum 4-in bar spacing of TEDs currently required in the shrimp fishery. Due to this issue, a proposed 2012 rule to require TEDs in the skimmer trawl fishery (77 FR 27411) was not implemented. Based on anecdotal information, these interactions were a relatively new issue for the inshore skimmer trawl fishery. Given the nesting trends and habitat utilization of Kemp's ridley sea turtles, it is likely that fishery interactions in the Northern Gulf of Mexico may continue to be an issue of concern for the species, and one that may potentially slow the rate of recovery for Kemp's ridley sea turtles.

3.2.4 General Threats Faced by All Sea Turtle Species

Sea turtles face numerous natural and anthropogenic threats that shape their status and affect their ability to recover. As many of the threats are either the same or similar in nature for all listed sea turtle species, those identified in this section below are discussed in a general sense for all listed sea turtles. Threat information specific to a particular species are discussed above in the corresponding status sections where appropriate.

Fisheries

Incidental bycatch in commercial fisheries is identified as a major contributor to past declines, and threat to future recovery, for all of the sea turtle species (NMFS and USFWS 1991; NMFS and USFWS 1992; NMFS and USFWS 1993; NMFS and USFWS 2008a; NMFS et al. 2011b). Domestic fisheries often capture, injure, and kill sea turtles at various life stages. Sea turtles in the pelagic environment are exposed to U.S. Atlantic pelagic longline fisheries. Sea turtles in the benthic environment in waters off the coastal United States are exposed to a suite of other fisheries in federal and state waters. These fishing methods include trawls, gillnets, purse seines, hook-and-line gear (including bottom longlines and vertical lines [e.g., bandit gear, handlines, and rod-reel]), pound nets, and trap fisheries. Refer to the Environmental Baseline section of this opinion for more specific information regarding federal and state managed fisheries affecting sea turtles within the action area). The southeastern U.S. shrimp fisheries have historically been the largest fishery threat to benthic sea turtles in the southeastern United States, and continue to interact with and kill large numbers of sea turtles each year.

In addition to domestic fisheries, sea turtles are subject to direct as well as incidental capture in numerous foreign fisheries, further impeding the ability of sea turtles to survive and recover on a global scale. For example, pelagic stage sea turtles, especially loggerheads and leatherbacks, circumnavigating the Atlantic are susceptible to international longline fisheries including the Azorean, Spanish, and various other fleets (Aguilar et al. 1995; Bolten et al. 1994; Crouse 1999). Bottom longlines and gillnet fishing is known to occur in many foreign waters, including (but not limited to) the northwest Atlantic, western Mediterranean, South America, West Africa, Central America, and the Caribbean. Shrimp trawl fisheries are also occurring off the shores of numerous foreign countries and pose a significant threat to sea turtles similar to the impacts seen in U.S. waters. Many unreported takes or incomplete records by foreign fleets make it difficult to characterize the total impact that international fishing pressure is having on listed sea turtles. Nevertheless, international fisheries represent a continuing threat to sea turtle survival and recovery throughout their respective ranges.

Non-Fishery In-Water Activities
There are also many non-fishery impacts affecting the status of sea turtle species, both in the ocean and on land. In nearshore waters of the United States, the construction and maintenance of federal navigation channels has been identified as a source of sea turtle mortality. Hopper dredges, which are frequently used in ocean bar channels and sometimes in harbor channels and offshore borrow areas, move relatively rapidly and can entrain and kill sea turtles (NMFS 1997a). Sea turtles entering coastal or inshore areas have also been affected by entrainment in the cooling-water systems of electrical generating plants. Other nearshore threats include harassment and/or injury resulting from private and commercial vessel operations, military detonations and training exercises, in-water construction activities, and scientific research activities.

Coastal Development and Erosion Control
Coastal development can deter or interfere with nesting, affect nesting success, and degrade nesting habitats for sea turtles. Structural impacts to nesting habitat include the construction of buildings and pilings, beach armoring and re-nourishment, and sand extraction (Bouchard et al. 1998; Lutcavage et al. 1997). These factors may decrease the amount of nesting area available to females and change the natural behaviors of both adults and hatchlings, directly or indirectly, through loss of beach habitat or changing thermal profiles and increasing erosion, respectively. (Ackerman 1997; Witherington et al. 2003; Witherington et al. 2007). In addition, coastal development is usually accompanied by artificial lighting which can alter the behavior of nesting adults (Witherington 1992) and is often fatal to emerging hatchlings that are drawn away from the water (Witherington and Bjorndal 1991). In-water erosion control structures such as breakwaters, groins, and jetties can impact nesting females and hatchling as they approach and leave the surf zone or head out to sea by creating physical blockage, concentrating predators, creating longshore currents, and disrupting of wave patterns.

Environmental Contamination
Multiple municipal, industrial, and household sources, as well as atmospheric transport, introduce various pollutants such as pesticides, hydrocarbons, organochlorides (e.g., DDT, PCBs, and PFCs), and others that may cause adverse health effects to sea turtles (Garrett 2004; Grant and Ross 2002; Hartwell 2004; Iwata et al. 1993). Acute exposure to hydrocarbons from petroleum products released into the environment via oil spills and other discharges may directly injure individuals through skin contact with oils (Geraci 1990), inhalation at the water's surface and ingesting compounds while feeding (Matkin and Saulitis 1997). Hydrocarbons also have the potential to impact prey populations, and therefore may affect listed species indirectly by reducing food availability in the action area. In 2010, there was a massive oil spill in the Gulf of Mexico at BP's DWH well. Official estimates are that millions of barrels of oil were released into the Gulf of Mexico. Additionally, approximately 1.8 million gallons of chemical dispersant was applied on the seawater surface and at the wellhead to attempt to break down the oil. At this time the assessment of total direct impact to sea turtles has not been determined. Additionally, the long-term impacts to sea turtles as a result of habitat impacts, prey loss, and subsurface oil particles and oil components broken down through physical, chemical, and biological processes are not known.

Marine debris is a continuing problem for sea turtles. Sea turtles living in the pelagic environment commonly eat or become entangled in marine debris (e.g., tar balls, plastic bags/pellets, balloons, and ghost fishing gear) as they feed along oceanographic fronts where debris and their natural food items converge. This is especially problematic for sea turtles that spend all or significant portions of their life cycle in the pelagic environment (i.e., leatherbacks, juvenile loggerheads, and juvenile green turtles).

Climate Change
There is a large and growing body of literature on past, present, and future impacts of global climate change, exacerbated and accelerated by human activities. Some of the likely effects commonly mentioned are sea level rise, increased frequency of severe weather events, and change in air and water temperatures. NOAA's climate information portal provides basic background information on these and other measured or anticipated effects (see http://www.climate.gov).

Climate change impacts on sea turtles currently cannot be predicted with any degree of certainty; however significant impacts to the hatchling sex ratios of sea turtles may result (NMFS and USFWS 2007c). In sea turtles, sex is determined by the ambient sand temperature (during the middle third of incubation) with female offspring produced at higher temperatures and males at lower temperatures within a thermal tolerance range of 25°-35°C (Ackerman 1997). Increases in global temperature could potentially skew future sex ratios toward higher numbers of females (NMFS and USFWS 2007c).

The effects from increased temperatures may be intensified on developed nesting beaches where shoreline armoring and construction have denuded vegetation. Erosion control structures could potentially result in the permanent loss of nesting beach habitat or deter nesting females (NRC 1990). These impacts will be exacerbated by sea level rise. If females nest on the seaward side of the erosion control structures, nests may be exposed to repeated tidal overwash (NMFS and USFWS 2007c). Sea level rise from global climate change is also a potential problem for areas with low-lying beaches where sand depth is a limiting factor, as the sea may inundate nesting sites and decrease available nesting habitat (Baker et al. 2006; Daniels et al. 1993; Fish et al. 2005). The loss of habitat as a result of climate change could be accelerated due to a combination of other environmental and oceanographic changes such as an increase in the frequency of storms and/or changes in prevailing currents, both of which could lead to increased beach loss via erosion (Antonelis et al. 2006; Baker et al. 2006).

Other changes in the marine ecosystem caused by global climate change (e.g., ocean acidification, salinity, oceanic currents, dissolved oxygen levels, nutrient distribution, etc.) could influence the distribution and abundance of lower trophic levels (e.g., phytoplankton, zooplankton, submerged aquatic vegetation, crustaceans, mollusks, forage fish, etc.) which could ultimately affect the primary foraging areas of sea turtles.

Other Threats
Predation by various land predators is a threat to developing nests and emerging hatchlings. The major natural predators of sea turtle nests are mammals, including raccoons, dogs, pigs, skunks, and badgers. Emergent hatchlings are preyed upon by these mammals as well as ghost crabs, laughing gulls, and the exotic South American fire ant.[17] In addition to natural predation, direct

[17] *Solenopsis invicta*

harvest of eggs and adults from beaches in foreign countries continues to be a problem for various sea turtle species throughout their ranges (NMFS and USFWS 2008a).

Diseases, toxic blooms from algae and other microorganisms, and cold stunning events are additional sources of mortality that can range from local and limited to wide-scale and impacting hundreds or thousands of animals.

4 ENVIRONMENTAL BASELINE

By regulation, environmental baselines for opinions include the past and present impacts of all state, federal, or private actions and other human activities in the action area, the anticipated impacts of all proposed federal projects in the action area that have already undergone formal or early Section 7 consultation, and the impact of state or private actions that are contemporaneous with the consultation in process (50 CFR 402.02).

This section contains a description of the effects of past and ongoing human activities leading to the current status of the species, their habitat, and the ecosystem, within the action area. The environmental baseline is a snapshot of the factors affecting the species and includes federal, state, tribal, local, and private actions already affecting the species, or that will occur contemporaneously with the consultation in progress. Unrelated future federal actions affecting the same species in the action area that have completed formal or informal consultation are also part of the environmental baseline, as are implemented and ongoing federal and other actions within the action area that may benefit listed species.

The proposed action occurs in the Gulf of Mexico, POB, and the man-made BIH navigation channel in Cameron County, Texas, to the PA offshore and all waters in between (Figure 1) (approximately 20.15 mi).

The following analysis examines actions that may affect these species' environment specifically within this defined action area. The environmental baseline for this Opinion includes the effects of several activities affecting the survival and recovery of ESA-listed sea turtle species, in the action area. The activities that shape the environmental baseline in the action area of this consultation are primarily oil and natural gas well operations, vessel operations, and dredging.

4.1 Status and Distribution of Sea Turtles in the Action Area

Sea turtle species occurring in the project area that may be adversely affected by the proposed action are loggerhead, green, and Kemp's ridley. Sea turtles found in the immediate project area may travel widely throughout the Atlantic, Gulf of Mexico, and Caribbean Sea, and individuals found in the action area can potentially be affected by activities anywhere within this wide range. These impacts outside of the action area are discussed and incorporated as part of the overall status of the species as detailed in Section 3 above. The following environmental baseline includes past and ongoing human activities in the action area (Figure 1) that relate to the status of the species.

All of these species are highly migratory. The same individuals found in the action area may migrate into offshore waters and thus be impacted by activities occurring there; therefore, the species' statuses in the action area are considered to be the same as their range-wide statuses and supported by the species accounts in Section 3.

4.2 Factors Affecting Sea Turtles in the Action Area

As stated in Section 2.2 ("Action Area"), the action area for the project includes all areas to be dredged from the turning basin of the navigation channel to the entrance channel extension (approximately 20.15 mi) to the PA offshore and all waters in between (shown in Figure 1). The following analysis examines actions that may affect these species' environment specifically within the defined action area.

4.2.1 Federal Actions

NMFS has completed a number of Section 7 consultations to address the effects of federally-permitted dredging and other federal actions on threatened and endangered sea turtle species, and when appropriate, has authorized the incidental taking of these species. Each of those consultations sought to minimize the adverse impacts of the action on sea turtles. The summary below of federal actions and the effects these actions have had or are having on sea turtles includes only those federal actions in, or with effects within, the action area that have already concluded or are currently undergoing formal Section 7 consultation.

4.2.2 Dredging

Hopper Dredging

The construction and maintenance of federal navigation channels and dredging or sand mining from borrow areas has been documented to result in capture, injury and death of sea turtles. Hopper dredges move relatively rapidly (compared to sea turtle swimming speeds) and can entrain and kill sea turtles as the drag arm of the moving dredge overtakes the slower moving sea turtle. The USACE has Biological Opinions from NMFS covering their implementation and authorization of hopper dredging in the Atlantic and Gulf of Mexico. For the entire Gulf of Mexico from the United States-Mexico border to Key West, the annual documented USACE incidental take per fiscal year by injury or mortality, is expected to consist of 20 Kemp's ridley turtles, 14 green turtles, 4 hawksbill turtles and 40 loggerhead turtles (NMFS 2003); because 50% of turtles taken by hopper dredges are expected to go unobserved, the total take of turtle species is predicted to be twice these levels.

Mechanical Dredging

NMFS has previously determined in dredging Biological Opinions that, while oceangoing hopper-type dredges may lethally entrain protected species, non-hopper type dredging methods (e.g., clamshell or bucket dredging, cutterhead dredging, pipeline dredging, sidecast dredging) are slower and unlikely to overtake or adversely affect them. NMFS has no new information that would alter that finding.

4.2.3 Beach Nourishment

The activity of beach nourishment has been documented to result in injury and death of juvenile sea turtles. A beach nourishment project was carried out at South Padre Island where approximately 400,000 cubic yards of beach-grade sand was placed along approximately 5,000 feet of shoreline covering approximately 79 acres (NMFS project number SER-2011-3592). The dredging and associated take was authorized under the existing GRBO.[18] The placement of materials (which did not take turtles) was addressed in the NLAA consultation.

4.2.4 Outer Continental Shelf Oil and Gas Exploration and Development

NMFS has issued several Biological Opinions to the Bureau of Ocean Energy Management for the effects of authorized oil and gas exploration and development on the outer continental shelf in the Gulf of Mexico. The most recent Opinion (NMFS 2007a) evaluated the effects of all activities associated with lease sales during the 5-year period 2007-2012, in the Western and Central Planning Areas. The Opinion predicted take of sea turtles and Gulf sturgeon caused by oil spills resulting from lease sale activities, but did not authorize such take because all releases of oil are prohibited by law. The Opinion also predicted take of sperm whales by harassment from seismic surveys, but this take will not be authorized until a take authorization under the Marine Mammal Protection Act (MMPA) is issued. The Opinion also predicted and authorized take of sea turtles from vessel strikes associated with lease sale activities.

The Gulf of Mexico is an area of high-density offshore oil extraction with chronic, low-level spills and occasional massive spills (such as the Deepwater Horizon oil spill, Ixtoc I oil well blowout and fire in the Bay of Campeche in 1979, and the explosion and destruction of a loaded supertanker, the Mega Borg, near Galveston in 1990). Oil spills can impact wildlife directly through 3 primary pathways: ingestion – when animals swallow oil particles directly or consume prey items that have been exposed to oil, absorption – when animals come into direct contact with oil, and inhalation – when animals breath volatile organics released from oil or from "dispersants" applied by response teams in an effort to increase the rate of degradation of the oil in seawater. Several aspects of sea turtle biology and behavior place them at particular risk, including the lack of avoidance behavior, indiscriminate feeding in convergence zones, and large pre-dive inhalations (Shigenaka et al. 2003). When large quantities of oil enter a body of water, chronic effects such as cancer, and direct mortality of wildlife becomes more likely (Lutcavage et al. 1997). Oil spills in the vicinity of nesting beaches just prior to or during the nesting season could place nesting females, incubating egg clutches, and hatchlings at significant risk (Fritts et al. 1982; Lutcavage et al. 1997; Witherington 1999). Continuous low-level exposure to oil in the form of tarballs, slicks, or elevated background concentrations also challenge animals facing other natural and anthropogenic stresses. Types of trauma can include skin irritation, altering of the immune system, reproductive or developmental damage, and liver disease (Keller et al. 2004; Keller et al. 2006). Chronic exposure may not be lethal by itself, but it may impair a turtle's overall fitness so that it is less able to withstand other stressors (Shigenaka et al. 2003).

The earlier life stages of living marine resources are usually at greater risk from an oil spill than adults. This is especially true for turtle hatchlings, since they spend a greater portion of their time at the sea surface than adults; thus, their risk of exposure to floating oil slicks is increased (Lutcavage et al. 1995). One of the reasons might be the simple effects of scale. For example, a given amount of oil may overwhelm a smaller immature organism relative to the larger adult. The metabolic machinery an animal uses to detoxify or cleanse itself of a contaminant may not be fully developed in younger life stages. Also, in early life stages, animals may contain

[18] NMFS Biological Opinion dated November 19, 2003: Dredging of Gulf of Mexico Channels and Sand Mining ("Borrow") Areas Using Hopper Dredges by COE Galveston, New Orleans, Mobile, and Jacksonville Districts (Consultation Number F/SER/2000/01287). NMFS Southeast Regional Office, Protected Resources Division.

proportionally higher concentrations of lipids, to which many contaminants such as petroleum hydrocarbons bind. Most reports of oiled hatchlings originate from convergence zones, ocean areas where currents meet to form collection points for material at or near the surface of the water. Sixty-five of 103 post-hatchling loggerheads in convergence zones off Florida's east coast were found with tar in the mouth, esophagus or stomach (Loehefener et al. 1989). Of post-hatchlings captured in Sargassum off the Florida coast, 34% had tar in the mouth or esophagus and more than 50% had tar caked in their jaws (Witherington 1994). These zones aggregate oil slicks, such as a Langmuir cell, where surface currents collide before pushing down and around, and represents a virtually closed system where a smaller weaker sea turtle can easily become trapped (Witherington 2002) (Carr 1987). Lutz and Lutcavage (1989) reported that hatchlings have been found apparently starved to death, their beaks and esophagi blocked with tarballs. Hatchlings sticky with oil residue may have a more difficult time crawling and swimming, rendering them more vulnerable to predation.

(Frazier 1980) suggested that olfactory impairment from chemical contamination could represent a substantial indirect effect in sea turtles, since a keen sense of smell apparently plays an important role in navigation and orientation. A related problem is the possibility that an oil spill impacting nesting beaches may affect the locational imprinting of hatchlings, and thus impair their ability to return to their natal beaches to breed and nest (Shigenaka et al. 2003). Whether hatchlings, juveniles, or adults, tarballs in a turtle's gut are likely to have a variety of effects – starvation from gut blockage, decreased absorption efficiency, absorption of toxins, effects of general intestinal blockage (such as local necrosis or ulceration), interference with fat metabolism, and buoyancy problems caused by the buildup of fermentation gases (floating prevents turtles from feeding and increases their vulnerability to predators and boats), among others. Also, trapped oil can kill the seagrass beds that turtles feed upon.

Unfortunately, little is known about the effects of dispersants on sea turtles, and such impacts are difficult to predict in the absence of direct testing. While inhaling petroleum vapors can irritate turtles' lungs, dispersants can interfere with lung function through their surfactant (detergent) effect. Dispersant components absorbed through the lungs or gut may affect multiple organ systems, interfering with digestion, respiration, excretion, and/or salt-gland function—similar to the empirically demonstrated effects of oil alone (Shigenaka et al. 2003). Oil cleanup activities can also be harmful. Earth-moving equipment can dissuade females from nesting and destroy nests, containment booms can entrap hatchlings, and lighting from nighttime activities can misdirect turtles (Witherington 2002).

There are studies on organic contaminants and trace metal accumulation in green and leatherback sea turtles (Aguirre et al. 1994; Caurant et al. 1999; Corsolini et al. 2000). McKenzie et al. (1999) measured concentrations of chlorobiphenyls and organochlorine pesticides in sea turtles tissues collected from the Mediterranean (Cyprus, Greece) and European Atlantic waters (Scotland) between 1994 and 1996. Omnivorous loggerhead turtles had the highest organochlorine contaminant concentrations in all the tissues sampled, including those from green and leatherback turtles (Storelli et al. 2008). It is thought that dietary preferences were likely to be the main differentiating factor among species. Decreasing lipid contaminant burdens with turtle size were observed in green turtles, most likely attributable to a change in diet with age. (Sakai et al. 1995) found the presence of metal residues occurring in loggerhead turtle organs and eggs. Storelli et al. (2008) analyzed tissues from twelve loggerhead sea turtles stranded along the Adriatic Sea (Italy) and found that characteristically, mercury accumulates in sea turtle livers while cadmium accumulates in their kidneys, as has been reported for other marine organisms such as dolphins, seals and porpoises (Law et al. 1991b). No information on detrimental threshold concentrations is available, and little is known about the consequences of exposure of organochlorine compounds to sea turtles. Research is needed on the short- and long-term health and fecundity effects of chlorobiphenyl, organochlorine, and heavy metal accumulation in sea turtles.

Nutrient loading from land-based sources, such as coastal communities and agricultural operations, are known to stimulate plankton blooms in closed or semi-closed estuarine systems. The effects on larger embayments are unknown. An example is the large area of the Louisiana continental shelf with seasonally-depleted oxygen levels (< 2 mg/Liter) is caused by eutrophication from both point and non-point sources. Most aquatic species cannot survive at such low oxygen levels and these areas are known as "dead zones." The oxygen depletion, referred to as hypoxia, begins in late spring, reaches a maximum in mid-summer, and disappears in the fall. Since 1993, the average extent of mid-summer, bottom-water hypoxia in the northern Gulf of Mexico has been approximately 16,000 km^2, approximately twice the average size measured between 1985 and 1992. The hypoxic zone attained a maximum measured extent in 2002, when it was about 22,000 km^2 which is larger than the state of Massachusetts (U.S. Geological Service 2005). The hypoxic zone has impacts on the animals found there, including sea turtles, and the ecosystem-level impacts continue to be investigated.

On April 20, 2010, there was a massive oil spill in the Gulf of Mexico at British Petroleum's DWH well, in a lease sale area covered by the 2007 Opinion. Official estimates are that several million barrels of oil were released into the Gulf, with some experts estimating even higher volumes. The full environmental impact of this disaster will not be known for years to come and may never be known. Assessing the current impacts of this oil spill on loggerhead, green, and Kemp's ridley sea turtles is difficult because so much remains unknown or unclear about the impacts to the environment and habitat. Given these uncertainties, it is not practical to speculate on spill effects to the species of sea turtles discussed in this environmental baseline at this time. However, we expect the primary route of effects to sea turtles from the release of oil and subsequent cleanup efforts, including the use of chemical dispersants, is to the benthos and the benthic community it supports. There are at least 2 routes of exposure: suffocation of infaunal organisms and toxicity of substrate. Both of these effects would impact the abundance of sea turtle prey. The long-term impact to sea turtles from exposure to oil and the subsequent response and cleanup efforts is currently unknown. The magnitude of the spill and the documented impacts, including take of sea turtles from the oil spill and oiling of inshore habitats, required reinitiation of consultation on the 2007 Opinion. Oil and gas rigs are located along the length of the Texas coast including within approximately eleven nautical mi of the POB in federal waters and likely closer in state waters.

4.2.5 ESA Permits

The ESA allows the issuance of permits to take ESA-listed species for the purposes of scientific research (Section 10(a)(1)(A)). Sea turtles are the focus of research activities authorized by a Section 10 permit under the ESA. Authorized activities range from photographing, weighing, and tagging sea turtles incidentally taken in fisheries, blood sampling, tissue sampling (biopsy), and performing laparoscopy on intentionally captured turtles. The number of authorized takes varies widely depending on the research and species involved but may involve the taking of hundreds of turtles annually. Most takes authorized under these permits are expected to be nonlethal. Before any research permit is issued, the proposal must be reviewed under the permit regulations (i.e., must show a benefit to the species). In addition, since issuance of the permit is a federal activity, issuance of the permit by NMFS must also be reviewed for compliance with Section 7(a)(2) of the ESA to ensure that issuance of the permit does not result in jeopardy to the species.

4.2.6 State or Private Actions

Vessel Traffic

Commercial traffic and recreational boating pursuits can have adverse effects on sea turtles via propeller and boat strike damage. The STSSN data includes many records of vessel interactions (propeller injury) with sea turtles off Gulf of Mexico coastal states such as Texas, where there are high levels of vessel traffic in some areas of the coastline. The stranding records include all causes of mortality, such as disease, hopper dredge entrainment impacts, hypothermic stunning (i.e., cold-stunning), interactions with fisheries, interactions with pollution, and vessel strikes. However, due to the condition of stranded turtles in many cases (i.e., decomposition), it was impossible to definitively determine actual cause of mortality for 70% of the specimens. In addition, it was not possible to determine in many cases whether the vessel strike occurred before or after the turtle's death. Additionally, it should be noted that many turtles killed by anthropogenic causes will not show up in the strandings database, as the mortality event may occur far offshore or the damage to the turtle is so significant the carcass sinks, preventing the turtle from washing ashore. This point is important to remember when considering apparent geographical trends in the data, which may be an artifact of other factors rather than increased mortality risk in one area versus another. Additionally, stranding information does not indicate where a potential mortality event (e.g., vessel strike) occurred, as a turtle could have been injured/killed at one location and then drifted with currents for a considerable distance before coming ashore. Given these variables, it is difficult to definitively evaluate potential risk to sea turtles stemming from specific vessel traffic. This difficulty is compounded by a general lack of information on vessel use trends, particularly in regard to offshore vessel traffic.

State Fisheries

Recreational fishing from private vessels and from shore occurs in the area. Observations of recreational fisheries have shown that loggerhead, leatherback, and green sea turtles are known to take baited hooks, and loggerheads frequently ingest the hooks. Hooked turtles have been reported by the public fishing from boats, piers, and beach, banks, and jetties and from commercial fishermen fishing for reef fish and for sharks with both single rigs and bottom longlines (NMFS 2001). Additionally, lost fishing gear such as line cut after snagging on rocks, or discarded hooks and line, can also pose an entanglement threat to sea turtles in the area. A detailed summary of the known impacts of hook-and-line incidental captures to loggerhead sea turtles can be found in the TEWG reports (TEWG 1998; TEWG 2000a). In August of 2007, NMFS issued a regulation to require any fishing vessels subject to the jurisdiction of the United States to take observers upon NMFS's request (72 FR 43176, August 3, 2007). The purpose of the regulation is to learn more about sea turtle interactions with fishing operations, to evaluate existing measures to reduce sea turtle takes, and to determine whether additional measures to address prohibited sea turtle takes may be necessary.

4.2.7 Other Potential Sources of Impacts in the Environmental Baseline

A number of activities that may affect sea turtles in the action area of this consultation include anthropogenic marine debris. The impacts from these activities are difficult to measure. Where possible, conservation actions are being implemented to monitor or study impacts from these sources.

Marine Pollution

Sources of pollutants along the Gulf of Mexico coastal regions include atmospheric loading of pollutants such as polychlorinated biphenyls (PCBs), stormwater runoff from coastal towns and cities into rivers and canals emptying into bays and the ocean, groundwater, and other discharges. Nutrient loading from land-based sources such as coastal community discharges is known to stimulate plankton blooms in closed or semi-closed estuarine systems. The effects on larger embayments are unknown. Although pathological effects of oil spills have been documented in laboratory studies of marine mammals and sea turtles (Vargo et al. 1986), the impacts of many other anthropogenic toxins have not been investigated.

Climate Change

The Intergovernmental Panel on Climate Change has stated that global climate change is unequivocal (IPCC 2007; IPCC 2013) and its impacts to coastal resources may be significant. There is a large and growing body of literature on past, present, and future impacts of global climate change induced by human activities, i.e., global warming mostly driven by the burning of fossil fuels. Some of the likely effects commonly mentioned are sea level rise, increased frequency of severe weather events, and change in air and water temperatures. NOAA's climate change web portal[19] provides information on the climate-related variability and changes that are exacerbated by human activities. The Environmental Protection Agency's climate change webpage[20] also provides basic background information on these and other measured or anticipated effects. Changes in the marine ecosystem caused by global climate change (e.g., ocean acidification, salinity, oceanic currents, dissolved oxygen levels, nutrient distribution, etc.) could influence the distribution and abundance of phytoplankton, zooplankton, submerged aquatic vegetation, crustaceans, mollusks, forage fish, etc., which could ultimately affect the primary foraging areas of sea turtles. Sea-level rise is one of the more certain consequences of climate change; it has already had significant impacts on coastal areas and these impacts are likely to increase. Since 1852, when the first topographic maps of the southeastern United States were prepared, high tidal flood elevations have increased approximately 12 in. During the 20th century, global sea level has increased 15 to 20 cm (NAST 2000).

4.2.8 Conservation and Recovery Actions Shaping the Environmental Baseline

NMFS has implemented a series of regulations aimed at reducing potential for incidental mortality of sea turtles from commercial fisheries in the action area. These include sea turtle release gear requirements for Atlantic HMS and Gulf of Mexico reef fish fisheries, and TED requirements for the southeastern shrimp trawl fisheries. These regulations have relieved some of the pressure on sea turtle populations.

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[19] http://www.climate.gov

[20] www.epa.gov/climatechange/index.html

Under Section 6 of the ESA, NMFS may enter into cooperative research and conservation agreements with states to assist in recovery actions of listed species. Prior to issuance of these agreements, the proposal must be reviewed for compliance with Section 7 of the ESA.

Outreach and Education, Sea Turtle Entanglements, and Rehabilitation
NMFS and cooperating states have established an extensive network of STSSN participants along the Atlantic and Gulf of Mexico coasts that collects data on dead sea turtles, and also rescues and rehabilitates any live stranded sea turtles.

Sea Turtle Handling and Resuscitation Techniques
NMFS published a final rule (66 FR 67495, December 31, 2001) detailing handling and resuscitation techniques for sea turtles that are incidentally caught during scientific research or fishing activities. Persons participating in fishing activities or scientific research are required to handle and resuscitate (as necessary) sea turtles as prescribed in the final rule. These measures help to prevent mortality of hard-shelled turtles caught in fishing or scientific research gear.

A final rule (70 FR 42508) published on July 25, 2005, allows any agent or employee of NMFS, the USFWS, the U.S. Coast Guard, or any other federal land or water management agency, or any agent or employee of a state agency responsible for fish and wildlife, when acting in the course of his or her official duties, to take endangered sea turtles encountered in the marine environment if such taking is necessary to aid a sick, injured, or entangled endangered sea turtle, or dispose of a dead endangered sea turtle, or salvage a dead endangered sea turtle that may be useful for scientific or educational purposes. NMFS already affords the same protection to sea turtles listed as threatened under the ESA [50 CFR 223.206(b)].

On August 3, 2007, NMFS published a final rule requiring selected fishing vessels to carry observers on board to collect data on sea turtle interactions with fishing operations, to evaluate existing measures to reduce sea turtle takes, and to determine whether additional measures to address prohibited sea turtle takes may be necessary (72 FR 43176). This rule also extended from 30 to 180 days, the maximum period NMFS observers may be placed on vessels in response to a determination by the Assistant Administrator that the unauthorized take of sea turtles may be likely to jeopardize their continued existence under existing regulations.

Other Actions
A revised recovery plan for the loggerhead sea turtle was completed in 2009 (NMFS and USFWS 2008a). An updated bi-national recovery plan for the Kemp's ridley sea turtle was completed in 2011 (NMFS et al. 2011a). Recovery teams comprised of sea turtle experts have been convened and are currently working towards revising other plans based upon the latest and best available information. Five-year status reviews have recently been completed for green, hawksbill, Kemp's ridley, leatherback, and loggerhead sea turtles. These reviews were conducted to comply with the ESA mandate for periodic evaluation of listed species to ensure that their threatened or endangered listing status remains accurate. Each review determined that no delisting or reclassification of a species status (i.e., threatened or endangered) was warranted at the time. However, further review of species data for the green, hawksbill, leatherback, and loggerhead sea turtles was recommended, to evaluate whether DPSs should be established for these species (NMFS and USFWS 2007a; NMFS and USFWS 2007b; NMFS and USFWS 2007c; NMFS and USFWS 2007d; NMFS and USFWS 2007e). The Services published a final

rule on September 22, 2011, listing the global population of loggerhead sea turtles as 9 separate DPSs.

5 EFFECTS OF THE ACTION

In this section of the Opinion, we assess the effects of the proposed action on loggerhead, green, and Kemp's ridley sea turtles within the action area. The analysis in this section forms the foundation for our jeopardy analysis in Section 7.0. A jeopardy determination is reached if we would reasonably expect the proposed action to cause reductions in numbers, reproduction, or distribution that would appreciably reduce listed species' likelihood of surviving and recovering in the wild.

The proposed BIH is likely to adversely affect loggerhead, green, and Kemp's ridley sea turtles by entrainment in hopper dredge suction dragheads. Impacts may include direct, short-term impacts from dredging and disposal operations for the BIH as well as relocation trawling effects.

5.1 Effects of the Action on Sea Turtles

5.1.1 Dredging

The potential for adverse effects of dredging operations on sea turtles has been previously assessed by NMFS (NMFS 1991; NMFS 1997b; NMFS 2007b) in the various versions of the regional biological opinions (RBO), the 2003 (revised in 2005 and 2007) Gulf of Mexico Regional Biological Opinion on Hopper Dredging (GRBO) (NMFS 2005; NMFS 2007c) and the South Atlantic Regional Biological Opinion on Hopper Dredging (SARBO) (NMFS 1997b). Additionally, the USACE has recently prepared a comprehensive analysis of data from Gulf and Atlantic hopper dredging projects to identify factors affecting sea turtle take rates (Dickerson et al. 2007). Furthermore, the USACE maintains the STDW with historical records of dredging projects and turtle interactions. These are the primary sources, discussed further below, for our analysis of dredging effects on sea turtles.

5.1.1.1 Mechanical (Clamshell/Bucket Dredges) and/or Cutterhead Dredging

The project may affect sea turtles by injury or death as a result of interactions with equipment or materials used during dredging; however, NMFS believes the chance of injury or death from interactions with clamshell and/or hydraulic dredging equipment is discountable as these species are highly mobile and are likely to avoid the areas during construction. NMFS has received very few reports of sea turtle takes associated with these dredging methods in the South Atlantic region: only one live sea turtle has been taken by a clamshell dredge over the past 20 years. The take occurred at Cape Canaveral, Florida, which routinely has very high local turtle abundance. Cold-stunned turtles have been taken by cutterhead dredging, but this also rarely happens[21] and

[21] In 2006, NMFS received a report of a potential cutterhead interaction with a loggerhead sea turtle offshore from Palm Beach, Florida (E-mail from Wendy Teas, NMFS, to Eric Hawk, NMFS, April 10, 2006); however, we suspect the turtle was already dead or impaired since it is likely that a healthy sea turtle would actively avoid the slow dredge. Since the 1990s, NMFS has also received few reports of juvenile green turtles taken by cutterhead dredges at Laguna Madre, an inshore shallow estuary in Texas, following the sudden onset of cold weather and rapid cooling of water temperatures within the estuary. We believe these small turtles were cold-stunned prior to being impacted by the dredge, which would explain their immobility (i.e., they were already dead or extremely lethargic and torpid due to the rapid drop in water temperatures).

has been generally limited to shallow, confined waters (e.g., Laguna Madre, Texas) or bays where turtles get trapped and stunned when the rapid passage of a cold front causes the temperature of the shallow water body to drop abruptly. Due to the infrequency of interactions with these gear types and the project location and channel depths located away from the shallow confined waters of Laguna Madre located to the north of the project area, NMFS believes that the possibility of a sea turtle being taken by a hydraulic cutterhead or a clamshell dredge is discountable.

5.1.1.2 Bed-Leveler Type Dredging

Bed-leveling is often associated with hopper dredging (and other types of dredging) operations, and may be utilized in this project. The applicant has stated that this is often not necessary in this area based on previous dredging experience; however, bed-leveling may be required during the proposed action. Bed-leveling "dredges" do not use suction; they redistribute sediments, rather than removing them. Plows, I-beams, or other seabed-leveling mechanical dredging devices are often used for cleanup operations, i.e., to lower high spots left in channel bottoms and dredged material deposition areas by hopper dredges or other type dredges. Leveling devices typically weigh about 30 to 50 tons and are fixed with cables to a derrick mounted on a barge pushed or pulled by a tugboat at about 1–2 knots. Some evidence indicates that bed leveling devices may be responsible for occasional sea turtle mortalities (NMFS 2003). Sea turtles may be crushed as the leveling device passes over a turtle which fails to move or is not pushed out of the way by the sediment wedge "wave" generated by and pushed ahead of the device. Sea turtles in Georgia waters may have been crushed and killed in 2003 by bed-leveling which commenced after the hopper dredge finished its work associated with the Brunswick Harbor Entrance Channel dredging. The local sea turtle stranding network reported documented stranded crushed sea turtles in the area where the bed-leveler dredge was working, within days after the dredge was in the area. Brunswick Harbor is also one of the sites where sea turtles captured by relocation trawlers sometimes show evidence of brumating (over-wintering) in the muddy channel bottom, which could explain why, if sea turtles were in fact crushed by bed-leveler type dredges (there is no proof, but it is the most likely explanation), they failed to react quickly enough to avoid the bed-leveler. Bed-leveler use at other dredging operations has not resulted in observed or documented sea turtle mortalities; therefore, the best available evidence points to occasional potential interactions to brumating sea turtles at Brunswick. There are only 2 documented locations of sea turtles bromating in North America, one in Baja California Mexico, and the other in Cape Canaveral Florida(Ogren et al.). There have been no documented observations of brumating sea turtles in the BIH or POB areas and none are expected to occur there.

The project proposes to bed level only in the Entrance Channel. Furthermore, their use would be restricted to the leveling of high spots in the channel located and leveled using sonar or similar methods. Proposed modifications (i.e., integrated deflector configurations) to traditional bed-levelers are expected to reduce their unknown (but thought to be insignificant) potential to impact sea turtles. Because the bed leveler does not use suction NMFS believes that it is extremely unlikely that sea turtles would be entrained. A bed leveler is suspended at a set elevation, so in situations with a deep trench, the bed leveler may pass over a resting turtle. In other situations, the sand wave produced by a bed leveler may disturb a resting turtle and cause it to rise into the water column above the leveler. Therefore, because sea turtles are not known to bromate in the project area and the bed leveler does not include suction which could result in entrainment, NMFS believes the risk that a sea turtle will be taken by potential bed-leveling activities during "high-spot cleanup" during the proposed action is discountable. If evidence or compelling STSSN observer reports indicate that a turtle was killed by a bed-leveler associated with the proposed action covered by this Opinion, reinitiation of consultation will be required (see RPMs, Term and Condition No. 7).

5.1.1.3 Hopper Dredging

Since 1995, the USACE has used the same conservation recommendations as those defined by the GRBO, including onboard monitoring and relocation trawling.[22] By continuing to use these measures, we can expect that the sea turtle mortalities should be similar to those experienced in the project area since that time.

Calculation of Sea Turtle Entrainment Rates during Hopper Dredging
To calculate the expected catch per unit effort (CPUE) in hopper dredging for this project, NMFS consulted the STDW to find the most applicable historic dredging information for the project area. Prior hopper dredging of approximately 3.61 mcy resulted in 31 lethal observed turtle takes from hopper dredging which is equal to the mortality of one sea turtle associated with every 116,540 cy of dredged material (3.61 mcy/31 turtles) (Table 6). If the proposed project anticipates 2,066,300 cy of dredged material, then this would result in the expected mortality of 17.73 sea turtles (2,066,300 cy/116,540 cy) during the course of the proposed dredging, assuming the same mortality rate as has been observed in the project area since 1995. Because it is impossible to take a fraction of an animal, we will round this number up to 18. This estimate is based on the use of only hopper dredges for the entire project and represents the sea turtle mortalities detected by onboard observers only. Since turtle monitoring began in the POB and BIH navigation channel in Fiscal Year 1995 (FY, defined as October 1 through September 30), these areas have been dredged 11 times using hopper dredges.

[22] Undertaken by the USACE where any of the following conditions are met: (a) 2 or more turtles are taken in a 24-hour period in the project; (b) 4 or more turtles are taken in the project; or, (c) when 75% of the incidental take is met.

Table 6. Dredged material removed and sea turtle takes during dredging in the POB and BIH navigation channel, 1995-2013 (STDW)

Fiscal Year	Quantity of Dredged Material (Cubic yards) Brazos	Loggerhead	Green	Kemp's Ridley	Total turtles
1995	755,301	0	5	1	6
1997	350,907	1		1	2
1999	186,571		2		2
2002	207,338		2		2
2003	121,549		2		2
2004	355,957		3		3
2006	332,721		2		2
2007	443,000	1	5		6
2008 (entrance)	130,933	0	0	0	0
2008 (jetty)	490,690	1	1		2
2009	237,772	2	1	1	4
Total	**3,612,739**	**5**	**23**	**3**	**31**
Catch Per Unit Effort (per cy)	**0.00000858**	**% of each species**			
1 Sea Turtle every (cy)	**116,540**	**Loggerhead**	**Green**	**Kemp's Ridley**	
% of each species		0.161	0.742	0.097	
Total Sea Turtles predicted taken (2,066,300 cy)	**18.00**	**2.90**	**13.35**	**1.74**	

Historically a total of 31 turtles have been taken during dredging operations over an 18 year period[23], including 5 loggerhead (16.1%), 23 green (74.2%), and 3 Kemp's ridley (9.7%) sea turtles (Table 6). If we assume that future sea turtle takes in this area will continue in a similar pattern as those seen during dredging projects within the POB, then we can expect the estimated 18 sea turtle observed takes to be a likely combination of 2.9 loggerhead, 13.35 green, and 1.74 Kemp's ridley sea turtles.

In summary, anticipated *detected* take estimates by species (i.e., those takes witnessed and documented by hopper dredge protected species observers) are 18 sea turtle observed takes to be a likely combination of 2.9 loggerhead, 13.35 green, and 1.74 Kemp's ridley sea turtles (Table 6, above). Because it is impossible to take a fraction of a sea turtle, we expect take of 3 loggerhead, 14 green, and 2 Kemp's ridley sea turtles. The species specific take numbers do not sum to the total take number from which they were derived due to rounding up all the species-specific take estimates.

[23] Between 1995-2013 dredging occurred only during the years listed in Table 6.

Detected vs. Actual Takes
NMFS-approved observers monitor dredged material inflow and overflow screening baskets on many hopper dredging projects, and observers will be required to monitor the proposed action. Dredged material screening, however, is only partially effective, and observed takes likely provide only partial estimates of total sea turtle mortality. NMFS believes that some turtles killed by hopper dredges go undetected because body parts are forced through the sampling screens by water pressure and are buried in the dredged material, or animals are crushed or killed, but their bodies or body parts are not entrapped by the suction and so the takes may go unnoticed. The only mortalities that are noticed and documented are those where body parts float, are large enough to be caught in the screens, and can be identified as sea turtle parts. Body parts that are forced through the 4-in (or greater) inflow screens by the suction-pump pressure and that do not float are very unlikely to be observed, since they will sink to the bottom of the hopper and not be detected by the overflow screening. Unobserved takes are not documented, thus, observed takes may under-represent actual lethal takes. It is not known how many turtles are killed but unobserved. Because of this, in the Gulf of Mexico Regional Biological Opinion (GRBO) (NMFS 2003), when making its jeopardy analysis, NMFS estimated that up to 1 out of 2 impacted turtles may go undetected (i.e., that observed take constituted only about 50% of total take. That estimate was based on region-wide (overall Gulf of Mexico) hopper dredging projects including navigation channel dredging and sand borrow area dredging for beach re-nourishment projects, year-round, including seasonal windows when no observers are required, times when 100% coverage is required, and times when only 50% observer coverage is required (i.e., at sand borrow sites).

The proposed dredging of the BIH will include observer coverage at certain times during hopper dredging operations for the duration of work.[24] NMFS estimates, as it did in the GRBO, that with observer coverage as described in the proposed action, protected species observers aboard hopper dredges for the proposed project will detect approximately just 1 of every 2 turtles that are struck and killed by the suction draghead and either crushed and pushed away or entrained during hopper dredging. This results in an additional estimated 18 sea turtles (2.9 loggerhead, 13.35 green, and 1.74 Kemp's ridley) taken, but not detected, for a total of 36 sea turtles taken (killed) (Table 7). We will use these total, by species, estimates (6 loggerheads, 27 greens, and 4 Kemp's ridleys; totaling 36 turtles) rounded up (because you can't take a part of a sea turtle) for our jeopardy analyses.[25]

Table 7. Estimated sea turtle takes (observed and unobserved) with assumed 50% detection rate by onboard protected species observers over the life of the project

	Loggerhead	Green	Kemp's Ridley	Total Sea Turtle Takes
Observed Sea Turtles	2.90	13.35	1.74	18
Unobserved	2.90	13.35	1.74	18
Total Sea Turtles for BIH	5.81	26.71	3.48	36
Rounded up	6.00	27.00	4.00	

[24] Observer coverage sufficient for 100% monitoring (i.e., 2 observers) of hopper dredging operations will be implemented between April 1 and November 30 and/or if the surface water temperatures are 11°C or greater.
[25] The species-specific take numbers do not sum to the total take number from which they were derived due to rounding up all the species-specific take estimates.

As with previous NMFS Biological Opinions on hopper dredging, our subsequent jeopardy analysis (Section 7 of this Opinion) is necessarily based on our knowledge (in this case, our best estimate) of the total number of turtles that will be lethally taken, which includes those that are killed, but not detected. Our best estimate of turtles lethally taken will be the sum of the observed and unobserved takes, i.e., those observed and documented by onboard protected species observers, plus those unobserved, undocumented lethal takes (because the turtles/turtle parts were either not entrained, or were entrained but were not seen/counted by onboard protected species observers). For example, the 2003 GRBO on hopper dredging estimated that 80 loggerhead sea turtles would be killed annually by hopper dredges, but that only 40 would be detected by onboard observers. Similarly, in this Opinion we have estimated that 36 sea turtles (6 loggerheads, 27 greens, 4 Kemp's ridleys) will be killed by dredges, but shipboard protected species observers will only detect half of each of these takes by species.

Our ITS is based on observed takes, not only because observed mortality gives us an estimate of unobserved mortality, but because observed, documented take numbers serve as triggers for some of the reasonable and prudent measures, and for potential reinitiation of consultation if actual observed takes exceed the anticipated/authorized number of observed takes. Furthermore, our ITS level of anticipated/authorized lethal takes is based on the implementation of relocation trawling, since it is an integral and important part of the proposed action. Without the implementation of relocation trawling, mortalities resulting from hopper dredge activities could be higher.

A very few turtles (over the years, a fraction of 1%) survive entrainment in hopper dredges, and those that do are usually smaller juveniles that are sucked through the pumps without being dismembered or badly injured. Often they will appear uninjured only to die days later of unknown internal injuries, while in rehabilitation. Experience has shown that the vast majority of hopper-dredge impacted turtles are immediately crushed or dismembered by the violent forces they are subjected to during entrainment. Therefore, we are conservatively predicting that all takes by hopper dredges will be lethal.

5.1.2 Dredge Vessel Collisions

NMFS believes that the possibility that the hopper dredge vessel(s) will collide with and injure or kill sea turtles during dredging and/or sand pumpout operations is discountable, given the vessel's slow speed, the ability of these species to move out of the way, and anticipated avoidance behavior by sea turtles at the sea surface or in the water column.

5.1.3 Relocation Trawling Activities and Estimated Take by Trawlers

Relocation trawling, when it can be done safely, is a means to reduce sea turtle mortalities because it is a proven method of reducing sea turtle density in front of an advancing hopper dredge and very likely results in reduced sea turtle/hopper dredge interactions. Nets are dragged on the bottom for 30 minutes or less before each retrieval and re-setting. Its effects are mostly nonlethal and non-injurious to trawl captured sea turtles. Over the course of 20+ years that relocation trawling has been conducted by the USACE, very few sea turtle mortalities (approximately 8, of which 3 died under unusual circumstances (apparently drowned) during intensive relocation trawling efforts associated with the Deepwater Horizon event) have occurred, while approximately 2,000 sea turtles have been safely relocated. NMFS has previously estimated in dredging opinions that the risk of a sea turtle being killed in a capture trawl net is less than 0.4% and has no new information to alter the basis of that conclusion. NMFS believes that it is unlikely that a sea turtle will be killed or injured during capture trawling (using modified shrimp trawl nets).

During previous capture trawling from 2003-2013 associated with hopper dredging of harbors, turning basins, and/or entrance channels to the POB and BIH, a total of 138 sea turtles were safely trawled-captured and released over 102 days of relocation trawling[26] (Table 8). Relocation trawling data was reviewed from 2003-2013, however relocation trawling in POB and BIH occurred only in the years listed in the table. This averages out to be approximately 1.35 turtle captures per relocation trawling day. Estimating the expected number of trawl captured turtles during this project is difficult and necessarily imprecise, given the uncertainties associated with the project, the various seasons, varying water temperatures and differences in availability and location of sea turtle potential foraging habitat from year to year (which may cause turtles to move into or out of the action area), and different bottom substrates (sand and mud to hard clay) and topography (smooth vs. rough and undulating) over which the trawling may be performed (which affects capture trawling effectiveness). On average, 1.35 turtles were captured per day of relocation trawling, but averaging, though useful, is just an estimate. Relocation trawling for the BIH will only occur during hopper dredging which will take 7 months (~210 days) to complete (USACE 2013).

Table 8. Relocation trawling efforts in POB and BIH, 2003-2013

Fiscal Year	DAY OF TRAWLING	Loggerhead	Green	Kemp's Ridley	Total turtles
2003	6	1	5		6
2004	18		13		13
2006	10		34		34
2007	24	1	64	1	66
2008 (entrance)	7	2		1	3
2008 (jetty)	21	11	1	2	14
2,009	16	1	1		2
Total	102	16.00	118.00	4.00	138
Species Percentage		11.6%	85.5%	2.9%	100%
Turtles per day	1.35				
BIH Relocation Trawling Days	210				
Turtles Relocated	283.5				

To determine the number of each species of turtle expected to be relocated, we multiplied the turtles per day from Table 8 (1.35) times the number of possible relocation trawling days (210) then apply the species percentages for previous relocation trawling efforts in the area from Table 8 (11.6% loggerhead, 85.5% green, and 2.9% Kemp's) to determine the quantity and species composition of the expected relocated sea turtles (Table 9). In total, we expect 283.5 sea turtles to be relocated. When we apply the species percentages (and round up because a fraction of a sea turtle cannot be taken, we end up with 33 loggerhead, 243 green, and 9 Kemp's Ridley sea

[26] STDW

turtles (for a total of 285 sea turtles) relocated during the expected 210 days of relocation trawling.

Table 9. Relocation trawling species composition

Trawling days: 210	Loggerhead	Green	Kemp's Ridley	
Species Percentage	11.6%	85.5%	2.9%	100%
Turtles relocated	32.87	242.41	8.22	284
Rounded up	33	243	9	285

The effects of capture and handling during relocation trawling can result in raised levels of stressor hormones, and can cause some discomfort during tagging procedures. Based on past observations obtained during similar research-trawling for turtles, these effects are expected to dissipate within a day (Stabenau and Vietti 2003). Since turtle recaptures are rare, and recaptures that do occur typically happen several days to weeks after initial capture, cumulative adverse effects of recapture are not expected. We believe that properly conducted and supervised relocation trawling (i.e., observing trawl speed and tow-time limits, and taking adequate precautions to release captured animals) and tagging is unlikely to result lethal takes of sea turtles.

Relocation trawling will be undertaken by the USACE where any of the following conditions are met: (a) 2 or more turtles are taken in a 24-hour period in the project; or, (b) Total dredge takes in the project approach 75% (rounded-down) of any of the incidental take limits (Table 10); i.e., 2 loggerheads, 10 greens, or 1 Kemp's ridley taken.. Handling of sea turtles captured during relocation trawling in association with hopper dredging projects in Gulf navigation channels and sand mining areas shall be conducted by NMFS-approved endangered species observers.

5.1.4 Dredged Material Disposal

NMFS believes the proposed dredged material (approximately 14,146,000 cy) disposal activities over the life of the project are not likely to adversely affect sea turtles. Sea turtles may be attracted to ODMDS sites, to forage on the bycatch that may be occasionally found in the dredged material being dumped. As such, turtles could be potentially impacted by the sediments being discharged overhead. However, NMFS has never received a report of an injury to a sea turtle resulting from burial in, or impacts from, hopper-dredge-released sediments, from either inshore or offshore disposal sites, anywhere the USACE conducts dredged material disposal operations. Sea turtles are highly mobile and are able to avoid a descending sediment plume discharged at the surface by a hopper dredge opening its hopper doors, or pumping its sediment load over the side. Even if temporarily enveloped in a sediment plume, NMFS believes the possibility of injury, or burial of normal, healthy sea turtles by dredged material (i.e., sand and silt) disposal, is discountable or its effects insignificant. NMFS believes that foraging habitat for sea turtles is not likely a limiting factor in the action area, and thus the loss of potential sand bottom foraging habitat adjacent to, or on the surface of, the disposal areas (compared to remaining foraging habitat) from burial by dredged material sediments will have insignificant effects on sea turtles. The risk of injury to sea turtles from collisions with dredge-related vessels (dredges/barges/scows) carrying dredge spoils to the ODMDS and/or returning to the dredging sites is also considered discountable.

6 CUMULATIVE EFFECTS

ESA Section 7 regulations require NMFS to consider cumulative effects in formulating their Biological Opinions (50 CFR 402.14). Cumulative effects include the effects of future state, tribal, local, or private actions that are reasonably certain to occur in the action area considered in this Opinion. Because many activities that affect marine habitat involve some degree of federal authorization (e.g., through USACE), NMFS expects that ESA Section 7 will apply to most major, future actions that could affect sea turtles. In addition, other activities identified in the environmental baseline are expected to continue to affect sea turtles, at similar levels into the foreseeable future.

7 JEOPARDY ANALYSIS

The analyses conducted in the previous sections of this Opinion serve to provide a basis to determine whether the proposed action would be likely to jeopardize the continued existence of affected ESA-listed sea turtles and sturgeon. In Section 5, we outlined how the proposed action can affect sea turtles and the extent of those effects in terms of estimates of the numbers of each species expected to be killed or captured. Now, we turn to an assessment of each species' response to this impact, in terms of overall population effects from the estimated take, and whether those effects of the proposed action, when considered in the context of the status of the species (Section 3), the environmental baseline (Section 4), and the cumulative effects (Section 6), will jeopardize the continued existence of the affected species.

It is the responsibility of the action agency to ensure that "any action authorized, funded, or carried out by such agency is not likely to jeopardize the continued existence of any endangered species or threatened species…" (ESA Section 7(a)(2)). Action agencies must consult with and seek assistance from the Services to meet this responsibility. The Services must ultimately determine in a Biological Opinion whether the action jeopardizes listed species. "To jeopardize the continued existence of" means to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and the recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species (50 CFR 402.02). Thus, in making this determination, NMFS must look at whether the action directly or indirectly reduces the reproduction, numbers, or distribution of a listed species. Then, if there is a reduction in one or more of these elements, we evaluate whether it would be expected to cause an appreciable reduction in the likelihood of both the survival and the recovery of the species. In the following section we evaluate the responses of loggerhead (NWA DPS), green, and Kemp's ridley sea turtles, to the effects of the action.

Effects of the Action on Sea Turtles' Likelihood of Survival and Recovery in the Wild
The lethal (observed and unobserved) take of 36 sea turtles (6 loggerheads, 28 greens, 4 Kemp's ridleys) by hopper dredges over the life of the project will result in a temporary reduction in total population numbers. Sea turtle mortality resulting from hopper dredges could result in the loss of reproductive value of an adult turtle. The death of an adult female eliminates an individual's contribution (thousands of hatchlings over a lifetime of nesting) to future generations, and the action will result in a reduction in sea turtle reproduction. While the death of any individual is regrettable, its value in terms of reproductive potential is considerably less than that of an equal number of adults.

7.1 Loggerhead NWA DPS

The maximum potential lethal take of up to 6 loggerhead sea turtles (3 observed and 3 unobserved) by hopper dredge is a reduction in numbers. These lethal takes would also result in a reduction in reproduction as a result of lost reproductive potential, as some of these individuals could be females who could have survived other threats and reproduced in the future, thus eliminating each female individual's contribution to future generations. For example, an adult female loggerhead sea turtle can lay 3 or 4 clutches of eggs every 2 to 4 years, with 100 to 130 eggs per clutch. The annual loss of adult female sea turtles, on average, could preclude the production of thousands of eggs and hatchlings of which a small percentage would be expected to survive to sexual maturity. The non-injurious capture of 33 turtles due to relocation trawling is not expected to result in a reduction in numbers or in reproduction for the species, as the capture and release are not expected to reduce the fitness and growth prior to maturity of any juveniles that are captured. Because all the potential interactions are expected to occur at random throughout the proposed action area and sea turtles generally have large ranges in which they disperse, the distribution of loggerhead sea turtles in the action area is expected to be unaffected.

Whether or not the reductions in loggerhead sea turtle numbers and reproduction attributed to the proposed action would appreciably reduce the likelihood of survival for loggerheads depends on what effect these reductions in numbers and reproduction would have on overall population sizes and trends, i.e., whether the estimated reductions, when viewed within the context of the environmental baseline and status of the species, are of such an extent that adverse effects on population dynamics are appreciable. In Section 3.1, we reviewed the status of the species in terms of nesting and female population trends and several recent assessments based on population modeling (e.g., (Conant et al. 2009; NMFS-SEFSC 2009a). Below we synthesize what that information means in general terms and also in the more specific context of the proposed action and the environmental baseline.

Loggerhead sea turtles are a slow growing, late-maturing species. Because of their longevity, loggerhead sea turtles require high survival rates throughout their life to maintain a population. In other words, late-maturing species cannot tolerate much anthropogenic mortality without going into decline. Conant et al. (2009) concluded loggerhead natural growth rates are small; natural survival needs to be high; and even low to moderate mortality can drive the population into decline. Because recruitment to the adult population is slow, population modeling studies suggest even small increased mortality rates in adults and subadults could substantially impact population numbers and viability (Chaloupka and Musick 1997; Crouse et al. 1987; Crowder et al. 1994; Heppell et al. 1995).

The best available information indicates that the NWA DPS of loggerheads is still large, but is possibly experiencing more mortality than it can withstand. All of the results of population models in both NMFS SEFSC (2009a) and Conant et al. (2009) indicated western North Atlantic loggerheads were likely to continue to decline in the future unless action was taken to reduce anthropogenic mortality. With the inclusion of newer nesting data beyond the 2007 data used in those analyses, the status of loggerhead nesting is beginning to show improvement. As previously described in the Status of the Species section, in 2008 nesting numbers were high, but not enough to change the negative trend line. Nesting dipped again in 2009, but rose substantially in 2010. The 2010 Florida index nesting number was the largest since 2000. With the addition of data through 2010, the nesting trend for the NWA DPS of loggerheads is only slightly negative and not statistically different from zero (no trend) (NMFS and USFWS 2010). Additionally, although the best-fit trend line is slightly negative, the range from the statistical analysis of the nesting trend includes both negative and positive growth (NMFS and USFWS 2010). The 2011 nesting was on par with 2010, providing further evidence that the nesting trend may have stabilized. It is important to note, however, that even if the trend has stabilized, overall numbers have a long way to go to meet the goals of the recovery plan.

NMFS SEFSC (2009a) estimated the minimum adult female population size for the western North Atlantic in the 2004-2008 time frame to likely be between 20,000 to 40,000 (median 30,050) individuals, with a low likelihood of being as many as 70,000 individuals. Estimates were based on the following equation: Adult females = (nests/(nests per female)) x remigration interval. The estimate of western North Atlantic adult loggerhead female was considered conservative for several reasons. The number of nests used for the western North Atlantic was based primarily on U.S. nesting beaches. Thus, the results are a slight underestimate of total nests because of the inability to collect complete nest counts for many non-U.S. nesting beaches. In estimating the current population size for adult nesting female loggerhead sea turtles, NMFS SEFSC (2009a) simplified the number of assumptions and reduced uncertainty by using the minimum total annual nest count over the relevant 5-year period (2004-2008) (i.e., 48,252 nests). This was a particularly conservative assumption considering how the number of nests and nesting females can vary widely from year to year (cf., 2008's nest count of 69,668 nests, which would have increased the adult female estimate proportionately, to between 30,000 and 60,000). Also, minimal assumptions were made about the distribution of remigration intervals and nests per female parameters, which are fairly robust and well known parameters.

Although not in NMFS SEFSC (2009a), NMFS SEFSC, in conducting its loggerhead assessment also produced a much less robust estimate for total benthic females in the western North Atlantic, with a likely range of approximately 60,000 to 700,000, up to less than 1 million. This estimate was discussed during the SEFSC's presentation on the loggerhead assessment to the Gulf Council's Reef Fish Committee at its June 16, 2009, meeting (NMFS-SEFSC 2009b). The estimate of overall benthic females is considered less robust because it is model-derived, assumes a stable age/stage distribution, and is highly dependent upon the life history input parameters. Relative to the more robust estimate of adult females, this estimate of total benthic female population is consistent with our knowledge of loggerhead life history and the relative abundance of adults and benthic juveniles: the benthic juvenile population is an order of magnitude larger than adults. Therefore, we believe female benthic loggerheads number in the hundreds of thousands, and therefore smaller pelagic stage individuals would occur in similar or even greater numbers.

As described in the Environmental Baseline section, we believe that the DWH oil release event had an adverse impact on loggerhead sea turtles, and resulted in mortalities to an unquantified number of individuals, along with unknown lingering impacts resulting from nest relocations, nonlethal exposure, and foraging resource impacts. It is also possible that the DWH oil release event reduced that survival rate of all age classes to varying degrees, and may continue to do so for some undetermined time into the future. However, there is no information at this time that it has, or should be expected to have, substantially altered the long-term survival rates in a manner that would significantly change the population dynamics compared to the conservative estimates used in this Opinion.

Also described in the Environmental Baseline section, we believe that climate change has the potential to adversely impact loggerhead sea turtles through rising sea levels, increased frequency of severe weather events, and changes in air and water temperatures. However, there is not enough information yet to determine exactly how climate change will affect the long term survivability of sea turtles.

Recent studies (Conant et al. 2009; Merrick et al. 2008; NMFS-SEFSC 2009a; NMFS and USFWS 2008a; TEWG 2009; Witherington et al. 2009) have all concluded that loggerhead nesting and adult female populations in the western North Atlantic are in decline and likely to continue to decline, while more recent analyses have indicated that the trend may have stabilized (NMFS and USFWS 2010). While the nesting and adult female populations are in decline, there is information on increases of abundance in some juvenile age classes (TEWG (2009), . The population is clearly not at a stable age distribution, given past population perturbations, thus making an assessment of overall population trends is difficult (adults decreasing, juveniles increasing, etc.). It is possible that observed declines may be transitory effects, which will be compensated for by a wave of recruitment, which may be what we are seeing with the latest data. However, the fact remains that NMFS-SEFSC (2009b), even though it was completed prior to nesting data from 2008-2010, is still the most comprehensive demographic model to date and predicted that a continued decline in the total population is likely, given our present knowledge of loggerhead life history parameters. Because more recent data is not enough to determine if the trend has been altered or reversed, we believe a conservative assessment of the NWA DPS is to consider the effects of the action as if the population is still in an overall minor declining trend.

Despite the recently observed decline of the NWA DPS, its total population remains large. Adult female population size is conservatively estimated, based on the minimum nesting year of 2007, in the range of 20,000 to 40,000. The adult male population would be similar. Benthic juveniles number into the hundreds of thousands. As detailed previously, although the DWH event is expected to have impacted individuals within the Gulf of Mexico, there is no information at this time to indicate population-level impacts occurred that were significant enough to alter the population status in such a manner that it would change the relative impact of the proposed action on the NWA DPS.

We believe that the effects on loggerhead turtles associated with the proposed action are not reasonably expected to cause an appreciable reduction in the likelihood of survival of the NWA DPS of loggerheads, even in light of the impacts of the DWH oil release event. We believe the currently large population is still under the threat of possible future decline until large mortality reductions in fisheries and other sources of mortality (including impacts outside U.S. jurisdiction) are achieved or the impacts of past protection and conservation efforts are realized within the population. However, over at least the next several decades, we expect the NWA population of adult females to remain large and to retain the potential for recovery. Although the effects of the proposed action will have an instantaneous effect on the overall size of the population, the action will not measurably reduce the size of the population, which we believe will remain sufficiently large for several decades to come even if the population were still in a minor decline, cause the population to lose genetic heterogeneity or broad demographic representation, impede successful reproduction, or affect loggerheads' ability to meet their life cycle requirements, including reproduction, sustenance, and shelter.

The Services' recovery plan for the NWA population of the loggerhead turtle (NMFS and USFWS 2008a) which is the same population of turtles as the NWA DPS, provides additional explanation of the goals and vision for recovery for this population. The objectives of the recovery plan most pertinent to the threats posed by the proposed action are numbers 1 and 2:

1. Ensure that the number of nests in each recovery unit is increasing and that this increase corresponds to an increase in the number of nesting females.
2. Ensure the in-water abundance of juveniles in both neritic and oceanic habitats is increasing and is increasing at a greater rate than strandings of similar age classes.

Recovery objective 1, "Ensure that the number of nests in each recovery unit is increasing...," is the plan's overarching objective and has associated demographic criteria. Currently, none of the plan's criteria are being met, but the plan acknowledges that it will take 50-150 years to do so. Further reduction of multiple threats throughout the North Atlantic, Gulf of Mexico, and Greater Caribbean will be needed for strong, positive population growth, following implementation of more of the plan's actions. Although any continuing mortality in what might be an already declining population can affect the potential for population growth, we believe that given the large total population size, the lethal take of up to 6 individuals will not impede or prevent achieving this recovery objective over the anticipated 50- to 150-year time frame.

Recovery objective 2, "Ensure the in-water abundance of juveniles in both neritic and oceanic habitats is increasing and is increasing at a greater rate than strandings of similar age classes." Currently, there are not enough data to determine if this objective is being met. The NWA DPS nesting trend for loggerhead sea turtles remains slightly negative, although as mentioned above the trend has likely stabilized and in some areas improved. Overall, loggerhead populations may require many years before the population decline is reversed and numerical increases in population meet the goals of the recovery plan. As with recovery objective 1 above, we believe that given the large total population size, the lethal take of up to 6 individuals will not impede or prevent achieving this recovery objective over the anticipated 50- to 150-year time frame.

We believe that the proposed action is not reasonably expected to cause an appreciable reduction in the likelihood of recovery of the NWA DPS of loggerheads. Recovery is the process of removing threats so self-sustaining populations persist in the wild. The proposed action would not impede progress on achieving the identified relevant recovery objectives or achieving the overall recovery strategy.

7.2 Green Sea Turtles

The maximum potential lethal take of up to 27 green sea turtles (14 observed and 13 unobserved by hopper dredge) is a reduction in numbers. These lethal takes would also result in a potential reduction in future reproduction, assuming some individuals would be females and would have survived otherwise to reproduce. For example, an adult green sea turtle can lay 1-7 clutches (usually 2-3) of eggs every 2 to 4 years, with 110-115 eggs/nest of which a small percentage is expected to survive to sexual maturity. The non-injurious capture of 243 green turtles due to relocation trawling is not expected to result in a reduction in numbers or in reproduction for the species, as the capture and release are not expected to reduce the fitness and growth prior to maturity of any juveniles that are captured. Green sea turtles are highly migratory, and individuals from all Atlantic nesting populations may range throughout the Gulf of Mexico, Atlantic Ocean, and Caribbean Sea. While the potential lethal take and relocation of turtles captured in trawls would result in a displacement of individuals from important developmental habitat, the loss is not significant in terms of local, regional, or global distribution as a whole. The majority of reproductive effort for green sea turtles comes from Florida and the Florida population distribution would be expected to remain the same. Therefore, we believe the anticipated impacts will not affect the species' distribution.

Whether the reductions in numbers and reproduction of green sea turtles species would appreciably reduce the species' likelihood of survival depends on the probable effect the changes in numbers and reproduction would have on current population sizes and trends.

The 5-year status review for green sea turtles states that of the 7 green sea turtle nesting concentrations in the Atlantic Basin for which abundance trend information is available, all were determined to be either stable or increasing (NMFS and USFWS 2007a). That review also states that the annual nesting female population in the Atlantic basin ranges from 29,243-50,539 individuals. Additionally, the pattern of green sea turtle nesting shows biennial peaks in abundance, with a generally positive trend during the 10 years of regular monitoring since establishment of index beaches in Florida in 1989. An average of 5,039 green turtle nests were laid annually in Florida between 2001 and 2006 with a low of 581 in 2001 and a high of 9,644 in 2005 (NMFS and USFWS 2007a). Data from the index nesting beaches program in Florida substantiate the dramatic increase in nesting. In 2007, there were 9,455 green turtle nests found just on index nesting beaches, the highest since index beach monitoring began in 1989. The number fell back to 6,385 in 2008, further dropping under 3,000 in 2009, but that consecutive drop was a temporary deviation from the normal biennial nesting cycle for green turtles, as 2010 saw an increase back to 8,426 nests on the index nesting beaches (FWC Index Nesting Beach Survey Database). Modeling by Chaloupka et al. (2008) using data sets of 25 years or more resulted in an estimate of the Tortuguero, Costa Rica, population growing at 4.9% annually.

Also described in the Environmental Baseline section, we believe that climate change has the potential to adversely impact green sea turtles through rising sea levels, increased frequency of severe weather events, and changes in air and water temperatures. However, there is not enough information yet to determine exactly how climate change will affect the long term survivability of sea turtles.

For a population to remain stable, sea turtles must replace themselves through successful reproduction at least once over the course of their reproductive lives, and at least one offspring must survive to reproduce itself. If the hatchling survival rate to maturity is greater than the mortality rate of the population, the loss of breeding individuals would be exceeded through recruitment of new breeding individuals from successful reproduction of non-taken sea turtles. Since the abundance trend information for green sea turtles is clearly increasing, we believe the lethal interactions attributed to the proposed action will not have any measurable effect on that trend. As described in the Environmental Baseline section, although the DWH oil spill is expected to have resulted in adverse impacts to green turtles, there is no information to indicate, or basis to believe, that a significant population-level impact has occurred that would have changed the species' status to an extent that the expected interactions from the proposed action would result in a detectable change in the population status of green turtles in the Atlantic. Any impacts are not thought to alter the population status to a degree in which the number of mortalities from the proposed action could be seen as reducing the likelihood of survival of the species. Therefore, we conclude the proposed action is not likely to appreciably reduce the likelihood of survival of green sea turtles in the wild.

The Recovery plan for the population of Atlantic green sea turtles (NMFS and USFWS 1991) lists the following relevant recovery objectives over a period of 25 continuous years:

- The level of nesting in Florida has increased to an average of 5,000 nests per year for at least 6 years
    - Status: Green sea turtle nesting in Florida between 2001-2006 was documented as follows: 2001 – 581 nests, 2002 – 9,201 nests, 2003 – 2,622, 2004 – 3,577 nests, 2005 – 9,644 nests, 2006 – 4,970 nests. This averages 5,039 nests annually over those 6 years (2001-2006) (NMFS and USFWS 2007a). Subsequent nesting has shown even higher average numbers (i.e., 2007 – 9,455 nests, 2008 – 6,385 nests, 2009 – 3,000 nests, 2010 – 8,426 nests, 2011 – 10,701); thus, this recovery criterion continues to be met.
- A reduction in stage class mortality is reflected in higher counts of individuals on foraging grounds
    - Status: Several actions are being taken to address this objective; however, there are currently no estimates available specifically addressing changes in abundance of individuals on foraging grounds. Given the clear increases in nesting, however, it is likely that numbers on foraging grounds have increased by at least the same amount. This Opinion's effects analysis assumes that in-water abundance has increased at the same rate as Tortuguero nesting.

Lethal take of up to 27 green sea turtles are not likely to reduce population numbers over time due to current population sizes, nesting increases and expected recruitment. Thus, the proposed action is not likely to impede the recovery objectives above and will not result in an appreciable reduction in the likelihood of green sea turtles' recovery in the wild.

7.3 Kemp's Ridley Sea Turtles

The maximum potential lethal take of 4 Kemp's ridley sea turtles (2 observed and 2 unobserved by hopper dredge) is a reduction in numbers. These lethal takes would also result in a potential reduction in future reproduction, assuming some individuals would be females and would have survived otherwise to reproduce. For example, females lay approximately 2.5 nests per season with each nest containing approximately 100 eggs, though only a small percentage is expected to survive to sexual maturity. The non-injurious capture of up to 9 Kemp's ridleys due to relocation trawling is not expected to result in a reduction in numbers or a reduction in reproduction for the species, as the capture and release is not expected to reduce the fitness and growth prior to maturity of any juveniles that are captured. Kemp's ridleys are wide ranging throughout the Gulf of Mexico and along the Atlantic coast, and while the potential lethal take and relocation of turtles captured in trawls would result in a displacement of individuals from important developmental habitat, the loss is not significant in terms of the species' rangewide distribution as a whole.

The proposed action's reductions in numbers and reproduction would reduce the species' population compared to the number that would have been present in the absence of the proposed action, assuming all other variables remained the same. Whether the reductions in numbers and reproduction of Kemp's ridley sea turtles species would appreciably reduce this species' likelihood of survival depends on the probable effect the changes in numbers and reproduction would have on current population sizes and trends.

Heppell et al. (2005) predicted in a population model that the Kemp's ridley sea turtle population is expected to increase at least 12-16% per year and that the population could attain at least 10,000 females nesting on Mexico beaches by 2015. NMFS et al. (2011a) contains an updated model which predicted that the population is expected to increase 19% per year and that the population could attain at least 10,000 females nesting on Mexico beaches by 2011. Approximately 25,000 nests would be needed for an estimate of 10,000 nesters on the beach, based on an average 2.5 nests/nesting female. In 2009, the population consisted of 21,144 nests, but an unexpected and as yet unexplained drop in nesting occurred in 2010 (13,302), deviating from the NMFS et al. (2011a) model prediction. A subsequent increase to 20,570 nests in 2011 occurred. Though we will not know if the population is continuing the recovery trajectory and timeline predicted by the model until future nesting data is available, there is nothing to indicate the trend of increases in this species' population will cease.

It is likely that the Kemp's ridley sea turtle was the sea turtle species most affected by the DWH oil spill on a population level. In addition, the sea turtle strandings documented in 2011 in Alabama, Louisiana, and Mississippi primarily involved Kemp's ridley sea turtles (see Environmental Baseline section). Also, as described in the Environmental Baseline section, we believe that climate change has the potential to adversely impact Kemp's ridley sea turtles through rising sea levels, increased frequency of severe weather events, and changes in air and water temperatures. However, there is not enough information yet to determine exactly how climate change will affect the long term survivability of sea turtles. Nevertheless, the one-time loss of 3 Kemp's ridley sea turtles from the proposed action is not likely to measurably affect overall population numbers due to current large population sizes, expected recruitment, and continuing strong nesting numbers (including, based on preliminary information, in 2011), even in light of the adverse impacts expected to have occurred from the DWH oil spill and the strandings documented in 2011. Thus, we believe the proposed action will not result in an appreciable reduction in the likelihood of Kemp's ridley sea turtles' survival in the wild.

The recovery plan for the Kemp's ridley sea turtle (NMFS et al. 2011a) lists the following relevant recovery objectives:

- A population of at least 10,000 nesting females in a season (as measured by clutch frequency per female per season) distributed at the primary nesting beaches (Rancho Nuevo, Tepehuajes, and Playa Dos) in Mexico is attained. Methodology and capacity to implement and ensure accurate nesting female counts have been developed.

The recovery plan states average nests per female is 2.5 and sets a recovery goal of 10,000 nesting females that would be represented by 25,000 nests in a season. As discussed above, nesting levels had been steadily increasing to a high of 21,144 nests in 2009, exhibited a substantial decline in 2010, but rebounded markedly in 2011 to 20,570 nests and again in 2012 with 21,797 nests. The potential nonlethal relocation of 9 Kemp's ridley turtles and the one-time lethal take of 3 Kemp's ridleys by the proposed action will not affect the overall level or trend in adult female nesting population numbers or number of nests per nesting season. Thus, the proposed action will not result in an appreciable reduction in the likelihood of Kemp's ridley sea turtle recovery in the wild.

8 CONCLUSION

We have analyzed the best available data, the current status of the species, environmental baseline, effects of the proposed action, and cumulative effects to determine whether the proposed action is likely to jeopardize the continued existence of the Northwest Atlantic DPS of loggerhead, green, and Kemp's ridley sea turtles.

Loggerhead (NWA DPS), Green, and Kemp's Ridley Sea Turtles
Because the proposed action is not reasonably expected to reduce appreciably the likelihood of survival and recovery of loggerhead (NWA DPS), green, or Kemp's ridley or sea turtles, it is our opinion that the BIH is not likely to jeopardize their continued existence.

9 INCIDENTAL TAKE STATEMENT (ITS)

Section 9 of the ESA and protective regulations issued pursuant to Section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without a special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or attempt to engage in any such conduct. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of Section 7(b)(4) and Section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the ESA provided that such taking is in compliance with the RPMs and terms and conditions of the ITS.

9.1 Anticipated Amount or Extent of Incidental Take
Section 9 of the ESA and federal regulation pursuant to Section 4(d) of the ESA prohibit take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by NMFS to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Incidental

take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of ESA Section 7(b)(4) and Section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

Based on historical distribution data, hopper dredge observer reports, observations of past strandings, and increasing turtle populations of loggerhead, green, and Kemp's ridley sea turtles in the action area, we estimate that these 3 species may occur in the action area and may be taken by the hopper dredging operations of this project, by crushing and/or entrainment in suction dragheads. NMFS anticipates incidental take will consist of up to 18 sea turtles[27] (3 loggerheads, 14 greens, and 2 Kemp's ridleys) killed during BIH, which will be detected and documented by onboard protected species observers (Table 10). NMFS also anticipates that capture trawling may result in up to 285 non-injurious captures and relocations of an estimated (up to) 33 loggerheads, 243 greens, and 9 Kemp's ridleys.

Table 10. Amount of authorized observed take during the BIH project and associated relocation trawling

During Dredging		Loggerhead	Green	Kemp's Ridley
Total Sea Turtles Observed Taken	18.00	2.90	13.35	1.74
Rounded up	19.00	3.00	14.00	2.00
	During Relocation Trawling			
Total Sea Turtles Relocated	285.00	46	211	28

9.2 Effect of the Take

NMFS has determined the anticipated level of incidental take specified in Section 9.1 is not likely to jeopardize the continued existence of loggerhead (NWA DPS), green, or Kemp's ridley sea turtles.

9.3 Reasonable and Prudent Measures

Section 7(b)(4) of the ESA requires NMFS to issue a statement specifying the impact of any incidental take on listed species, which results from an agency action otherwise found to comply with Section 7(a)(2) of the ESA. It also states the RPMs necessary to minimize the impacts of take and the terms and conditions to implement those measures, must be provided and must be followed to minimize those impacts. Only incidental taking by the federal agency that complies with the specified terms and conditions is authorized.

The RPMs and terms and conditions are specified as required, by 50 CFR 402.14(i), to document the incidental take of ESA-listed species by the proposed action, to minimize the impact of that take, and to specify the procedures to be used to handle any individuals taken. These measures and terms and conditions are non-discretionary and must be implemented by the USACE in order for the protection of Section 7(o)(2) to apply. The USACE has a continuing duty to regulate the activity covered by this incidental take statement. If the USACE fails to adhere to the terms and

[27] The species-specific take numbers do not sum to the total take number from which they were derived due to rounding up all the species-specific take estimates.

conditions through enforceable terms, and/or fails to retain oversight to ensure compliance with these terms and conditions, the protective coverage of Section 7(o)(2) may lapse.

Current regional Opinions for hopper dredging require observers to document takes, deflector dragheads, and conditions and guidelines for relocation trawling, which NMFS believes are necessary to minimize effects dredging activities on listed sea turtle species that occur in the action area. NMFS has determined that the following RPMs, patterned after long-standing hopper dredging requirements, are necessary and appropriate to minimize impacts of the incidental take of sea turtles during the proposed action. The RPMs that NMFS believes are necessary to minimize and monitor the impacts of the proposed hopper dredging have been discussed with the USACE in the past and are standard operating procedures, including use of sea turtle deflector dragheads, of intake and overflow screening, observer and reporting requirements, and relocation trawling. The following RPMS and associated terms and conditions are established to implement these measures, to document incidental takes, and to specify procedures for handling individuals taken. Only incidental takes that occur while these measures are in full implementation are authorized.

1. The USACE shall implement best management measures, including use of temperature- and date-based dredging windows, sea turtle deflector dragheads, disengagement of dredging pumps when they are not on the bottom, limiting dredge lights seasonally, and relocation trawling to reduce the risk of injury or mortality of listed species and lessen the number of sea turtles killed by the proposed action.

   Rationale: Temperature- and date-based dredging windows appear to be very effective in reducing sea turtle entrainments, by avoiding times and places either where turtle densities are high or their behaviors may make them less susceptible to entrainment. Draghead deflectors provide a last line of defense, by acting as physical barriers, reducing the likelihood that turtles that are close to the draghead are actually entrained. When the suction dragheads are not firmly placed on the bottom during dredging operations, sea turtles encountered by the dragheads can be crushed underneath them and/or impinged or sucked into the suction pipes by the powerful suction, almost always resulting in death. Seasonally limiting dredge lights will help reduce potential disorientation effects on female sea turtles approaching the nesting beaches and sea turtle hatchlings making their way seaward from their natal beaches. Relocation (i.e., capture) trawling reduces the risk of turtle entrainment even when turtle densities are high, possibly by either temporarily reducing the local density of turtles in the channel where the dredge is working or by modifying the turtles' behavior temporarily and making them less susceptible to entrainment. In addition, the use of relocation trawling provides the USACE with valuable real-time estimates of sea turtle abundance, takes, and distribution which have been helpful to USACE project planning efforts to reduce sea turtle impacts, for example by delaying or changing the location of hopper dredge deployment in response to sea turtle density information in the channel.

2. The USACE shall have measures in place to detect and report all interactions with any protected species (ESA or Marine Mammal Protection Act) resulting from the proposed action. These measures include endangered species observers aboard the hopper dredge and relocation trawlers, screening of dredge material to allow discovery of any entrained turtles, and handling procedures for incidentally taken animals.

Rationale: NMFS-approved observers monitor dredged material inflow and overflow screening baskets and relocation trawling efforts to monitor and report incidental take. Gathering basic biological information (e.g., size which will help determine the age class) will enable monitoring of the impact of the take on the species taken. PIT tagging, external flipper tagging, and tissue sampling of turtles captured pursuant to relocation trawling, including genetic analysis of tissue samples taken from dredge- and trawl-captured turtles, will provide important monitoring information about the animals taken during relocation trawling. Tagging will inform about the fate of the turtles relocated should they be recaptured or strand subsequent to being relocated. Tissue sampling will identify which sea turtle stocks are being impacted and their geographic origin.

9.4 Terms and Conditions

In order to be exempt from the prohibitions of Section 9 of the ESA, the USACE must comply with the following terms and conditions, which implement the reasonable and prudent measures described above and outline required reporting and monitoring requirements. These terms and conditions are non-discretionary.

1) Hopper Dredging (RPM 1): Hopper dredging activities shall be completed, whenever possible, between December 1 and March 31, when sea turtle abundance is lowest throughout Gulf coastal waters.
2) Non-hopper Type Dredging (RPM 1): Pipeline or hydraulic dredges, because they are not known to take turtles, must be used whenever possible between April 1 and November 30.
3) Operational Procedures (RPM 1): During periods in which hopper dredges are operating and NMFS-approved protected species observers are *not* required, (December 1 through March 31, if water temperatures are under 11°C), the USACE must:
   a) Advise inspectors, operators, and vessel captains about the prohibitions on taking, harming, or harassing sea turtles
   b) Instruct the captain of the hopper dredge to avoid any turtles encountered while traveling between the dredge site and offshore disposal area, and to immediately contact the USACE if sea turtles are seen in the vicinity.
   c) Notify NMFS immediately by e-mail (takereport.nmfsser@noaa.gov) if a sea turtle or other threatened or endangered species is taken by the dredge, and reference this biological opinion (F/SER/2013/11766).
4) Dredging Pumps (RPM 1): Standard operating procedure shall be that dredging pumps shall be disengaged by the operator when the dragheads are not firmly on the bottom, to prevent impingement or entrainment of sea turtles within the water column. This precaution is especially important during the cleanup phase of dredging operations when the draghead frequently comes off the bottom and can suck in turtles resting in the shallow depressions between the high spots the draghead is trimming off.
5) Dredge Lighting (RPM 1): From May 1 through October 31, sea turtle nesting and emergence season, all lighting aboard hopper dredges and hopper dredge pumpout barges operating within 3 nautical miles of sea turtle nesting beaches shall be limited to the minimal

lighting necessary to comply with U.S. Coast Guard and/or Occupational Safety and Health Administration requirements. All non-essential lighting on the dredge and pumpout barge shall be minimized through reduction, shielding, lowering, and appropriate placement of lights to minimize illumination of the water to reduce potential disorientation effects on female sea turtles approaching the nesting beaches and sea turtle hatchlings making their way seaward from their natal beaches.

6) Sea Turtle Deflecting Draghead (RPM 1): A state-of-the-art solid, plow-type rigid deflector dragheads must be used on all hopper dredges at all times. The use of alternative, experimental dragheads is not authorized without prior written approval from NMFS, in consultation with USACE ERDC. Slotted draghead deflectors or chain-type deflectors are currently not authorized.

7) Training – Personnel on Hopper Dredges (RPM 1): The USACE must ensure that all contracted personnel involved in operating hopper dredges (whether privately-funded or federally-funded projects) receive thorough training on measures of dredge operation that will minimize takes of sea turtles. It shall be the goal of the hopper dredging operation to establish operating procedures that are consistent with those that have been used successfully during hopper dredging in other regions of the coastal United States, and which have proven effective in reducing turtle/dredge interactions. Therefore, USACE Engineering Research and Development Center experts or other persons with expertise in this matter shall be involved both in dredge operation training, and installation, adjustment, and monitoring of the rigid deflector draghead assembly.

8) Observers (RPM 2): The USACE shall arrange for NMFS-approved protected species observers to be aboard the hopper dredges to monitor the hopper bin, screening, and dragheads for sea turtles and their remains. Observer coverage sufficient for 100 percent monitoring (i.e., two observers) of hopper dredging operations is required aboard the hopper dredges between April 1 and November 30, or whenever surface water temperatures are 11°C or greater.

9) Screening (RPM 2): When sea turtle observers are required on hopper dredges, 100 % inflow screening of dredged material is required and 100 percent overflow screening is recommended. If conditions prevent 100 percent inflow screening, inflow screening may be reduced gradually, as further detailed in the following, but 100 percent overflow screening is then required.

   a) Screen Size: The hopper's inflow screens should have 4-inch by 4-inch screening. If the USACE, in consultation with observers and the draghead operator, determines that the draghead is clogging and reducing production substantially, other than in sand borrow areas the screens may be modified sequentially. Mesh size may be increased to 8-inch by 8-inch; if that fails to solve the clogging problem, then 16-inch by 16-inch openings may be used. Clogging should be greatly reduced or eliminated with these options; however, further clogging may compel removal of the screening altogether, in which case effective 100% overflow monitoring and screening is mandatory. The USACE shall notify NMFS beforehand if inflow screening is going to be reduced or eliminated, what attempts were made to reduce the clogging problem, and provide details of how effective overflow screening will be achieved.

b) Need for Flexible, Graduated Screens: NMFS believes that this flexible, graduated-screen option is necessary, since the need to constantly clear the inflow screens will increase the time it takes to complete the project and therefore increase the exposure of sea turtles to the risk of impingement or entrainment. Additionally, there are increased risks to sea turtles in the water column when the inflow is halted to clear screens, since this results in clogged intake pipes, which may have to be lifted from the bottom to discharge the clay by applying suction.

10) Dredge Take Reporting and Final Report (RPM 2): Observer reports of incidental take by hopper dredges must be emailed to the Southeast Regional Office (takereport.nmfsser@noaa.gov with reference to this biological opinion - F/SER/2013/11766) by onboard NMFS-approved protected species observers, the dredging company, or the USACE within 24 hours of any sea turtle or other listed species take observed.

A final report summarizing the results of the hopper dredging and any documented sea turtle or other listed species takes must be submitted to NMFS (takereport.nmfsser@noaa.gov with reference to this biological opinion) within 60 working days of completion of the dredging project. The reports shall contain information on project location (specific channel/area dredged), start-up and completion dates, cubic yards of material dredged, problems encountered, incidental takes and sightings of protected species, mitigative actions taken (if relocation trawling, the number and species of turtles relocated), screening type (inflow, overflow) utilized, daily water temperatures, name of dredge, names of endangered species observers, percent observer coverage, and any other information the USACE deems relevant.

11) Sea Turtle Strandings (RPM 2): The USACE Project Manager or designated representative shall notify the STSSN state representative (contact information available at: http://www.sefsc.noaa.gov/seaturtleSTSSN.jsp) of the start-up and completion of hopper dredging operations and bed-leveler dredging operations and ask to be notified of any sea turtle strandings in the project area that, in the estimation of STSSN personnel, bear signs of potential draghead impingement or entrainment, or interaction with a bed-leveling type dredge.

a) Information on any such strandings shall be reported in writing within 30 days of project end to NMFS' Southeast Regional Office (takereport.nmfsser@noaa.gov with reference to this biological opinion) with a report detailing incidents, with photographs when available, of stranded sea turtles that bear indications of draghead impingement or entrainment. Because the deaths of these turtles, if hopper dredge related, have already been accounted for in NMFS' jeopardy analysis, these strandings will not be counted against the USACE's take limit if they do not exceed the take limits set forth in this consultation.

12) Conditions Requiring Relocation Trawling (RPM 1): The USACE shall require trawling to start as soon as possible within 72 hours of either:

a) Two or more turtles are taken by hopper dredges in a 24-hour period, or

b) Total dredge takes in the project approach 75% (rounded-down) of any of the incidental take limits (Table 10); i.e., 2 loggerheads, 10 greens, or 1 Kemp's ridley taken.

Relocation trawling may be suspended if no relocation or dredge takes occur within 14 days.

13) Relocation Trawling (RPM 1): Any relocation trawling conducted or contracted by the USACE to temporarily reduce abundance of these listed species during hopper dredging in order to reduce the possibility of lethal hopper dredge interactions, is subject to the following conditions:

a) Trawl Time: Trawl tow-time duration shall not exceed 42 minutes (measured from the time the trawl doors enter the water until the time the trawl doors are out of the water) and trawl speeds shall not exceed 3.5 knots.

b) Protected Species Handling During Trawling: Handling of sea turtles captured during relocation trawling in association with the dredging project shall be conducted by NMFS-approved protected species observers. Sea turtles captured pursuant to relocation trawling shall be handled in a manner designed to ensure their safety and viability, and shall be released over the side of the vessel, away from the propeller, and only after ensuring that the vessel's propeller is in the neutral, or disengaged, position (i.e., not rotating). Resuscitation guidelines are attached (Appendix B).

c) Captured Sea Turtle Holding Conditions: Sea turtles may be held briefly for the collection of important biological information, prior to their release. Captured sea turtles shall be kept moist, and shaded whenever possible, until they are released, according to the requirements of Term and Condition No. 13-e, below.

d) Biological Data Collection: When safely possible, all turtles shall be measured (standard carapace measurements including body depth), tagged, weighed, and a tissue sample taken prior to release. Any external tags shall be noted and data recorded into the observers' log. Only NMFS-approved protected species observers or observer candidates in training under the direct supervision of a NMFS-approved protected species observer shall conduct the tagging/measuring/weighing/tissues sampling operations.

e) Take and Release Time During Trawling – Turtles: Turtles shall be kept no longer than 12 hours prior to release and shall be released not less than 3 nautical miles from the dredge site. Turtles to which satellite tags will be affixed may be held up to 24 hours before release. If two or more released turtles are later recaptured, subsequent turtle captures shall be released not less than 5 nautical miles away. If it can be done safely, turtles may be transferred onto another vessel for transport to the release area to enable the relocation trawler to keep sweeping the dredge site without interruption.

f) Injuries: Injured sea turtles shall be immediately transported to the nearest sea turtle rehabilitation facility. Minor skin abrasions resulting from trawl capture are considered non-injurious. The USACE shall ensure that logistical arrangements and support to accomplish this are pre-planned and ready. The USACE shall bear the financial cost of all sea turtle transport, treatment, rehabilitation, and release.

g) Flipper Tagging: All sea turtles captured by relocation trawling shall be flipper-tagged prior to release with external tags which shall be obtained prior to the project from the University of Florida's Archie Carr Center for Sea Turtle Research. This Opinion serves as the permitting authority for any NMFS-approved protected species observer aboard these relocation trawlers to flipper-tag with external tags (e.g., Inconel tags) captured sea turtles. Columbus crabs or other organisms living on external sea turtle surfaces may also be sampled and removed under this Opinion's authority.

h) PIT-Tag: This opinion serves as the permitting authority for any NMFS-approved protected species observer aboard a relocation trawler to PIT-tag captured sea turtles. Tagging of sea turtles is not required to be done if the NMFS-approved protected species observer does not have prior training or experience in said activity; however, if the observer has received prior training in PIT tagging procedures, then the observer shall tag the animal prior to release (in addition to the standard external tagging):

   i) Sea turtle PIT tagging must then be performed in accordance with the protocol detailed at NMFS' Southeast Fisheries Science Center's Web page: http://www.sefsc.noaa.gov/seaturtlefisheriesobservers.jsp. (See Appendix C on SEFSC's "Fisheries Observers" Web page);

   ii) PIT tags used must be sterile, individually-wrapped tags to prevent disease transmission. PIT tags should be 125-kHz, glass-encapsulated tags–the smallest ones made. Note: If scanning reveals a PIT tag and it was not difficult to find, then do not insert another PIT tag; simply record the tag number and location, and frequency, if known. If for some reason the tag is difficult to detect (e.g., tag is embedded deep in muscle, or is a 400-kHz tag), then insert one in the other shoulder.

i) PIT-Tag Scanning and Data Submission Requirements: All sea turtles captured by relocation trawling or dredges shall be thoroughly scanned for the presence of PIT tags prior to release using a multi-frequency scanner powerful enough to read multiple frequencies (including 125-, 128-, 134-, and 400-kHz tags) and read tags deeply embedded in muscle tissue (e.g., manufactured by Trovan, Biomark, or Avid). Turtles whose scans show they have been previously PIT tagged shall nevertheless be externally flipper tagged. Sea turtle data collected (PIT tag scan data and external tagging data) shall be submitted to NOAA, National Marine Fisheries Service, Southeast Fisheries Science Center, Attn: Lisa Belskis, 75 Virginia Beach Drive, Miami, Florida 33149. All sea turtle data collected shall be submitted in electronic format within 60 days of project completion to Lisa.Belskis@noaa.gov. Sea turtle external flipper tag and PIT tag data generated and collected by relocation trawlers shall also be submitted to the Cooperative Marine Turtle Tagging Program (CMTTP), on the appropriate CMTTP form, at the University of Florida's Archie Carr Center for Sea Turtle Research.

j) Handling Fibropapillomatose Turtles: NMFS-approved protected species observers are not required to handle viral fibropapilloma tumors if they believe there is a health hazard to themselves and choose not to. When handling sea turtles infected with fibropapilloma tumors, observers must maintain a separate set of sampling equipment for handling animals displaying fibropapilloma tumors or lesions.

k) Additional Data Collection Allowed During the Handling of Sea Turtles and Other Incidentally-caught ESA-listed species: The USACE shall allow NMFS-approved protected species observers to conduct additional investigations that may include more invasive procedures (e.g., blood-letting, laparoscopies, external tumor removals, anal and gastric lavages, mounting satellite or radio transmitters, etc.) and partake in or assist in research projects but only if 1) the additional work does not interfere with any project operations (dredging activities, relocation trawling, etc), 2) the observer holds a valid federal research permit (and any required state permits) authorizing the activities, either as the permit holder, or as designated agent of the permit holder, 3) the additional work does not incur any additional expenses to the USACE or the USACE approves of the expense, and 4) the observer has first coordinated with USACE Galveston District and notified NMFS's Southeast Regional Office, Protected Resources Division (takereport.nmfsser@noaa.gov with reference to this biological opinion).

14) Relocation Trawling Report (RPM 2): The USACE shall provide NMFS' Southeast Regional Office (takereport.nmfsser@noaa.gov with reference to this biological opinion) with an end-of-project report within 30 days of completion of any relocation trawling. This report may be incorporated into the final report summarizing the results of the hopper dredging project.

15) Requirement and Authority to Conduct Tissue Sampling for Genetic Analyses (RPM 2): This opinion serves as the permitting authority for any NMFS-approved protected species observer aboard a relocation trawler or hopper dredge to tissue-sample live- or dead-captured sea turtles without the need for an ESA Section 10 permit. All live or dead sea turtles captured by relocation trawling and hopper dredging shall be tissue-sampled by a NMFS-approved protected species observer prior to release.

    Sea turtle tissue samples shall be taken in accordance with NMFS SEFSC's procedures for sea turtle genetic analyses (Appendix II of this opinion). The USACE shall ensure that tissue samples taken during the dredging project are collected, stored properly, and mailed no later than 60 days of completion of the dredging project to: NOAA, National Marine Fisheries Service, Southeast Fisheries Science Center, Attn: Lisa Belskis, 75 Virginia Beach Drive, Miami, Florida 33149.

10 CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the ESA directs federal agencies to utilize their authority to further the purposes of the ESA by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat to help implement recovery plans or to develop information.

Pursuant to Section 7(a)(1) of the ESA, the following conservation recommendations are made to assist the USACE in contributing to the conservation of sea turtles by further reducing or eliminating adverse impacts that result from dredging.

1. Channel Conditions and Seasonal Abundance Studies: Channel-specific studies should be undertaken to identify seasonal relative abundance of sea turtles within Gulf of Mexico channels. The December 1 through March 31 dredging window and associated observer requirements listed above may be adjusted (after consultation and authorization by NMFS) on a channel-specific basis, if (a) the USACE can provide sufficient scientific evidence that sea turtles are not present or that levels of abundance are extremely low during other months of the year, or (b) the USACE can identify seawater temperature regimes that ensure extremely low abundance of sea turtles in coastal waters, and can monitor water temperatures in a real-time manner. Surveys may indicate that some channels do not support significant turtle populations, and hopper dredging in these channels may be unrestricted on a year-round basis. To date, sea turtle deflector draghead efficiency has not reached the point where seasonal restrictions can be lifted.

2. Draghead Modifications and Bed-Leveling Studies: The USACE should supplement other efforts to develop modifications to existing dredges to reduce or eliminate take of sea turtles, and develop methods to minimize sea turtle take during "cleanup" operations when the draghead maintains only intermittent contact with the bottom. Some method to level the "peaks and valleys" created by dredging would reduce the amount of time dragheads are off the bottom. NMFS is ready to assist the USACE in conducting studies to evaluate bed-leveling devices and their potential for interaction with sea turtles, and develop modifications if needed.

3. Draghead Evaluation Studies and Protocol: Additional research, development, and improved performance is needed before the V-shaped rigid deflector draghead can replace seasonal restrictions as a method of reducing sea turtle captures during hopper dredging activities. Development of a more effective deflector draghead or other entrainment-deterring device (or combination of devices, including use of acoustic deterrents) could potentially reduce the need for sea turtle relocation or result in expansion of the preferred winter dredging window. NMFS should be consulted regarding the development of a protocol for draghead evaluation tests. NMFS recommends that USACE coordinate with ERDC, the Association of Dredge Contractors of America, and dredge operators (Manson, Bean-Stuyvesant, Great Lakes, Natco, etc.) regarding additional reasonable measures they may take to further reduce the likelihood of sea turtle takes.

4. Continuous Improvements in Monitoring and Detecting Takes: The USACE should seek continuous improvements in detecting takes and should determine, through research and development, a better method for monitoring and estimating sea turtle takes by hopper dredge. Observation of overflow and inflow screening is only partially effective and provides only partial estimates of total sea turtle mortality.

5. Overflow Screening: The USACE should encourage dredging companies to develop or modify existing overflow screening methods on their company's dredge vessels for maximum effectiveness of screening and monitoring. Horizontal overflow screening is preferable to vertical overflow screening because NMFS considers that horizontal overflow screening is significantly more effective at detecting evidence of protected species entrainment than vertical overflow screening.

6. Preferential Consideration for Horizontal Overflow Screening: The USACE should give preferential consideration to hopper dredges with horizontal overflow screening when awarding hopper dredging contracts for areas where new materials, large amounts of debris, or clay may be encountered, or have historically been encountered. Excessive inflow screen clogging may in some instances necessitate removal of inflow screening, at which point, effective overflow screening becomes more important.

7. Section 10 Research Permits, Relocation Trawling, Piggy-Back Research, and 50 CFR Part 223 Authority to Conduct Research on Salvaged, Dead Specimens: NMFS recommends that USACE ERDC apply to NMFS for an ESA Section 10 research permit to conduct additional endangered species research on species incidentally captured during traditional relocation trawling. SERO shall assist the USACE with the permit application process.

NMFS also encourages the USACE to cooperate with NMFS scientists, other federal agencies' scientists, and university scientists holding appropriate research permits to make more use of turtles taken or captured by hopper dredges and relocation trawlers pursuant to the authority conferred by this Opinion. NMFS encourages "piggy-back" research projects by duly-permitted or authorized individuals or their authorized designees.

Important research can be conducted without a Section 10 permit on salvaged dead specimens. Under current federal regulations (see 50 CFR 223.206 (b): Exception for injured, dead, or stranded [threatened sea turtle] specimens), "Agents...of a Federal land or water management agency may...salvage a dead specimen which may be useful for scientific study." Similar regulations at 50 CFR 222.310 provide "salvaging" authority for endangered sea turtles.

8. <u>Draghead Improvements - Water Ports</u>: NMFS recommends that the USACE require, or at least recommend, that dredge operators have all dragheads on hopper dredges contracted by the USACE for dredging projects outfitted (eventually) with water ports located in the top of the dragheads to help prevent the dragheads from becoming plugged with sediments. When the dragheads become plugged with sediments, the dragheads are often raised off the bottom by the dredge operator with the suction pumps on in order to take in enough water to help clear clogs in the dragarm pipeline, which increases the likelihood that sea turtles in the vicinity of the draghead will be taken by the dredge. Water ports located in the top of the dragheads would relieve the necessity of raising the draghead off the bottom to perform such an action, and reduce the chance of incidental take of sea turtles.

   NMFS supports and recommends the implementation of proposals by ERDC and USACE personnel for various draghead modifications to address scenarios where turtles may be entrained during hopper dredging (Dickerson and Clausner 2003). These proposals include: (1) An adjustable visor; (2) water jets for flaps to prevent plugging and thus reduce the requirement to lift the draghead off the bottom; and (3) a valve arrangement (which mimics the function of a "Hoffer" valve used on cutterhead type dredges to allow additional water to be brought in when the suction line is plugging) that will provide a very large amount of water into the suction pipe thereby significantly reducing flow through the visor when the draghead is lifted off the bottom, reducing the potential to take a turtle.

9. <u>Economic Incentives for No Turtle Takes</u>: The USACE should consider devising and implementing some method of significant economic incentives to hopper dredge operators such as financial reimbursement based on their satisfactory completion of dredging operations, or X number of cubic yards of material moved, or hours of dredging performed, without taking turtles. This may encourage dredging companies to research and develop "turtle friendly" dredging methods; more effective, deflector dragheads; pre-deflectors; top-located water ports on dragarms; etc.

10. <u>Sodium Vapor Lights on Offshore Equipment</u>: On offshore equipment (i.e., hopper dredges, pumpout barges) shielded low-pressure sodium vapor lights are highly recommended for lights that cannot be eliminated when the vessels are operating with 10 mi of sea turtle nesting beaches.

11 REINITIATION OF CONSULTATION

This concludes formal consultation on the proposed project, the Brazos Island Harbor Channel Improvement. As provided in 50 CFR 402.16, reinitiation of formal consultation is required where discretionary federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) The amount or extent of taking specified in the incidental take statement is exceeded; (2) new information reveals effects of the action may affect listed species or critical habitat in a manner or to an extent not previously considered; (3) the identified action is subsequently modified in a manner that causes an effect to listed species or critical habitat that was not considered in the Biological Opinion; or (4) a new species is listed or critical habitat designated that may be affected by the identified action. In instances where the amount or extent of take is exceeded, USACE must immediately request reinitiation of formal consultation.

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13 APPENDIX A

US Army Corps of Engineers
Management Protocol for Effective Implementation of the
National Marine Fisheries Service
Regional Biological Opinion for Hopper Dredging
Gulf of Mexico

29 December 2006

1. **General.**

a. **Purpose.** This management protocol was developed to effectively implement the Gulf Regional Biological Opinion (GRBO) for the Gulf of Mexico issued by National Marine Fisheries Service (NMFS), SE Region, on 19 November 2003, and subsequently revised on 24 June 2005 (Revision Number 1) and 9 January 2007 (Revision Number 2).

b. **Applicability.** This management protocol applies to all hopper dredging conducted within the Gulf of Mexico region, for US Army Corps of Engineers (COE) conducted dredging and COE permitted dredging under a Clean Water Act (CWA) Section 10/404 permit or Marine Protection, Research, Sanctuaries Act (MPRSA) Section 103 permit.

c. **District Points of Contact.** Each COE District under the GRBO will designate a single primary point of contact (POC) to ensure full day-to-day coordination of all relevant sea turtle related issues (as well as other protected species issues associated with the GRBO) across functional elements for COE conducted dredging and COE permitted dredging within his/her organization. At the beginning of each fiscal year (FY), each District will be responsible for preparation of its annual Protocol Management Plan. The District POC will coordinate the plan with his/her counterpart in the four Gulf Districts and with the Executive Advisory Group (EAG) for the Gulf Region.

d. **Executive Advisory Group - Gulf Region.** A Gulf Regional Biological Opinion Executive Advisory Group (EAG) composed of the Chiefs of Operations from Southwestern Division, Mississippi Valley Division, and South Atlantic Division will provide oversight and implementation of this Protocol. The EAG will make recommendations involving policy and oversight for the implementation of the GRBO and this Management Protocol. The EAG will collectively make recommendations on whether or not hopper dredging operations for COE conducted and COE permitted projects should continue or be permanently stopped based on an overall view of the Corps' compliance with the GRBO. The EAG will communicate its collective recommendations through the respective Gulf District POCs. After considering the recommendations of the EAG, the District Commander will make the final decision on whether or not dredging will cease or continue. Each Gulf District POC will be responsible for managing their District's "trigger" limits in the GRBO (paragraph 2c) and informing all relevant elements within his/her District of EAG recommendations. The

EAG will regularly communicate and will conduct meetings (formal or informal) to review progress under the GRBO and with related sea turtle and Gulf sturgeon protection initiatives.

e. **Coordination of Incidental Take Information.** All reporting of sea turtles and Gulf sturgeon takes (both lethal and non-lethal takes) from dredging activities and relocation trawling within each District will be reported immediately by the District POC to NMFS (SE Region) and the Engineer Research and Development Center (ERDC) staff which maintains the Sea Turtle Database Warehouse. The Sea Turtle Warehouse Website is: http://el.erdc.usace.army.mil/seaturtles/index.cfm. Non-lethal takes from relocation trawling will be compiled and reported at least weekly to the same entities or more frequently if appreciable numbers of turtles are being captured and relocated.

f. **Implementation of Reasonable and Prudent Measures (RPM).** Each Gulf District covered under the GRBO, ERDC, and the EAG will work together to foster application of contract specifications and/or permit conditions that consistently and effectively implement the Reasonable and Prudent Measures to avoid/minimize take of protected species as specified in the GRBO.

g. **Annual Sea Turtle Report.** Each Gulf District POC will prepare an annual sea turtle report covering dredging during the previous Fiscal Year (FY) within its jurisdiction by 30 November of each year. In addition to project specifics (location, duration, amount dredged) and endangered/threatened (E/T) species take data, the report will include data on sea turtle relocation trawling per project, summary totals by District and Gulf-wide total relocation trawling captures, and other data required by the GRBO. ERDC, with the assistance of the Gulf District POCs, is responsible for consolidating District reports and developing a brief Gulf-wide summary report to be forwarded to NMFS, SE Region, by 31 December, for the previous FY.

h. **Annual Review of Protocol.** This protocol will be reviewed annually (formal or informal) by the EAG and the Gulf Districts before the end of each FY to determine whether revisions/updates are required. Revisions or updates will be scheduled to be implemented the following FY.

i. **Dispute Resolution.** Disagreements and unresolved issues relating to implementation of specific provisions of this protocol by the staffs of pertinent COE Divisions and Districts will be quickly elevated to the EAG for resolution. Disputes that cannot be resolved by the EAG will be elevated to the Senior Executive Management Group comprised of a Senior Executive Service (SES) member from each of the three Gulf Divisions.

j. **Period of Coverage.** This management protocol will be in effect for a period of five years unless terminated prior to that time by mutual consent. At the end of the five-year period, this protocol may be extended by mutual consent of the affected COE Divisions.

2. **Conditions Applicable to COE Conducted Hopper Dredging.**

a. **Federal Activities.** COE conducted dredging, as defined for the GRBO, includes any hopper dredging conducted in the Gulf of Mexico by the COE to maintain federally authorized navigation channels, for sand mining to construct federally authorized hurricane/storm damage reduction projects, or to restore coastal habitat restoration projects. New Congressionally authorized Federal navigation dredging projects and authorized navigation channel improvements are not covered by the GRBO. Separate Section 7 consultations are required for any such activity.

b. **Gulf-wide Incidental Takes.** The GRBO assigns incidental takes for Federal activities by FY for Threatened (T) and Endangered (E) protected species as follows:

Loggerhead sea turtles (T): thirty-two (32)

Kemp's ridley sea turtles (E): sixteen (16)

Green sea turtles (T): eleven (11)

Hawksbill sea turtles (E): three (3)

Gulf sturgeon (E): three (3)

c. **District Trigger Points.** The GRBO does not assign specific take allowances by species by District. However, for management purposes, each District will be asked to work within identified "Trigger Points" or limits by species. The EAG will be engaged when identified Trigger Points are reached by any given District. The Trigger Points for each District, by species, are:

District	Loggerhead	Kemp's ridley	Green	Hawksbill	Total Turtles	Gulf sturgeon
SAJ (FL West Coast)	4	3	3	1	11	1
SAM (MS, AL, FL Panhandle)	4	3	2	0	9	2
MVN (LA)	12	4	2	1	19	0
SWG (TX)	12	6	4	1	23	0
Totals	32	16	11	3	62	3

Note that these are trigger points to engage the EAG and are not take limit allocations by Districts.

d. **MSC Oversight and Responsibilities - COE Conducted Dredging.**

(1) Each District will implement all Reasonable and Prudent Measures to minimize incidental take on COE conducted dredging. As takes occur and are reported, the District POC and the assigned Project Manager for the particular project on which the take occurs will assess potential causes for the take and potential risk for additional takes for each project. All incidental takes associated with the dredging activity and relocation trawling will be reported as specified in paragraph 1e above by the District POC.

(2) Each District will be responsible for monitoring trigger point limits for all listed turtle species (or Gulf sturgeon as applicable) for COE conducted dredging projects and keeping the EAG informed. The EAG will be notified when any of the following occurs:

(a) four sea turtles are taken on any single project,

(b) seventy-five percent (75%) of the District trigger point limit for any protected species as listed in the table above is approached/taken, or

(c) any single take of a Gulf sturgeon.

(3) The EAG will make a recommendation on whether dredging operations will continue or be permanently stopped based on an overall view of the Corps compliance with the GRBO. The District Commander, in consultation with the EAG, will make the final decision on whether or not dredging will cease or continue. E-mail notification of recommendations will be sufficient. The District POC will be responsible for communication and coordination among the various functional elements within each District.

e. **Operational Protocol for COE Conducted Projects.**

(1) A hopper dredge inspection will be performed using the "COE Sea Turtle Inspection Checklist for Hopper Dredges for COE Projects or COE/Army Permitted Project" (attachment 1). The District POC will be responsible for ensuring that the hopper dredge inspection has been performed and that all recommendations have been implemented or addressed prior to giving the project approval to proceed.

(2) Silent Inspector (SI) will be activated and operational in accordance with CECW-CO memorandum, 17 April 2006, subject: Implementation of Automated Dredging Quality Assurance Monitoring.

(3) Sea turtle deflecting dragheads, sea turtle observers, and inflow and overflow screens will be used during all dredging operations. Variations from these provisions may be granted by the MSC, but any approved variation must be justified from a technical perspective. All corrective actions proposed during the hopper dredge inspection will be made prior to initiation of dredging.

(4) Based on project conditions, pre-trawling condition and abundance surveys may be performed prior to initiation of dredging in accordance with the GRBO. The need for relocation trawling during the project may include assessments of pre-trawling surveys and conditions as found in paragraph 4 below, and/or historical records for the project.

(5) A risk assessment will be performed after each incidental take up to three sea turtles on a particular project. While the risk assessments are being performed dredging may continue. The risk assessments will include a review of the circumstances which contributed to the take, a review of the Silent Inspector (SI) data, and a physical inspection of the dredge and its operating procedures. A risk management plan will be developed after each take. This plan will address what occurred and suggested changes to the hopper dredge operations. This plan will be provided to the contractor (or the dredge Captain for Corps-owned hopper dredges) for implementation in order to minimize the likelihood of additional sea turtle takes and to ensure compliance with the terms and conditions of the GRBO. E-mail notification of recommendations and documentation will be sufficient. Additionally, the District findings will be provided to the EAG for information.

(6) At the first take of a Gulf sturgeon on a particular project, a risk assessment will be performed and a risk management plan prepared. Results will be implemented. While the risk assessment is being performed dredging may continue. The results of the risk assessment and recommendations in the risk management plan will be provided to the EAG for information.

(7) Should a total of four sea turtle on a particular project, a risk assessment will be performed and a risk management plan prepared. Results will be implemented. While the risk assessment is being performed dredging may continue. The EAG will be engaged in dialogue and remain engaged until such time as the project is completed or the District Commander, in consultation with the EAG, makes a decision to stop work on that project.

f. **Reinitiation of Consultation.** If the overall allotted takes assigned to COE conducted dredging projects for one or more species are reached in any given FY for federal projects, the Executive Advisory Group will reinitiate formal Section 7 consultation with NMFS. Formal reinitiation documentation in draft form will be coordinated with each Gulf Division/District. During reinitiation of consultation, the COE is not necessarily required to suspend dredging or relocation trawling operations pending the conclusion of the reinitiated consultation so long as the continuation of operations (by all Districts) would not violate Sections 7(a)(2) or 7(d) of the Endangered Species Act (ESA). The COE will document its determination that these provisions will not be violated by continuing activities covered by the GRBO during the reinitiation period and will notify NMFS of its findings.

3. **Conditions Applicable to COE Permitted Dredging.** COE permitted hopper dredging, as defined in the GRBO, includes any dredging conducted under a Department of the Army Permit (Section 10/404 permits or Section 103 permit) authorizing dredging for sand mining to construct hurricane/storm damage reduction projects or for coastal habitat restoration. All applicable requirements for COE permitted projects will be conducted through the respective District Regulatory Project Manager for the Department of the Army Permit.

a. The EAG involvement for COE permitted activities will be more frequent than COE conducted activities because of the variability in the number of Department of the Army permit projects being conducted annually and the number of allocated takes assigned to these activities per FY.

b. **Incidental Take Allowance.** The GRBO assigns incidental takes for COE permitted projects by FY for Threatened (T) and Endangered (E) protected species as follows:

Loggerhead sea turtles (T): eight (8)

Kemp's ridley sea turtles (E): four (4)

Green sea turtles (T): three (3)

Hawksbill sea turtles (E): one (1)

Gulf sturgeon (E): one (1)

c. **Incidental Take Limits.** For COE permitted dredging, the GRBO assigns an overall incidental take allowance for the entire Gulf of Mexico. There are no assigned "Trigger Points" for COE permitted dredging. Each District Regulatory Division will be expected to monitor takes for the FY using the ERDC Sea Turtle warehouse. The EAG will be consulted in all discussions when and after fifty percent (50%) of the allotted COE permitted dredging takes for any protected species are reached during the FY. Dredging may continue during the reinitiation period in accordance with Sections 7(a)(2) and 7(d) of the ESA in compliance with the RPMs and Terms and Conditions of the Incidental Take Statement, and so long as continuing the activity would not violate Sections 7(a)(2) and 7(d) of the ESA.

d. **Coordination with NMFS.** The Regulatory Project Manager assigned to the permit application will be responsible for initiating contact with NMFS on behalf of permit applicants. Each Regulatory Project Manager will be responsible for coordinating their actions with their District POC using the Engineer Research and Development Center (ERDC) Sea Turtle Database Warehouse webpage. NMFS will respond to a District's permit application within 15 days. E-mail and other forms of electronic notification are acceptable.

e. **Individual Consultation.** Where a permit applicant so desires and requests in writing, the Regulatory Project Manager responsible for the permit application will initiate consultation on their permit application with the NMFS.

f. **Project Schedules.** Where a Permittee cannot demonstrate that it intends to commence construction within 30 days of permit issuance, the permit will be conditioned to require the Permittee to return to the District within 30 days prior to construction, and sufficiently in advance to allow for NMFS to approve authorization of the permit conditions.

g. **Standard Permit Terms and Conditions.** Each COE permit will include standard terms and conditions to implement the terms and conditions of the GRBO. Prior to issuing a permit allowing the use of hopper dredges, the District Navigation Section or the Dredging Function in Operations Division will be consulted to ensure that the project can be executed using such equipment. The navigation "expert" will evaluate the project conditions, particularly the borrow site, to ensure that there are no technical reasons that preclude the use on hopper dredges. For COE permitted dredging, permits will include the permit condition that dredging will cease anytime a take occurs and a risk assessment is being performed. Dredging may resume after any corrections, as determined by the risk assessment and included in the risk management plan as necessary to reduce lethal takes, have been implemented.

h. **MSC Oversight and Responsibilities - COE Permitted Dredging.**

(1) Each District will implement all Reasonable and Prudent Measures to minimize incidental take on COE permitted dredging. As takes occur and are reported, the respective District, the District POC, and the assigned Project Manager for the particular project on which the take occurs will assess potential causes for the take and potential risk for additional takes for each project. All incidental takes associated with the dredging activity and relocation trawling will be reported as specified in paragraph 1e above by the District POC.

(2) The EAG will make a recommendation on whether dredging operations will continue or be stopped based on an overall view of the Corps' compliance with the GRBO. The District Commander, in consultation with the EAG, will make the final decision on whether or not dredging will cease or continue. E-mail notification of recommendations will be sufficient. The District POC will be responsible for communication and coordination among the various functional elements within each District.

i. **Operational Protocol for COE Permitted Projects.**

(1) A hopper dredge inspection will be performed using the "COE Sea Turtle Inspection Checklist for Hopper Dredges for COE Projects or COE/Army Permitted Projects" (attachment 1). The Regulatory Project Manager will be responsible for ensuring that the hopper dredge inspection has been performed and that all

recommendations have been implemented or addressed, prior to giving the Permittee approval to proceed.

(2) Silent Inspector (SI) will be activated and operational in accordance with Regulatory Guidance Letter No. 06-04, 2 October 2006, subject: Guidance for the Implementation of the Silent Inspector (SI) for Dredging Projects Requiring Department of the Army (DA) Permits. The Permittee or its designee will be provided the opportunity to receive SI training and be certified that they are qualified to interpret SI monitoring data.

(3) Sea turtle deflecting dragheads, sea turtle observers, and inflow and overflow screens will be used during all dredging operations. Variations from these provisions may be granted by the MSC, but any approved variation must be justified from a technical perspective. All corrective actions proposed during the hopper dredge inspection will be made prior to initiation of dredging.

(4) Based on project conditions, pre-trawling condition and abundance surveys may be performed prior to initiation of dredging in accordance with the Conservation Recommendations in the GRBO. The need for relocation trawling during the project may include assessments of pre-trawling surveys and conditions as found in paragraph 4 below, and/or historical records for the project.

(5) At the first take of a sea turtle on a particular project, work will cease and a risk assessment will be performed by the Permittee or its designated consultant and the results provided to the COE. When the risk assessment is done and the results implemented, dredging may continue with Corps concurrence. The risk assessment will include a review of the circumstances which contributed to the take, a review of the Silent Inspector (SI) data, and a physical inspection of the dredge and its operating procedures. A risk management plan will be developed. This plan will address what occurred and suggested changes to the hopper dredge operations in order to minimize the likelihood of additional sea turtle takes and to ensure compliance with the terms and conditions of the GRBO. E-mail notification of recommendations and documentation will be sufficient.

(6) If a second take of sea turtle on the same project occurs, project work will cease and a risk assessment will be performed by the Permittee or its designated consultant, and the results provided to the Corps of Engineers. When the risk assessment is completed and the results implemented dredging may continue with Corps concurrence.

(7) Should a total take of three sea turtles occur on any particular project, work will cease. A risk assessment will be performed. A risk management plan will be developed and recommendations implemented. A copy of the risk assessment plan and corrective actions taken will be transmitted to the COE. Dredging may continue with approval of the COE Regulatory Project Manager or other designated representative. Additionally, the findings will be forwarded to the EAG for information.

(8) At the first take of a Gulf sturgeon, project work will cease. A risk assessment will be performed. A risk management plan will be developed and recommendations implemented. A copy of the risk assessment plan and corrective actions taken will be transmitted to the COE. Dredging may continue with approval of the COE Regulatory Project Manager or other designated representative. The results of the risk assessment and recommendations in the risk management plan will be provided to the EAG for information.

(9) Should a total of four sea turtles or two sturgeons occur on any particular project, work will cease. A risk assessment will be performed. A risk management plan will be developed. A copy of the risk assessment plan and corrective actions taken will be transmitted to the COE. The District Commander, in consultation with the EAG, will make the decision as to whether dredging may continue. Should permission to continue be given, the EAG will remain engaged until such time as the project is completed or the District Commander, in consultation with the EAG, makes a decision to stop work on that project.

j. **Reinitiation of Consultation.** If the overall allotted takes assigned to COE permitted dredging projects for one or more species are reached in any given FY, the Executive Advisory Group will reinitiate formal Section 7 consultation with NMFS. Formal reinitiation documentation in draft form will be coordinated with each Gulf Division/District. During reinitiation of consultation, the COE is not necessarily required to suspend dredging or relocation trawling operations pending the conclusion of the reinitiated consultation, so long as the continuation of operations (by all Districts) would not violate Section 7(a)(2) or 7(d) of the ESA. The COE will document its determination that these provisions will not be violated by continuing activities covered by the GRBO during the reinitiation period and will notify NMFS of its findings.

4. Relocation Trawling for both COE Conducted and COE Permitted Projects.

a. There is no separation between the authorized Relocation Trawling Take level between COE conducted and COE permitted projects. Relocation trawling will be initiated based on pertinent "triggers" or conditions requiring relocation trawling as contained in the Reasonable and Prudent Measures of the GRBO. When circumstances dictate that a high risk of turtle take is present at the beginning of a dredging project, a decision may be made to initiate trawling prior to reaching the GRBO "triggers." A Plan for Sea Turtle Relocation Trawling will be submitted to the COE Project Manager by the contractor or to the Regulatory Project Manager by the Permittee, prior to initiation of trawling. The Relocation Trawling Plan must be in compliance with the Reasonable and Prudent Measures as found in the GRBO.

b. Any incidental takes associated with relocation trawling, non-lethal and injurious/lethal, will be reported as specified in paragraph 1e above.

c. **Trawling Incidental Take Limits.** The EAG will be engaged if the overall non-lethal and injurious/lethal incidental take limits assigned to relocation trawling are reached in any given FY. The EAG will take the lead in initiating formal Section 7 consultation with NMFS. Reinitiation of consultation will be coordinated with all Gulf Districts.

Approved by the Executive Advisory Group:

Elisa D. Pelliciotto

ELISA D. PELLICCIOTTO
Chief, Operations and Regulatory Community of Practice
Southwestern Division

Date: 17 Jan 07

James R. Hannon

JAMES R. HANNON
Chief, Operations and Regulatory Community of Practice
Mississippi Valley Division

Date: 10 JAN 07

George R. Prince

GEORGE R. PRINCE, JR., PE, CPE
Chief, Operations and Regulatory Community of Practice
South Atlantic Division

Date: 9 Jan 07

ATTACHMENT 1

COE SEA TURTLE INSPECTION CHECKLIST FOR HOPPER DREDGES
for
COE Conducted or COE Permitted Projects

1. Read contract plans and specs and/or all applicable permits (Dept. of the Army Permit, State Permits) to determine the contract or permit requirements for the protection of endangered sea turtles (each District specs or permit may be different).

2. Read the Biological Opinion and any COE Sea Turtle Protocol if available.

3. Develop a list of inspection requirements:

a. Leading edge angle (90 degrees or less).
b. Approach angle or leading edge plowing depth (6 inches or more).
c. Aft rigid attachment of deflector to the draghead (hinged or trunnion).
d. Forward deflector attachment point (adjustable pinned or cable/chain with stop).
e. Opening between drag head and deflector (4"X 4" max).
f. Is screening of dredged material required?
g. Are inflow screens or overflow screens or both required?
h. Are inflow basket screen openings 4"X 4" max and is 100% of the dredged material being screened.
i. Lighting of inflow and overflow screens and proper access for cleaning (must meet EM 385-1-1).
j. Structural design of deflector (per approved deflector submittal).
k. Dredge operational requirements (starting/stopping dredge pump, draghead plugging, razing draghead, and turning the dredge).
l. Is dredging data recording, Silent Inspector, (drag elevation, slurry density and velocity) required by specs or permit? If so, is it being collected or is Silent Inspector turned on and is data being submitted?
m. Is turtle trawling required by specs or permit? If so is it being performed?
n. Turtle observers requirements (12 or 24 hours).

4. Review turtle deflector submittal (do not allow dredging to start until submittal is approved):

a. Structural soundness.
b. Leading edge angle (90 degrees or less).
c. Approach angles for dredging depths.
d. 4"X 4" opening between deflector and draghead.
e. Aft rigid deflector attachment to draghead (hinged or trunnion).
f. Forward deflector attachment point (adjustable pinned or cable/chain with stop).

5. Assure the Contractor Quality Control (CQC) performs a pre-dredging inspection. The CQC is required to review and inspect all items in paragraph 3a-n.

6. Assure the CQC performs a startup-dredging inspection:

a. CQC is required to check the turtle deflector to see if the deflector is installed and adjusted for the required dredge depth of this project in accordance with the approved deflector submittal.
b. CQC is required to assure the drag tenders are operating the dredge pump and draghead in accordance with the specs/permit.
c. CQC should perform a paint test to assure deflector is plowing at least 6" into the dredge material.

7. COE Quality Assurance (QA) should perform dredging operation inspection:

a. Review and inspect all items in paragraph 3a-n.
b. Inspect the turtle deflector to see if the deflector is installed and adjusted for the required dredge depth of this project in accordance with the approved deflector submittal.
c. Require the contractor to perform paint test to assure deflector is plowing at least 6" into the dredge material (over penetration of the deflector will reduce production and increase fuel consumption of the dredge).
d. Ride the dredge though at least one dredging cycle (dredging, to the dump, and back to the dredge site).
e. Watch the drag tender to assure he is operating the dredging equipment in accordance with the plans and specs (starting/stopping dredge pump, lower dragarm angle, swell compensator, slurry specific gravity, plugging of the draghead, ship crabbing).
f. Lockout/tagout procedure for cleaning the inflow and overflow screens (must meet EM 385-1-1).
g. Talk to turtle observers to assure they are aware of contract and permit requirements and are performing inspection of screens and deflectors and reporting any maintenance required to the dredge personnel. Assure that correct turtle observer forms are being used and filled out properly.
h. Talk to Dredge Captain about maintaining the screens and deflectors.
i. Picked up Silent Inspector data and emailed to ERDC at lease once a week or more.
j. All pre-dredge/post-dredge and follow up inspections should be noted in the CQC Daily Reports.

Contractor CQC Inspector:

Name: ______________________________

COE Inspector:

Name: ______________________________

Office Symbol: ______________ **Date of Inspection:** ______________

COMMENTS: ______________________________

Contractor CQC Inspector:

Name: ______________________________

COE Inspector:
Name: ______________________________

Office Symbol: ______________ **Date of Inspection:** ______________

14 APPENDIX B
SEA TURTLE HANDLING AND RESUSCITATION GUIDELINES

Any sea turtles taken incidentally during the course of fishing or scientific research activities must be handled with due care to prevent injury to live specimens, observed for activity, and returned to the water according to the following procedures:

A) Sea turtles that are actively moving or determined to be dead (as described in paragraph (B)(4) below) must be released over the stern of the boat. In addition, they must be released only when fishing or scientific collection gear is not in use, when the engine gears are in neutral position, and in areas where they are unlikely to be recaptured or injured by vessels.
B) Resuscitation must be attempted on sea turtles that are comatose or inactive by:

1) Placing the turtle on its bottom shell (plastron) so that the turtle is right side up and elevating its hindquarters at least 6 in (15.2 cm) for a period of 4 to 24 hours. The amount of elevation depends on the size of the turtle; greater elevations are needed for larger turtles. Periodically, rock the turtle gently left to right and right to left by holding the outer edge of the shell (carapace) and lifting one side about 3 in (7.6 cm) then alternate to the other side. Gently touch the eye and pinch the tail (reflex test) periodically to see if there is a response.

2) Sea turtles being resuscitated must be shaded and kept damp or moist but under no circumstance be placed into a container holding water. A water-soaked towel placed over the head, carapace, and flippers is the most effective method in keeping a turtle moist.

3) Sea turtles that revive and become active must be released over the stern of the boat only when fishing or scientific collection gear is not in use, when the engine gears are in neutral position, and in areas where they are unlikely to be recaptured or injured by vessels. Sea turtles that fail to respond to the reflex test or fail to move within 4 hours (up to 24, if possible) must be returned to the water in the same manner as that for actively moving turtles.

4) A turtle is determined to be dead if the muscles are stiff (rigor mortis) and/or the flesh has begun to rot; otherwise, the turtle is determined to be comatose or inactive and resuscitation attempts are necessary.

Any sea turtle so taken must not be consumed, sold, landed, offloaded, transshipped, or kept below deck.

These requirements are excerpted from 50 CFR 223.206(d)(1). Failure to follow these procedures is therefore a punishable offense under the Endangered Species Act.

15 APPENDIX C

PROTOCOL FOR COLLECTING TISSUE FROM SEA TURTLES FOR GENETIC ANALYSIS

Method for Dead Turtles

<<<IT IS CRITICAL TO USE A NEW SCALPEL BLADE AND GLOVES FOR EACH TURTLE TO AVOID CROSS-CONTAMINATION OF SAMPLES>>>

1) Put on a new pair of latex gloves.
2) Use a new disposable scalpel to cut out an approx. 1 cm (½ in) cube (bigger is NOT better) piece of muscle. Easy access to muscle tissue is in the neck region or on the ventral side where the front flippers "insert" near the plastron. It does not matter what stage of decomposition the carcass is in.
3) Place the muscle sample on a hard uncontaminated surface (plastron will do) and make slices through the sample so the buffer solution will penetrate the tissue.
4) Put the sample into the plastic vial containing saturated NaCl with 20 % dimethyl sulfoxide (DMSO).*
5) Use the pencil to write the stranding ID number (observer initials, year, month, day, turtle number by day), species, state and carapace length on the waterproof paper label and place it in the vial with the sample. EXAMPLE: For a 35.8 cm curved carapace length green turtle documented by Jane M. Doe on July 15, 2001 in Georgia, the label should read "JMD20010715-01, C. mydas, Georgia, CCL=35.8 cm". If this had been the third turtle Jane Doe responded to on July 15, 2001, it would be JMD20010715-03.
6) Label the outside of the vial with the same information (stranding ID number, species, state and carapace length) using the permanent marker.
7) Place clear scotch tape over the writing on the vial to protect it from being smeared or erased.
8) Wrap parafilm around the cap of the vial by stretching it as you wrap.
9) Place vial within whirl-pak and close.
10) Dispose of the scalpel.
11) Note on the stranding form that a part was salvaged, indicating that a genetic sample was taken and specify the location on the turtle where the sample was obtained.
12) Submit the vial with the stranding report to your state coordinator. State coordinators will forward the reports and vials to NMFS for processing and archiving.

Method for Live Turtles

<<< IT IS CRITICAL TO USE A NEW BIOPSY PUNCH AND GLOVES FOR EACH TURTLE TO AVOID CROSS-CONTAMINATION OF SAMPLES >>>

1) Turn the turtle over on its back.
2) Put on a new pair of latex gloves.
3) Swab the entire cap of the sample vial with alcohol.
4) Wipe the ventral and dorsal surfaces of the rear flipper 5-10 cm from the posterior edge with the Betadine/iodine swab.
5) Place the vial under the flipper edge to use the cleaned cap as a hard surface for the punch.
6) Press a new biopsy punch firmly into the flesh as close to the posterior edge as possible and rotate one complete turn. Cut all the way through the flipper to the cap of the vial.
7) Wipe the punched area with Betadine/iodine swab; rarely you may need to apply pressure to stop bleeding.
8) Use a wooden skewer to transfer the sample from the biopsy punch into the plastic vial containing saturated NaCl with 20 % DMSO.*
9) Use the pencil to write the stranding ID number (observer initials, year, month, day, turtle number by day), species, state and carapace length on the waterproof paper label and place it in the vial with the sample. EXAMPLE: For a 35.8 cm curved carapace length green turtle documented by Jane M. Doe on July 15, 2001 in Georgia, the label should read "JMD20010715-01, C. mydas, Georgia, CCL=35.8 cm". If this had been the third turtle Jane Doe responded to on July 15, 2001, it would be JMD20010715-03.
10) Label the outside of the vial with the same information (stranding ID number, species, state and carapace length) using the permanent marker.
11) Place clear scotch tape over the writing on the vial to protect it from being smeared or erased.
12) Wrap parafilm around the cap of the vial by stretching it as you wrap.
13) Place vial within whirl-pak and close.
14) Dispose of the biopsy punch.
15) Note on the stranding form that a part was salvaged, indicating that a genetic sample was taken and specify the location on the turtle where the sample was obtained.
16) Submit the vial with the stranding report to your state coordinator. State coordinators will forward the reports and vials to NMFS for processing and archiving.

*** The 20 % DMSO buffer in the plastic vials is nontoxic and nonflammable. Handling the buffer without gloves may result in exposure to DMSO. This substance soaks into skin very rapidly and is commonly used to alleviate muscle aches. DMSO will produce a garlic/oyster taste in the mouth along with breath**

odor. The protocol requires that you WEAR gloves each time you collect a sample and handle the buffer vials.

The vials (both before and after samples are taken) should be stored at room temperature or cooler. If you don't mind the vials in the refrigerator, this will prolong the life of the sample. DO NOT store the vials where they will experience extreme heat (like in your car!) as this could cause the buffer to break down and not preserve the sample properly.

Questions:
Sea Turtle Program
NOAA/NMFS/SEFSC
75 Virginia Beach Drive
Miami, FL 33149
305-361-4207

Genetic Sample Kit Materials

- latex gloves
- alcohol swabs
- Betadine/iodine swabs
- 4-6 mm biopsy punch – sterile, disposable (Moore Medical Supply 1-800-678-8678, part #0052442)
- wooden skewer
- single-use scalpel blades (Fisher Scientific 1-800-766-7000, cat. # 08-927-5A)
- plastic screw-cap vial containing saturated NaCl with 20 % DMSO, wrapped in parafilm
- waterproof paper label, ¼" x 4"
- pencil to write on waterproof paper label
- permanent marker to label the plastic vials
- scotch tape to protect writing on the vials
- piece of parafilm to wrap the cap of the vial
- whirl-pak to return/store sample vial

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southeast Regional Office
263 13th Avenue South
St. Petersburg, Florida 33701-5505
http://sero.nmfs.noaa.gov

F/SER31:NB

JUN 02 2014

Colonel Richard Pannell
Commander, Galveston District
Galveston District, Corps of Engineers
Department of the Army
P.O. Box 1229
Galveston, Texas 77558

Ref.: U.S. Army Corps of Engineers, Brazos Island Harbor Channel Improvement Project, Cameron County, Texas

Dear Colonel Pannell:

NOAA's National Marine Fisheries Service (NMFS) provided the U.S. Army Corps of Engineers (USACE) with a Biological Opinion ("Opinion") for the Brazos Island Harbor Channel Improvement Project (BIH) on May 13, 2014. Upon receiving it, the USACE contacted NMFS with questions about the Opinion. This letter addresses those 2 questions regarding the clarification of the incidental take statement (ITS) for sea turtles and the absence of a sentence in the document that had been requested by the USACE. Neither of the 2 questions requires changing the Opinion, and this letter is for clarification only.

First, the Opinion provides the amount of authorized observed take in the ITS of 19 turtles during the project as shown in Table 10 on page 58 (also shown below), but the paragraph before Table 10 states that the original take estimate was 18, which was rounded up to 19. To clarify, the second row of Table 10 shows the calculated estimate of the number of turtles to be taken by the dredge, including fractions of turtles. The sum of the individual species estimates is 17.99, but was incorrectly shown as 18.00. In the next line of the table, the individual species estimates are rounded up to the next integer, which then sum to 19. The individual species estimates in this "Rounded Up" row are the anticipated incidental take levels for the ITS of this opinion. The previous row was intended to show the basis of the anticipated take levels in greater detail.

Table 10. Amount of authorized observed take during the BIH project and associated relocation trawling

During Dredging		Loggerhead	Green	Kemp's Ridley
Total Sea Turtles Observed Taken	18.00	2.90	13.35	1.74
Rounded Up	19.00	3.00	14.00	2.00
During Relocation Trawling				
Total Sea Turtles Relocated	285.00	46	211	28

The second question concerned the omission of a sentence requested by the USACE to be added to the Opinion. The USACE made the following request by email on May 2, 2014:

> *HQ has asked if you would consider adding the following to the end of the "Rationale" paragraph under Reasonable and Prudent Measures # 2: "Compilation of these data will confirm species identification for take compliance for this project." HQ believes this more explicitly ties the tissue sampling requirement to our efforts to monitor impacts to incidental takes.*

The omission of this addition was not intentional but merely an oversight as we worked quickly to get this Opinion to the USACE by the pending deadline of May 13, 2014. We apologize for this oversight.

If you have any questions, please contact Nicole Bonine, Consultation Biologist, at (727) 824-5336, or by email at Nicole.Bonine@noaa.gov. Thank you for your continued cooperation in the conservation of ESA-listed species.

Sincerely,

Roy E. Crabtree, Ph.D.
Regional Administrator

File: 1514-22.F.8
Ref: SER-2013-11766

Brazos Island Harbor, Texas
Channel Improvement Project

Appendix J
Fish and Wildlife Coordination Act – Coordination Act Report

July 2014

APPENDIX J

U.S. FISH AND WILDLIFE COORDINATION ACT REPORT
BRAZOS ISLAND HARBOR
CHANNEL IMPROVEMENT PROJECT
CAMERON COUNTY, TEXAS

U.S. Army Corps of Engineers, Galveston District
2000 Fort Point Road
Galveston, Texas 77550

July 2014

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Texas Coastal Ecological Services Field Office
c/o TAMU-CC, Unit 5837
6300 Ocean Drive
Corpus Christi, Texas 78412-5837

July 25, 2013

Carolyn Murphy
Chief, Environmental Section
U. S. Army Corps of Engineers
Galveston District
P.O. Box 1229
Galveston, Texas 77553

Dear Ms. Murphy:

Enclosed is the U.S. Fish and Wildlife Service's (Service) Fish and Wildlife Coordination Act Report, Brazos Island Harbor Project, Texas July 2013. Both a printed and an electronic version have been provided with this letter.

The Service has been coordinating with the U. S. Army Corps of Engineers (USACE) as well as with the Port of Brownsville (POB) and other state and federal agency representatives on proposals to deepen the Brazos Island Harbor Entrance Channel, Brownsville Ship Channel and Turning Basin since 2007. Although driven, in part, by current federal economic restraints, the Service appreciates the considerable efforts of the USACE to avoid significant impacts to fish and wildlife resources, including federally listed, threatened and endangered species with the tentatively selected plan.

The Service looks forward to working with the USACE and the POB in the future as funding becomes available to proceed with final design and implementation of the BIH Project and, subsequent to project construction, coordination as needed for implementation of maintenance activities over the 50-year project life.

If you have any additional questions, or comments regarding this document, please contact Pat Clements at 361-994-9005 ext 225, or by email at pat_clements@fws.gov.

Sincerely,

E. Dawn Whitehead

for Edith Erfling
Field Supervisor

Enclosure

FISH AND WILDLIFE COORDINATION ACT REPORT

Brazos Island Harbor Channel Improvement Project
For the 52 X 250 feet Alternative
Cameron County, Texas

Submitted by

Patricia Bacak-Clements

U.S. Fish and Wildlife Service
Texas Coastal Ecological Services Field Office
Corpus Christi Field Office
Corpus Christi, Texas

July 2013

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EXECUTIVE SUMMARY

Under the Fish and Wildlife Coordination Act, the U.S. Fish and Wildlife Service (Service) provides conservation measures that Federal and federally-permitted or licensed water development projects are required to consider. Through a transfer funding agreement with the U.S. Army Corps of Engineers (USACE), the Service has prepared this Coordination Act Report (CAR). The proposed Brazos Island Harbor Project (BIH Project), Cameron County, Texas will deepen the entrance channel and main channel portions of the Brownsville Ship Channel. Impacts of the work are proposed to be significantly avoided by utilizing currently authorized dredge material placement areas (DMPAs). Dredged material from the new work and future maintenance activities would be accommodated within the existing boundaries of the DMPAs by elevation of containment dikes rather than outward expansion of the placement areas. The CAR describes the project area of the BIH Project, the habitats, and trust species that could be affected by the project. Additionally, the CAR describes impacts, negative and/or beneficial, as well as measures which could benefit the project's construction and maintenance work on fish and wildlife resources.

The Service reviewed the USACE's Draft Biological Assessment for federally-Listed Threatened and Endangered Species (USACE 2013a) (Draft BA) for the proposed BIH Project. In the Draft BA, the USACE determined that, for the trust resources which are the responsibility of the Service, with the exception of nesting sea turtles, that the proposed project would have "no effect" on each of these species. The USACE did not make a call on the impact of the project to nesting sea turtles. The USACE was advised that the Service does not provide concurrence on "no effect" calls, so if the Draft BA is not revised, there is no need for a response from us. The Service, however, recommends to the USACE that a record of decision is maintained on file that clearly outlines how and why the USACE made each determination. In the event an impact does occur, the USACE would be responsible for those impacts. Within the section of this CAR on federally listed threatened and endangered species are included some conservation recommendations for several species that, in our opinion, if included in the project plans, would provide better protection for the species. If these conservation recommendations are incorporated into the project plans, and the USACE's call, is changed to "may affect not likely to adversely affect", the Service could provide a concurrence letter, offering the USACE better protection under the Endangered Species Act.

The CAR includes the Service's review of each of the federally listed threatened and endangered species, and candidates for listing, that occur in Cameron County. The Service has provided comments regarding the potential for impacts related to the construction and maintenance of the BIH Project, as well as recommendations regarding maintenance over the project's 50-year life. As presented in the USACE's tentatively selected Plan (USACE 2013b), the BIH Project will be designed to avoid direct impact to federally listed species; however, the Service provides recommendations of additional conservation measures to be incorporated into construction and maintenance plans. Recommendations relative to the USACE's Draft BA are included in a text box following each species description. Conservation recommendations are provided for the ocelot (*Leopardus pardalis*), jaguarundi (*Herpailurus yagouaroundi cacomitli*), West Indian manatee (*Trichechus manatus*), piping plover (*Charadrius melodus*), and northern aplomado falcon (*Falco femoralis septentrionalis*).

Of the many diverse habitat types present in the immediate vicinity of the proposed project, three are of special importance to the Service's trust species and for which we have included conservation measures for project construction, maintenance, and over the life of the project. These special habitats are unvegetated tidal flats, which are also in some of the adjacent areas designated piping plover critical habitat, coastal prairie, and vegetated lomas. Although, as the proposed project plan, construction and maintenance of placement area levees would be done from within the existing placement areas, the Service recommends that the importance of not diverting from this approach be emphasized and reinforced with construction crews using: on-site observers to prevent accidental intrusion into areas outside of the levee, education of contractors regarding the importance of these habitats and the need for their protection, and coordination with the Service in cases, such as erosion or storm damage to the levees, prior to initiation of repairs. Additionally, the Service has provided recommendations to assist the USACE and the POB in their responsibilities under the Migratory Bird Treaty Act. Migratory birds should be considered and addressed during construction and throughout the life of the project.

The Service was advised by the POB in a meeting on July 11, 2013, that several years could elapse before funding is in place to construct the BIH Project. As information regarding federally listed species and their habitat requirements changes over time, the USACE and the POB should coordinate with the Service to review and update information regarding federal trust resources within and adjacent to the project area.

INTRODUCTION

The U.S. Fish and Wildlife Service (Service) is mandated to provide expertise during the planning and development of major federal projects, to ensure fish and wildlife resources are conserved, and that impacts to these resources are avoided or minimized.

Regulatory Background:

The Fish and Wildlife Coordination Act (16 U.S.C. 661-667e; the Act of March 10, 1934; Ch. 55; 48 Stat. 401), requires consultation with the Service and State fish and wildlife agencies where the "waters of any stream or other body of water are proposed or authorized, permitted or licensed to be impounded, diverted . . . or otherwise controlled or modified" by any agency under a Federal permit or license. Consultation is to be undertaken for the purpose of "preventing loss of and damage to wildlife resources." Second, The Rivers and Harbors Act of 1938 (33 U.S.C. 540, and other U.S.C. sections; Chapter 535, June 20, 1938; 52 Stat. 802), provides for wildlife conservation to be given "due regard" in planning federally authorized water resource projects.

The Fish and Wildlife Coordination Act provides a basic procedural framework for the orderly consideration of fish and wildlife conservation measures to be incorporated into Federal and Federally-permitted or licensed water development projects. The principle provisions of the Coordination Act include:

1. A statement of Congressional purpose that fish and wildlife conservation shall receive equal consideration with other project features;

2. Mandatory consultation with wildlife agencies to achieve such conservation;

3. Full consideration by action agencies of the recommendations resulting from consultations;

4. Authority for action agencies to implement such recommendations as they find acceptable.

Section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531-1544, 87 Stat. 884, as amended) requires Federal agencies to insure that any action authorized, funded or carried out by them is not likely to jeopardize the continued existence of listed species or modify critical habitat.

The Migratory Bird Treaty Act of 1918 (16. U.S.C. 703-712; Ch. 128; July 13, 1918; 40 Stat. 755, as amended) establishes a Federal prohibition, unless permitted by regulations, to "pursue, hunt, take, capture, kill, attempt to take, capture or kill, possess, at any time, or in any manner, any migratory bird (*e.g.* waterfowl, shorebirds, birds of prey, song birds, etc.) included in the terms of this Convention…for the protection of migratory birds…or any part, nest, or egg of any such bird."

DESCRIPTION OF STUDY AREA

Project Background:

The Brazos Santiago Pass in Cameron County, Texas cuts through the Rio Grande delta and borders the southern boundary of the Lower Laguna Madre of Texas. The Brazos Santiago Pass, once a natural inlet into the Lower Laguna Madre was deepened and expanded with the dredging of the Brazos Island Harbor (BIH) Entrance Channel and the Brownsville Ship Channel (BSC) in 1938 as a permanent commercial waterway and connection to the Gulf of Mexico (Tunnell 2002). The BIH connects to the Gulf Intracoastal Waterway (GIWW), for commercial barge and boat traffic, via the Port Isabel Channel. Immediately west of the BIH Entrance Channel, the BSC borders the southern terminus of the Laguna Madre for a distance of approximately 2 miles along the northern edge of the BSC.

Prior to the current proposal, as noted in the 2007 Project Review Plan (USACE 2007), the most recent deepening of the BSC was authorized by the Water Resources Development Act of 1986. The 2007 Project Review Plan addressed the feasibility of deepening the entrance and jetty channel (2 miles) to 48 feet, deepening the lower 9 miles of main channel to 48 feet, and deepening the upper 7 miles of main channel and turning basin to 45 feet. The feasibility study identified in the Project Review Plan also proposed to investigate potential restoration opportunities of over 6,500 acres of tidal marsh habitats, as well as brush habitat with the Bahia Grande in collaboration with federal and state agencies. The Service participated in interagency coordination team meetings in 2007 and 2008 with the USACE and the Port of Brownsville (POB) to review and discuss options for widening and deepening the BIH Entrance Channel and BSC Main Channel. The current project proposal, taken from the USACE's tentatively selected Plan (USACE 2013b) is summarized in the following section.

Project Description:

The proposed Brazos Island Harbor (BIH) Channel Improvement Project (BIH Project) (USACE 2013b) would extend and deepen the BIH entrance channel, deepen the BIH Jetty Channel, the BSC Main Channel, and BSC Turning Basin. According to the draft, tentatively selected plan the project would extend the BIH Entrance Channel 0.75 miles farther into the Gulf of Mexico to a depth of -54 feet mean lower low water (MLLW) and a width of 300 feet. The existing BIH Entrance Channel would be deepened to a depth of -54 feet MLLW at the existing bottom width of 300 feet. The BIH Jetty Channel would be deepened to -54 feet MLLW at the existing bottom width of 300 feet, transitioning to the existing 400-foot bottom width at the connection with the Laguna Madre. The BSC Main Channel, which has an existing width of 400 feet on the eastern end, transitions into an existing width of 250 feet and is proposed to be deepened to a depth of -52 feet MLLW for approximately 15.5 miles. The western terminus of the BSC and the turning basin (approximately 1.2 miles total) would be maintained at the existing depth of -42 feet MLLW and widths which transition from 325 feet in the main channel to 1200 feet in the turning basin.

The project as proposed would utilize existing disposal areas for new work dredged material, for the expansions, and for maintenance material over the 50-year project life. New work material from channel deepening would be distributed among the existing New Work Ocean Dredged Material Disposal Site (ODMDS) and upland, confined, Dredged Material Placement Areas (DMPAs) 2, 4A, 4B, 5A, 5B, 7 and 8 along the south side of the BSC. In addition, new work material may be placed in DMPA 3, a placement area managed by the San Benito Navigation District and generally used for Port Isabel Channel material. The clay new work material would be stockpiled and used to raise the DMPA 3 dikes for later, unrelated maintenance dredging of the Port Isabel Channel. None of the existing placement areas would be expanded beyond their current footprint. Construction to raise the containment dikes to heights needed to accommodate new work quantities would be done within the footprints of the existing placement areas. The resulting elevations of the placement area dikes for the new work placement activities would range from a total elevation of 12 feet NAVD 88 around DMPA 5A to a total elevation of 36 feet around DMPA 2. Additionally, armoring of the exterior toe of the PA 4A and 4B dikes on the side facing the channel is needed from station 22+000 to 33+800 where the outer toe of the existing placement area dikes is, or is close to, eroding into the ship channel. According to the seagrass survey conducted by the USACE for the project, no seagrass beds are located along the shoreline where the armoring is proposed (USACE 2012a, USACE 2012b).

Placement of maintenance dredging material over the 50-year life of the project is proposed to be into a nearshore Feeder Berm or the existing Maintenance ODMDS, and upland, confined DMPAs 4A, 4B, 5A, 5B, 7 and 8. The Feeder Berm, known as BU Site 1A was authorized in 1988 and is located between 1.5 and 2.5 miles from the north jetty and from 0.4 to 0.9 miles from shore. This site is proposed to receive the maintenance material from the Entrance and Jetty Channels and the first 11,000 feet of the Main Channel. Monitoring by the USACE of the use of BU Site 1A has shown that sediment placed in it moves back into the cross-shore and longshore sediment transport system of South Padre Island. If for some reason the Feeder Berm cannot be used, maintenance material from the Entrance and Jetty Channels would be placed in the Maintenance ODMDS which is located approximately 2.5 nautical miles from shore and north of the channel. Over the 50-year life of the project, the placement area dikes are estimated to be raised from 17 feet NAVD88 at DMPA 5A to 48 feet NAVD88 at DMPA 7.

Although not included in the text of the USACE description of its tentatively selected plan for the BIH project, the plan drawings identify a proposed levee to be constructed on the south side of Placement Area 4B to complete the containment dike system for this DMPA. The new levee would separate the disposal area from an existing loma or mound that has, to date, served as a part of the south boundary of 4B (USACE 2013b).

Project Area Description:

The project area for the BIH Project is situated within and bordered by nearshore areas of the Gulf of Mexico, the southern terminus of the Town of South Padre Island, the northern terminus of Boca Chica Island, the entrance channel to South Bay, and the southern terminus of the Laguna Madre. South Bay was historically connected to the Gulf of Mexico by a washover pass on Boca Chica. Historically, South Bay formed the southern end of the Laguna Madre. South

Bay was cut off, except for a small area, when the Brownsville Ship Channel was deepened in 1938 (Breuer 1962). The entrance into South Bay, which averages approximately 800 feet in width, is bounded by DMPA 4A on the west and Boca Chica Island on the east.

Habitat types within and immediately adjacent to the dredged channel and leveed disposal areas of the Brownsville Channel include permanently inundated marine waters, unvegetated shallow water areas, sea grass beds, tidal flats, sand flats, emergent low and high marsh, upland coastal prairie, and upland brushlands including lomas. Rainfall in the region averages 26 inches per year; however, the timing of the rains is irregular, and intermittent (Shearer 2003). Storm events including hurricanes may contribute much of the annual precipitation in a few days. A map of United States drought conditions, published online by the National Oceanic and Atmospheric Administration (NOAA) indicates that the project area is currently within a zone of extreme to exceptional drought (Rosencrans 2013).

Fish and Wildlife Resources:

The work on the BIH Project is proposed to be confined to the permanently inundated marine environment of the channel in the Gulf of Mexico, plus an additional 0.75-mile extension of the BIH Entrance Channel east into the Gulf of Mexico, the existing BIH Entrance Channel, BSC Main Channel, BSC Turning Basin, and the existing DMPAs. There are, however, three important habitat types, for Service trust resources, in immediate proximity to the project footprint that the USACE and POB should be aware of, and knowledgeable about, during construction and maintenance, and throughout the life of the project. These are tidal flats, coastal prairie, and vegetated lomas. Protection and preservation of these habitat types is highly important to several federally listed threatened and endangered species, as well as to the overall environmental health of the South Texas ecosystem.

Tidal Flats

The tidal flats are a significant feature of the Laguna Madre and unique in being more affected by wind and storm tides than by astronomical tides (Tunnell 2002). Likely minor changes in elevation in tidal flats from accretion of sediments carried from the disposal area could have no or minor impact to these areas, and could possibly counter the effects of long-term sea level rise; however, the difference between no, or positive, benefit and adverse impact are very small in this region of the Texas coast. Wind tidal flats have been well documented as providing important foraging habitat for large numbers of resident and wintering shore birds, wading birds and waterfowl (Tunnell 2002). Additionally, piping plover Critical Habitat Texas Unit 1 (CH TXU1) extends south and east from DMPA 2, 4A and 4B. Although the BIH Project does not propose to directly impact tidal flats adjacent to the DMPAs, over the life of the project, storm damage or erosion could result in impacts to these areas. A significant storm impact could result in relocation of disposal area material including, possibly levee material. While the Service understands that standard procedures for POB levee repairs occur from the inside of the DMPAs, if erosion has moved material outwards, on the south side of the disposal areas, sediments that have become deposited should be removed for the health of the tidal flat. The Service recommends that the USACE and POB document existing elevations of the flats, particularly those of CH TXU1 near the dikes of the disposal areas, and be aware of changes that occur in these areas over time and following storm events. If changes occur to the elevations of CH TXU1 from the movement of disposal area or levee material, the Service recommends that the USACE consult with the Service.

Coastal Prairie

Coastal prairie consists of open terrain with scattered trees or shrubs and is a required habitat for endangered falcons. In the proposed project area, this species forages and nests along yucca covered sand ridges of the coastal prairies (Service 1990).

Important plant species of the coastal prairie include salt-tolerant species such as sea ox-eye daisy (*Borrichia frutescens*), saltwort (*Batis maritima*), glasswort (*Salicornia* sp.), saltgrass (*Distichlis spicata*), and salt-flat grass (*Monanthochloe littoralis*) in the lower coastal prairie flats. Higher areas of the flats will support Gulf cordgrass (*Spartina spartinae*), four-flower trichloris (*Trichloris pluriflora*), and Spanish dagger (*Yucca treculeana*) (Lonard 1991).

As previously noted, the BIH Project does not propose to impact new areas, including the coastal prairie areas south of the DMPAs. As the port grows, however, and if the BIH Project is constructed, new and expanded facilities at the port could cause additional pressures on this habitat. The Service recommends that the USACE and the POB maintain communication with the Service and refuge staff regarding aplomado falcons in the area.

Lomas

Lomas, or tidal flat islands, adjacent to and south of the BIH Project area support a dense cover of woody vegetation and other native species where they have not been impacted by humans. As noted in a report completed for the I-69 Highway project, this habitat type is important to a range of species including migratory and neotropical birds (Service 2008b), as well as to, a range of species important to, the federally listed ocelot and jaguarundi.

Important plant species of the lomas include Spanish dagger, mesquite (*Prosopis glandulosa*), huisache (*Acacia smallii*), brasil (*Condalia hookeri*), Texas ebony (*Pithecellobium ebano*), tepeguaje (*Leucaena pulverulenta*), granjeno (*Celtis pallida*), prickly pear (*Opuntia lindheimeri*), lotebush (*Ziziphus obtusifolia*), night-blooming cereus (*Acanthocereus pentagonus*), Texas kidneywood (*Eysenhardtia texana*), allthorn (*Castela texana*), and others in this diverse chaparral association (Lonard 1991) (Everitt 1993).

On July 11, 2013, Service biologists met with Port of Brownsville officials to conduct an on-site inspection of the loma adjacent to DMPA 4B, identified as 'MOUND' on the project plans, where a new levee is proposed to be constructed to complete containment for the placement area. POB representatives noted that all work, both construction and maintenance of containment dikes for the project would be conducted from inside the disposal area, including any necessary work to raise levees for accommodating dredge material over the 50-year life of the project; therefore, no work corridor would be needed along the outside perimeter of the proposed new dike. The Service recommended, and the POB representatives were in agreement that an offset distance from the toe of the existing loma of approximately 30 feet would provide a reasonable separation from the loma vegetation complex. The Service recommends that the levee alignment follow the outer curve of the loma; however, if a straight-line orientation is determined to be needed for construction by the USACE design engineers, then the toe of the new levee at its closest point be located 30 feet from the loma. The outer edge of the loma begins where the land elevation begins to rise and the plant association shifts from the predominantly vegetated tidal flat complex, typified by batis, salicornia and related wetland species, to upland species such as those listed in the paragraph above. The Service agreed with POB representatives that nearby scattered mesquite trees are within the DMPA 4B boundary and not a part of the loma. The Service would like to participate in pre-construction meetings for the project to assist the USACE and POB in educating staff and contractors for the BIH Project about this important habitat type which is a unique and vital component of the South Texas landscape.

Migratory birds

The birds, nests, and eggs of migratory birds are protected under the Migratory Bird Treaty Act as noted in the section on Regulatory Background in this CAR. Cameron County is avian rich as evidenced by the 413 species of birds recorded at nearby Laguna Atascosa National Wildlife Refuge (Service 2008a) and the 403 species of birds at Santa Ana National Wildlife Refuge (Service 2011). Many of the bird species recorded for Cameron County sites are spring and/or fall migrants. The mild climate and diverse habitats of Cameron County also support a rich variety of nesting birds. Of particular importance to the activities of the BIH Project construction and maintenance activities are ground-nesting avian species that utilize the sparse or unvegetated substrates which might be found on the containment dikes and within the DMPAs. These include: the snowy plover (*Charadrius nivosus*), Wilson's plover (*Charadrius wilsonia*), killdeer (*Charadrius vociferus*), and least tern (*Sterna antillarum*). If, because of extended periods between maintenance dredging cycles, depressional ponds and some emergent wetland vegetation develops within a DMPA, other bird species could opportunistically nest within the project area such as the black-necked stilt (*Himantopus mexicanus*), and American avocet (*Recurvirostra americana*). The greater the time period between dredging cycles, the more likely a given DMPA is to become stabilized with vegetation and other features that could support nesting birds. As the BIH Project plan is for a 50-year project life, the USACE should coordinate with the Service and review conditions in the DMPAs prior to each dredging event with a goal of understanding conditions which may be conducive to support nesting birds.

The Service recommends activities requiring vegetation removal or disturbance avoid the peak nesting period of March 1 through August 31 to avoid destruction of individuals, nests, or eggs. If project activities must be conducted during this time, the Service recommends surveying for nests prior to commencing work. If a nest is found, and if possible, the Service recommends a buffer of vegetation ($\geq$ 50m for songbirds, > 100m for wading birds, and > 180m for terns, skimmers and birds of prey) remain around the nest until young have fledged or the nest is abandoned. A list of migratory birds may be viewed at http://migratorybirds.fws.gov/intrnltr/mbta/proposedbirdlist.pdf or http://federalregister.gov/a/2010-3294.

Federally Regulated Species:

The proposed project area for the BIH Project is entirely within the boundary of Cameron County, Texas and within State-owned submerged lands and federal waters of the Gulf of Mexico. The species, federally-listed as threatened or endangered, for this county, as well as any candidates proposed for listing, and critical habitat, are discussed below. As presented in the tentatively selected plan, the BIH Project has been designed by the USACE to avoid direct impact to federally listed species; however, the Service is including recommendations of conservation measures to be incorporated into construction and maintenance plans. Conservation recommendations are provided for the ocelot (*Leopardus pardalis*), jaguarundi (*Herpailurus yagouaroundi cacomitli*), West Indian manatee (*Trichechus manatus*), piping plover (*Charadrius melodus*), and northern aplomado falcon (*Falco femoralis septentrionalis*). These species should be considered in the decision-making process for the construction and maintenance dredging plans. Additionally, over the 50 year life-of-project, new opportunities could arise, or be required, for managing dredge materials and the authorized placement areas. As these issues arise, impacts to the species listed above will need consideration and consultation. Other species that may also need additional consideration and consultation over the 50-year life of the project include the 5 species of nesting sea turtles, Texas ayenia (*Ayenia limitaris*), the red knot (*Calidris canutus* ssp. *rufa*), and Sprague's pipit (*Anthus spragueii*).

__Ocelot__

Description/Habitat: The ocelot is a medium-sized (30-41 inches long and 15-30 lbs) feline. Its body coloration is variable; with the upper parts gray or buff with dark brown or black spots, small rings, blotches, and short bars. The under parts are white spotted with black. The tail is ringed or marked with dark bars on the upper surface. The backs of the rounded ears are black with a white central spot. They hunt and move around beginning at dusk. Their area of activity is normally 1-4 square miles. The female ocelot hunts during the night but spends the day at the den site. Kittens are born from late spring through December. The usual litter size is one or two kittens. They accompany the mother on hunts at about 3 months of age and stay with her until they are about a year old (Service 1995).

In Texas, the ocelots occur in dense shrubland. Although the ocelot's prime habitat needs are 70 to 90% canopy coverage, it will utilize a lesser degree of cover for hunting areas, and as protected corridors for travel. Tracts of at least 100 acres of isolated dense brush, or 75 acres of brush interconnected with other habitat tracts by brush corridors are important, however, ocelots will use tracts as small as 5 acres, when adjacent to larger areas of habitat. Roads, narrow water bodies, and rights-of-way, brushy fence lines, watercourses and other brush strips connecting areas of habitat are important habitat (Service 2010).

The ocelot population in Texas is very small; probably no more than 80 to 120 individuals (1993 estimate) and approximately 30-35 are known to occur in the chaparral remaining at or near the Laguna Atascosa National Wildlife Refuge in Cameron County (Mitch Sternberg, Ocelot Recovery Team Leader, LRGVNWR, pers. com., 2013). Although the distribution of these endangered cats is limited for the most part to the southern portion of Texas, a northern population of ocelot may range through portions of Jim Wells, Live Oak, Atascosa, and McMullen, San Patricio and Aransas counties.

Threats: Population declines are primarily due to habitat loss associated with clearing of brush. Losses of individuals in recent years have been predominately due to collisions with vehicles as the cats attempt to cross roads to gain access to other areas (Mitch Sternberg, Ocelot Recovery Team Leader, LRGVNWR, pers. com., 2013) .

Issues for Brazos Island Harbor Project: As proposed, the BIH Project, new work and maintenance activities and DMPAs will not impact areas supporting brush habitat, including two lomas adjacent to DMPAs 4A and 4B. The Service recommends that a proposed new levee on the south side of DMPA 4B be constructed in such a manner that the outer toe of the levee will terminate at least 30 feet from the outer edge of the loma. Also, personnel involved in levee construction and maintenance should be instructed to strictly avoid driving equipment onto any part of the loma. Cat sightings should be reported immediately to the Ocelot Recovery Team Leader (956-784-7592).

Draft Biological Assessment for Federally-Listed Threatened and Endangered Species, Brazos Island Harbor Channel Improvement Project, USACE, June 2013

Comments and Recommendations:

Although the BIH Project new and maintenance work is not proposed to directly impact brush vegetation, this species may use a variety of habitats for moving between preferred habitat sites. The Draft BA notes that this species is known to occur in areas around the project area. An important conservation measure is to conduct work, particularly construction work only during daylight hours. Additionally, the Service recommends that the conservation measures included in the issues section above be incorporated into the project construction and maintenance plans. If these measures are adopted, the Service would agree that the project may affect, but is not likely to adversely affect the ocelot.

Jaguarundi

Description/Habitat: The jaguarundi is a small, slender-bodied, unspotted cat, slightly larger than a domestic cat (8-16 lbs). They have a long tail, short legs, small, flattened head and have two color phases, a rusty-brown and a charcoal gray. They hunt primarily in the morning and evening. They are not as cautious as the ocelot and have been observed during the day. It is believed that the jaguarundi is similar to the ocelot in their requirement for dense brush cover, however, information from Mexico indicate that they may be more tolerant of open areas. They are good swimmers and enter the water freely. Mating season occurs in November and December, and kittens have been reported in March and also in August. Gestation period is 9 to 10 weeks and litters contain two to four young (Service 2012).

In Texas, the jaguarundi occurs in dense shrub lands. Although the distribution of these endangered cats is limited for the most part to the Rio Grande Valley, there have been unconfirmed sightings of jaguarundi as far north as Aransas, Jim Wells, Kleberg, Live Oak, and San Patricio counties.

Threats: Habitat loss and alteration, primarily due to brush clearing, and predator control activities threaten the jaguarundi (Service 2012).

Issues for Brazos Island Harbor Project: As proposed, the BIH Project, new work and maintenance activities and DMPAs will not impact areas supporting brush habitat, including two lomas adjacent to DMPAs 4A and 4B. The Service recommends that a proposed new levee on the south side of DMPA 4B will be constructed in such a manner that the outer toe of the levee will terminate at least 30 feet from the outer edge of the loma. Also, personnel involved in levee construction and maintenance should be instructed to avoid driving equipment onto any part of the loma. Cat sightings should be reported immediately to the Ocelot Recovery Team Leader (956-784-7592).

Draft Biological Assessment for Federally-Listed Threatened and Endangered Species, Brazos Island Harbor Channel Improvement Project, USACE, June 2013

Comments and Recommendations:

Because this species can utilize habitats similar to those of the ocelot, the Service recommends that conservation measures, recommended for the ocelot as follows be adopted:

Although the BIH Project new and maintenance work is not proposed to directly impact brush vegetation, this species may use a variety of habitats for moving between preferred habitat sites. The Draft BA notes that this species is known to occur in areas around the project area. An important conservation measure is to conduct work, particularly construction work only during daylight hours. Additionally, the Service recommends that the conservation measures in the issues section above be incorporated into the project construction and maintenance plans. If these measures are adopted, the Service would agree that the project may affect, but is not likely to adversely affect the jaguarundi.

Northern aplomado falcon

Description/Habitat: The name aplomado means “steel gray” in Spanish. The aplomado falcon is a medium sized falcon with a total length about 15-18 inches with a wingspan about 32-36 inches. Adults are characterized by rufous (rust) under parts, a gray back, a long, banded tail and a distinctive black and white facial pattern. They are extremely fast in level flight and agile on foot. Aplomado falcons hunt together, soar together, perch near one another, and even feed together outside the breeding season. During the spring of their second year, pair bonds are formed. They do not construct their own nest, but use the stick platforms built by other birds. Nests are usually 1-3 feet in diameter. They nest only once a year during the dry season

(January-June) with most nesting occurring in April and May. They lay 2-3 eggs between the months of March and June and both parents incubate the eggs. Eggs hatch in about 32 days, and nestlings fledge at 32 to 40 days (Service 1990).

Their habitat consists of open terrain with scattered trees, relatively low ground cover, abundance of insects and small to medium-sized birds as well as rodents and reptiles for prey, a supply of previously constructed nests, and above ground nesting substrate such as Spanish dagger and mesquite habitat. As falcons do not construct stick platforms, availability of nesting platforms may be a factor limiting populations within otherwise ideal habitat (Service 1990).

Threats: Habitat degradation due to brush encroachment and grassland degradation from overgrazing, conversion of habitat to agriculture, urban and suburban sprawl, and organochlorine pesticide contamination (Service 1995).

Issues for Brazos Island Harbor Project: As proposed there are no known nest sites in or immediately adjacent to the BIH project new work and maintenance DMPAs; however, nest structures that could be utilized by the aplomado falcon have been documented approximately ½ half mile south of DMPA 7, and DMPA 5A.

Prior to work commencing for the new work project and future maintenance work, areas adjacent to the levees on the south side of the DMPAs, and near the lomas at DMPA 4A and 4B will be evaluated for suitable habitat. Grassland and savannah habitats with abundant small birds and stick nests built by ravens or other raptors should receive special attention. During March through June, all large stick nests should be examined from a distance for signs of adults incubating eggs or brooding chicks. Observers should remain a safe distance away from the nest or perch, at least 100-300 yards, depending on the sensitivity of the individual bird, and keep human contact to a minimum. If suitable habitat is found to exist within 100 yards of a DMPA levee, further surveys should be performed and the Service should be contacted for review of survey results and impact determinations.

Over the 50 year life-of-project, assessment and review of the maintenance program, particularly for disposal options which currently are not proposed, may in the future become important to re-visit. At that time, impacts to this species will need consideration and consultation.

Draft Biological Assessment for Federally-Listed Threatened and Endangered Species, Brazos Island Harbor Channel Improvement Project, USACE, June 2013

Comments and Recommendations:

Although the BIH Project new and maintenance work is not proposed to directly impact foraging or potential nesting habitat of this species, coastal prairie is found south of the dredge material placement areas. An important conservation measure is to evaluate adjacent prairie for use by nesting aplomado falcons prior to commencing new work or maintenance activities, particularly areas in close proximity to levees (within 100 yards). If these measures, as outlined in the issues section above, are adopted and incorporated into project construction and maintenance plans, the Service would agree that the project may affect, but is not likely to adversely affect the aplomado falcon. Additionally, the USACE should coordinate with Service's National Wildlife Refuge biologists to stay apprised of the latest information regarding nesting sites and foraging areas for the aplomado falcon.

West Indian (=Florida) manatee

Description/Habitat: Manatees are massive gray to gray-brown, herbivorous aquatic mammals. They have fusiform, seal-like bodies, tails broadened into a horizontal paddle, no hind limbs, and front limbs formed into paddle-like flippers. They are hairless except for 3-4 stiff whiskers on the snout. Manatees are docile, harmless and completely defenseless. They feed on a variety of submerged, emergent and floating aquatic and marine plants, consuming 10-15% of their body weight daily. They may be solitary or in groups of two or three in warm-water aggregations during cold spells (Service 1995).

The manatee prefers shallow, slow moving rivers, river mouths, estuaries, bays and other coastal ecosystems in subtropical to tropical waters. They are extremely sensitive to cold temperatures and can be found in water that is fresh, salty, turbid, clear, acidic, or alkaline. Some may travel great distances (125 miles or more) along the coast or when moving from one island to another. (Service 1995)

In Texas, strandings have occurred in Galveston, Willacy, and Matagorda counties. Other live sightings have occurred along the Texas coastline with one in 1994 in the Lower Laguna Madre, Cameron County, and the most recent in the Corpus Christi Ship Channel in Nueces County in July 2013.

Threats: Current threats to the species include loss of habitat and human-related mortality caused primarily by water craft collisions, poaching, entanglement in fishing nets and line, and crushing or drowning in flood gates. Natural causes of mortality are related to cold temperature exposures, red tide, and disease (Service 1995).

Issues for Brazos Island Harbor Project: Close coordination between the Service and the USACE should be initiated when a manatee has been sighted along the Texas Gulf Coast when project construction or maintenance activities are planned or are underway. Experience with manatees documented on along the Texas coast is that the individuals can move over large distances, and in an unpredictable pattern. Dredging operators should be instructed to contact the

Texas Marine Mammal Stranding Network at (361) 947-4313 or the group's hotline at (800) 962-6625 if a manatee is sighted. If dredging operations are occurring or planned in the area of a recently sighted manatee, operators should be instructed to be cautious when operating boats to prevent a collision with a manatee.

We recommended the following measures be included in construction and maintenance project plans:

a. Training should be provided on avoiding potential impacts on the West Indian manatee for all personnel involved in construction and maintenance of in-water dredging activities.
b. The training information should advise contractors and staff that manatees may be found in the Brazos Island Harbor Entrance Channel, the Brownsville Ship Channel, and adjacent areas of the Lower Laguna Madre.
c. The training materials should include a poster to assist in identifying the mammal.
d. The training materials should instruct personnel not to feed or water the animal, and
e. The training materials should include instructions to call the Corpus Christi Office of the Texas Coastal Ecological Services Field Office (TCESFO-CC) in the event a manatee is sighted in or near the project area.

Draft Biological Assessment for Federally-Listed Threatened and Endangered Species, Brazos Island Harbor Channel Improvement Project, USACE, June 2013

Comments and Recommendations:

As is noted in the Draft BA, a manatee could enter into the project area during construction or maintenance activities. Although sightings of manatees are rare along the Texas coast, they do occur. For this reason, the Service consistently recommends the education measures outlined above in the issues section as a conservation measure for similar projects along the coast. With the incorporation of these measures, the Service would agree that the project may affect, but is not likely to adversely affect the manatee.

Piping plover

Description/Habitat: The piping plover is a small, stocky, shorebird about 7 inches long with a wingspan of about 15 inches. Adults have a sand-colored upper body, white undersides, and orange legs. A white rump, which is visible in flight, distinguishes this species from other small plovers. During the breeding season, adults acquire a dark narrow breast band, a dark strip across the forehead and black-tipped orange bill. They breed on sandy beaches along the Atlantic Coast from Canada to North Carolina, and along the sand and gravel shores of the Lakes Michigan and Superior. In Michigan, they nest on river sandbars and islands, barren shorelines of inland lakes, and alkali wetlands in the northern Great Plains of Canada and the United States. They spend 60-70% of the year on the wintering grounds along the coastal regions from North Carolina through Texas, adjacent barrier islands, and to the islands of the Caribbean. Piping plovers winter in Texas from approximately arriving as early as July, and some individuals may be found year-round on the Texas coast (Service 2001). On their wintering grounds, piping plovers feed on organisms that live in exposed wet sand in wash zones, intertidal ocean beach, in the debris line left from high tide (wrack lines), wash over passes, and mud- sand-algal wind tidal flats. The birds also forage on shorelines of freshwater streams, ephemeral ponds, lagoons and salt marshes. They use beaches adjacent to foraging areas for roosting and preening. Small sand dunes, debris, and sparse vegetation within adjacent beaches provide shelter from wind and extreme temperatures.

Threats: Threats to wintering populations include habitat loss and degradation due to coastal development, recreation, navigation, dredging, and shoreline stabilization and replenishment projects. Each has been major contributor to this species decline. Rising sea levels associated with climate change are expected to affect the amount, physical shape, and quality of the habitat for this species as well as, potentially, the community composition of prey species consumed by the piping plover and other shorebirds (Service 2003).

Issues for Brazos Island Harbor Project: No placement of dredge material, or beach nourishment activities will occur within areas of proposed or designated critical habitat; however piping plovers may opportunistically utilize unvegetated tidal flats in a wide range of areas because of extreme high or low tides or inclement weather conditions.

Over the 50 year life-of-project, assessment and review of the maintenance program, particularly for disposal options which currently are not proposed, may in the future become important to re-visit. At that time, impacts to this species will need consideration and consultation.

Draft Biological Assessment for Federally-Listed Threatened and Endangered Species, Brazos Island Harbor Channel Improvement Project, USACE, June 2013

Comments and Recommendations:

The Draft BA describes, and the Service agrees, that the project as proposed will not directly impact designated critical habitat of the piping plover. The Draft BA also describes, and the Service agrees, the unvegetated sand flats within dredge material placement areas could, at times, be utilized by piping plovers for foraging or roosting. A recommended conservation measure prior to placement of dredge material is to survey the area for use by the piping plover. Some Issues of Concern for wintering piping plovers include: cold temperatures (below 40 ° F), high winds (above 15-20 mph), and precipitation. Under these conditions, especially in combination, piping plovers are likely to roost to conserve energy and body reserves. Disturbing birds under these conditions will cause stress to the birds. A survey of disposal areas that support unvegetated sand flats to ensure that the area is not being utilized by roosting piping plovers would help achieve the goal of avoiding harm to the piping plover from dredge maintenance activities.

By incorporating the above conservation measure into the BIH Project construction and maintenance plans, the Service would agree that the project may affect, but is not likely to adversely affect the piping plover.

Green sea turtle (*Chelonia mydas*)

Description/Habitat: The carapace of the adults of this member of the Family Cheloniidae can grow to a length of four feet and range from 250 to 450 pounds. The adult's carapace is smooth, lacks a keel (center ridge), and is light to dark brown with dark mottling. They are mostly herbivorous, feeding on marine algae and shallow meadows of sea grasses. Small mollusks, sponges, crustaceans and jellyfish are also often consumed. Open beaches with sloping platforms and minimal disturbance are required for nesting. A variety of sand types are used for nesting, but must be friable and well drained. Clutch sizes range from 75 to 250 eggs with incubation lasting from 48 to 70 days. Nocturnal nesting occurs in 2, 3, or 4 year intervals and as many as seven clutches may be laid in one season. Renesting is usually within 1 mile from the previous nesting site (Service 1995).

Green sea turtles are distributed worldwide in tropical and subtropical waters. They are found in shallow waters (except when migrating) in or near reefs, bays, estuaries, and inlets, and especially within seagrass beds. Favored habitat appears to be lagoons and shoals with an abundance of marine grass and algae (Service 1991). This species has been documented nesting on the Texas coast including the Gulf beaches of South Padre Island.

Threats: Human exploitation of eggs and meat as a food source is a major threat as is mortality from commercial fishing operations and dredging, and habitat (nesting) disturbance (beach development). Rising sea levels associated with climate change are expected to affect the amount, physical shape, and quality of the nesting habitat for this species (Service 1991).

Issues for Brazos Island Harbor Project: All sea turtles, except when on nesting beaches, are the trust resource of NMFS. Sea turtles on beaches are the trust resource of the Service. As proposed, no new work or maintenance dredge material is proposed to be placed on Gulf of Mexico beaches to avoid impact to nesting sea turtles. Green sea turtles could occur in areas of the ship channel that support submerged aquatic vegetation (SAV). According to information provided in the project plan materials, some SAV occurs in shallow shoreline areas along the channel between stations 3+000 and 18+000 (USACE 2012a, USACE 2012b). The USACE proposes to avoid impacts to these seagrass beds. Green sea turtles may also occur in the Brazos Island Harbor entrance channel along the jetties. In general, best management practices with regard to nesting sea turtles include completion of all dredging outside of the turtle nesting season of March 15 to October 15. Additionally, the Service recommends: use of on-ship observers; screening dredge intake pipes; sea turtle deflection on drag head; dredge take reporting; use of shielded, low-sodium vapor lights; and turning off, lowering, and shielding non-essential lighting. If dredging activities are anticipated to continue past March 15th, into the turtle nesting season, the Service requests that this office be notified two weeks prior to that date to discuss appropriate conservation measures. Additionally, the Service would like to receive a copy of the biological opinion for the USACE's consultation with NMFS.

Over the 50 year life-of-project, assessment and review of the maintenance program, particularly for disposal options which currently are not proposed, may in the future become important to re-visit. At that time, impacts to this species will need consideration and consultation.

Draft Biological Assessment for Federally-Listed Threatened and Endangered Species, Brazos Island Harbor Channel Improvement Project, USACE, June 2013

Comments and Recommendations:

Sea turtles on the beach, whether nesting or stranded, are a trust resource of the Service; therefore, we recommend that the USACE make an effects determination of the BIH Project on the green sea turtle.

Kemp's ridley sea turtle (*Lepidochelys kempii*)

Description/Habitat: This is the smallest member of the sea turtle Family Cheloniidae, reaching 75-100 pounds. It has an unusually broad, heart-shaped, keeled carapace that is serrated behind the bridge. It has a triangular head and somewhat hooked beak with large crushing area. Juveniles have a dark-charcoal colored carapace and as they age this color changes to olive-green or grey. The lower shell has a light yellowish color. Diet consists primarily of crabs, shrimp, snails, sea urchins, sea stars, fish and occasionally marine plants may be consumed. A well-defined and elevated dune area is preferred for nesting. They prefer sections of beach backed up by extensive swamps, or large bodies of water having seasonal, narrow ocean connections. Average clutch size is 105 eggs with nesting taking place between April and June, primarily during daylight hours, and often in groups called arribada. A single female is capable of nesting three times per season (Service 1995).

The largest nesting population is found on the Playa del Rancho Nuevo, in the State of Tamaulipas, Mexico. Solitary females nest on Padre Island National Seashore and on other locations in the western Gulf of Mexico, as far north as Galveston, Texas and south to Boca Chica Island in Cameron County, Texas. Juveniles have been documented in Texas bays and estuaries, including the Laguna Madre.

Threats: The Kemps is threatened by human exploitation of eggs and meat, mortality from incidental commercial fishing operations, primarily shrimp trawling. Added threats to this species are from predation on eggs by raccoons, coyotes, and other carnivores. Rising sea levels associated with climate change are expected to affect the amount, physical shape, and quality of the nesting habitat for this species. (NMFS 2011)

Issues for Brazos Island Harbor Project: All sea turtles, except when on nesting beaches, are the trust resource of NMFS. Sea turtles on beaches are the trust resource of the Service. As proposed, no new work or maintenance dredge material is proposed to be placed on Gulf of Mexico beaches to avoid impact to nesting sea turtles. In general, best management practices with regard to nesting sea turtles include completion of all dredging outside of the turtle nesting season of March 15 to October 15. Additionally, the Service recommends: use of on-ship observers; screening dredge intake pipes; sea turtle deflection on drag head; dredge take reporting; use of shielded, low-sodium vapor lights; and turning off, lowering, and shielding non-essential lighting. If dredging activities are anticipated to continue past March 15th, into the turtle nesting season, the Service requests that this office be notified two weeks prior to that date to discuss appropriate conservation measures. Additionally, the Service would like to receive a copy of the biological opinion for the USACE's consultation with NMFS.

Over the 50 year life-of-project, assessment and review of the maintenance program, particularly for disposal options which currently are not proposed, may in the future become important to re-visit. At that time, impacts to this species will need consideration and consultation.

Draft Biological Assessment for Federally-Listed Threatened and Endangered Species, Brazos Island Harbor Channel Improvement Project, USACE, June 2013

Comments and Recommendations:

Sea turtles on the beach, whether nesting or stranded, are a trust resource of the Service; therefore, we recommend that the USACE make an effects determination of the BIH Project on the Kemp's ridley sea turtle.

Hawksbill sea turtle (*Eretmochelys imbricata*)

Description/Habitat: The hawksbill is one of the smaller members of the Family Cheloniidae, reaching 95-165 pounds. The shell is elongated and oval, and the scutes (shell plates) overlap. The carapace (top shell) is brown and strikingly patterned with yellow, orange or reddish-brown. Their beaks are relatively long and pointed like a hawk's bill. Nesting is nocturnal, occurring every 2 to 3 years, and several clutches may be laid during the season at two-week intervals. Average clutch size is 160 eggs. Hatchlings primarily eat sponges and are often found in floating masses of sea plants. Hawksbills are found in rocky areas, reefs, shallow coastal areas, and lagoons of oceanic islands, generally in waters less than 60 feet deep (Service 1995). They are found worldwide in subtropical and tropical seas. In the U.S. nesting is limited to Florida but may be found along the Texas Coast from Jefferson to Cameron County.

Threats: Human exploitation of eggs and carapace is a major threat as well as predation on hatchlings by ants, crabs, birds, and mammals can be an occasional problem (NMFS 1993). Rising sea levels associated with climate change are expected to affect the amount, physical shape, and quality of the nesting habitat for this species.

Issues for Brazos Island Harbor Project: All sea turtles, except when on nesting beaches, are the trust resource of NMFS. Sea turtles on beaches are the trust resource of the Service. As proposed, no new work or maintenance dredge material is proposed to be placed on Gulf of Mexico beaches to avoid impact to nesting sea turtles. In general, best management practices with regard to nesting sea turtles include completion of all dredging outside of the turtle nesting season of March 15 to October 15. Additionally, the Service recommends: use of on-ship observers; screening dredge intake pipes; sea turtle deflection on drag head; dredge take reporting; use of shielded, low-sodium vapor lights; and turning off, lowering, and shielding non-essential lighting. If dredging activities are anticipated to continue past March 15^{th}, into the turtle nesting season, the Service requests that this office be notified two weeks prior to that date to discuss appropriate conservation measures. Additionally, the Service would like to receive a copy of the biological opinion for the USACE's consultation with NMFS.

Over the 50 year life-of-project, assessment and review of the maintenance program, particularly for disposal options which currently are not proposed, may in the future become important to re-visit. At that time, impacts to this species will need consideration and consultation.

Draft Biological Assessment for Federally-Listed Threatened and Endangered Species, Brazos Island Harbor Channel Improvement Project, USACE, June 2013

Comments and Recommendations:

Sea turtles on the beach, whether nesting or stranded, are a trust resource of the Service; therefore, we recommend that you make an effects determination of the BIH Project on the hawksbill sea turtle.

Leatherback sea turtle (*Dermochelys coriacea*)

Description/Habitat: This member of the Family Dermochelyidae is the largest of all marine turtles, reaching weights between 650 and 1,200 pounds and above. This turtle has lost its shell plate and is covered with smooth, mottled brown or mottled slaty-black to dark bluish-black skin with seven longitudinal dorsal ridges. Diet may include sea urchins, squid, crustaceans, tunicates, fish, blue-green algae, and floating seaweed, but the principal diet component is jellyfishes. Females nest at night, at 2 to 3 year intervals with as many as 10 clutches laid in a single season. The average clutch size is 80 to 85 eggs, with maturation taking 6 to 10 years. Leatherbacks are the most pelagic (open sea) species of the sea turtles (NMFS 1992).

This species is distributed worldwide; forages in temperate waters and nesting in tropical and subtropical latitudes. Preferred nesting sites are sandy, sloping beaches backed-up by vegetation on mainland or islands near deep water and rough seas. In the United States, nesting is restricted to the Florida Coast (NMFS 1992). However, they have been found occasionally along the Texas coast from Jefferson to Cameron County. The most recent confirmed nesting of this species on the Texas coast was in 2008; however, an individual was observed off shore of South Padre Island in March of 2013.

Threats: Human exploitation of eggs and meat, destruction of nesting habitat, and predation by crabs, sharks and other fish, reptiles, and mammals on eggs and hatchlings threaten leatherback sea turtles. Rising sea levels associated with climate change are expected to affect the amount, physical shape, and quality of the nesting habitat for this species.

Issues for Brazos Island Harbor Project: All sea turtles, except when on nesting beaches, are the trust resource of NMFS. Sea turtles on beaches are the trust resource of the Service. As proposed, no new work or maintenance dredge material is proposed to be placed on Gulf of Mexico beaches to avoid impact to nesting sea turtles. In general, best management practices with regard to nesting sea turtles include completion of all dredging outside of the turtle nesting season of March 15 to October 15. Additionally, the Service recommends: use of on-ship observers; screening dredge intake pipes; sea turtle deflection on drag head; dredge take reporting; use of shielded, low-sodium vapor lights; and turning off, lowering, and shielding non-essential lighting. If dredging activities are anticipated to continue past March 15th, into the turtle nesting season, the Service requests that this office be notified two weeks prior to that date to discuss appropriate conservation measures. Additionally, the Service would like to receive a copy of the biological opinion for the USACE's consultation with NMFS.

Over the 50 year life-of-project, assessment and review of the maintenance program, particularly for disposal options which currently are not proposed, may in the future become important to re-visit. At that time, impacts to this species will need consideration and consultation.

Draft Biological Assessment for Federally-Listed Threatened and Endangered Species, Brazos Island Harbor Channel Improvement Project, USACE, June 2013

Comments and Recommendations:

Sea turtles on the beach, whether nesting or stranded, are a trust resource of the Service; therefore, we recommend an effects determination be made for the BIH Project on the leatherback sea turtle.

Loggerhead sea turtle (*Caretta caretta*)

Description/Habitat: Loggerheads have characteristically large heads with powerful jaws. The carapace is brown to reddish-brown, flippers are brown to yellow, and the lower shell (plastron) is yellow. Adults weigh 170-500 pounds, and have a carapace length of up to 45 inches long. They eat a variety of marine invertebrates and plants, primarily feeding on mollusks and crustaceans. Nesting takes place from May to August, usually during the nighttime. Preferred nest sites are sloping beaches 1.5 to 2.5 feet above waterline. Nesting occurs at 2 to 3 year intervals with a clutch size of about 125 eggs and several clutches are usually laid in any given season (Service 1995).

The species is distributed worldwide in warmer latitudes, including Atlantic, Pacific, and Indian oceans and the Mediterranean. The loggerhead ranges into temperate latitudes in summer. This species is widely distributed within its range and can be found hundreds of miles offshore. It also inhabits inshore areas such as bays, lagoons, salt marshes, ship channels and mouths of large rivers (NMFS 2008). This species has been documented nesting on the Texas Gulf Coast including the Gulf beaches of South Padre Island.

Threats: Human exploitation of eggs and meat is a major threat as well as loss of nesting habitat due to housing development, fishing operations and incidental catch or mortality by fishing gear (e.g. shrimp trawls). Added threats to this species are from predation on eggs by raccoons, coyotes, and other carnivores. Rising sea levels associated with climate change are expected to affect the amount, physical shape, and quality of the nesting habitat for this species (Service 1995).

Issues for Brazos Island Harbor Project: All sea turtles, except when on nesting beaches, are the trust resource of NMFS. Sea turtles on beaches are the trust resource of the Service. As proposed, no new work or maintenance dredge material is proposed to be placed on Gulf of Mexico beaches to avoid impact to nesting sea turtles. In general, best management practices with regard to nesting sea turtles include completion of all dredging outside of the turtle nesting season of March 15 to October 15. Additionally the Service recommends: use of on-ship observers; screening dredge intake pipes; sea turtle deflection on drag head; dredge take reporting; use of shielded, low-sodium vapor lights; and turning off, lowering, and shielding non-essential lighting. If dredging activities are anticipated to continue past March 15th, into the turtle nesting season, the Service requests that this office be notified two weeks prior to that date to discuss appropriate conservation measures. Additionally, the Service would like to receive a copy of the biological opinion for the USACE's consultation with NMFS.

Over the 50 year life-of-project, assessment and review of the maintenance program, particularly for disposal options which currently are not proposed, may in the future become important to re-visit. At that time, impacts to this species will need consideration and consultation.

Draft Biological Assessment for Federally-Listed Threatened and Endangered Species, Brazos Island Harbor Channel Improvement Project, USACE, June 2013

Comments and Recommendations:

Sea turtles on the beach, whether nesting or stranded, are a trust resource of the Service; therefore, we recommend an effects determination be made for the BIH Project on the loggerhead sea turtle.

Brown pelican (*Pelecanus occidentalis*)

Description/Habitat: A large (up to 9 pounds), dark gray-brown waterbird with a long pouched grayish bill and wingspan of approximately 5-7 feet. Adults have white head and neck, brownish-black on their breast and belly, and silver grayish on most of the upper parts. Immature birds are grayish brown above and dull white below. The birds breed in the spring. Nesting habitat ranges from mud banks and spoil islands to offshore islands covered with mangroves and other woody vegetation where they are safe from predators such as raccoons and coyotes. Nests vary in size and structure consisting of piles of sticks, grass reeds and other available vegetation. They usually lay two to four white eggs often stained brown by nest materials. Young hatch in about 30 days and are completely blind, with black, hairless, leathery skin. They have down feathers at two weeks and adult plumage by the third year (Shields 2002).

In Texas, they are found along the coast from Chambers County on the upper coast to Cameron County on the lower coast. Nesting populations occur in Aransas, Brazoria, Calhoun, Galveston, Matagorda, Nueces and San Patricio counties. Part of the Texas population spends the non-breeding season along the Texas coast while others migrate south to spend the winter on the eastern coast of Mexico (Service 1995).

Threats: In the 1920's and 30's they were killed because it was believed they competed with man for food, although their main diet consists of fish, game fish are not a typical food source. Widespread use of DDT and similar insecticides were used in the 1940s which impaired the reproductive system of the bird, and caused a thinning of the egg shells, preventing hatching. Numbers dramatically decreased in the 1960s and 70s but rebounded in the mid-1990's with an estimated 2,400 pairs in 1995 (Oberholser 1974). All 6 sub-species of the brown pelican were delisted in 2009. In September 2009, the Service published a final draft post-delisting monitoring plan (Service 2009). The plan notes that the Endangered Species Act (Act) requires implementing, at a minimum, a system in cooperation with the States to monitor effectively, for at least 5 years, the status of all species that have been recovered and no longer need the protection afforded by the Act. The plan, however, proposes to monitor the status of the brown pelican, annually, over a 10-year period from 2010 through 2020.

Issues for Brazos Island Harbor Project: No nesting islands for this species occur in the BIH project area, and to date, no significant impacts to this species are anticipated as a result of the continued maintenance dredging operations. As with all species that forage in the project area, the actions and decisions taken for the program need to consider the effects on the resources needed by this species.

Draft Biological Assessment for Federally-Listed Threatened and Endangered Species, Brazos Island Harbor Channel Improvement Project, USACE, June 2013

Comments and Recommendations:

No additional comments. Please see issues section above.

Red knot

Description/Habitat: The red knot is a medium-sized shorebird about 9 to 11 inches in length. The red knot is easily recognized during the breeding season by its distinctive rufous-red plumage (feathers). The face, prominent stripe above the eye, breast, and upper belly are a rich rufous-red to a brick or salmon red, sometimes with a few scattered light feathers mixed in. The feathers of the lower belly and under the tail are whitish with dark flecks. Upperparts are dark brown with white and rufous feather edges; outer primary feathers are dark brown to black. Females are similar in color to males, though rufous colors are typically less intense, with more buff or light gray on the dorsal (back) parts (Oberholser 1974). Main foods during the nonbreeding season include invertebrates, especially bivalves, small snails, and crustaceans (Harrington 2001).

The red knot forages in coastal areas primarily on intertidal sand flats and beaches. Foraging activity is largely dictated by tidal conditions, and it rarely wades in water greater than .79 to 1.2 inches deep. The red knot migrates annually between its breeding grounds in the Canadian

Arctic and several wintering regions, including the Southeast United States (including Texas), the Northeast Gulf of Mexico, northern Brazil, and Tierra del Fuego at the southern tip of South America. During both the northbound (spring) and southbound (fall) migrations, red knots use key staging and stopover areas to rest and feed. Major wintering areas for the red knot include the Atlantic coasts of Argentina and Chile, the north coast of Brazil, the Northwest Gulf of Mexico from the Mexican State of Tamaulipas through Texas (particularly at Laguna Madre) to Louisiana, and the Southeast from Florida to North Carolina (Harrington 2001).

Threats: Much of the U.S. coast within the range of the red knot is already extensively developed. Direct loss of shorebird habitats occurred over the past century as substantial commercial and residential developments were constructed in and adjacent to ocean and estuarine beaches along the Atlantic and Gulf coasts. In addition, red knot habitat was also lost indirectly, as sediment supplies were reduced and stabilization structures were constructed to protect developed areas. Biological invasions of both plants and animals threaten sandy beaches, with the potential to alter food webs, nutrient cycling, and invertebrate assemblages. The practice of intensive beach raking may cause physical changes to beaches that degrade their suitability as red knot habitat. At key stopover sites, other threats to red knot populations include habitat loss, food shortages, and asynchronies between the birds' stopover period and the occurrence of favorable food and weather conditions. Predation pressures can worsen threats when red knots are pushed out of otherwise suitable foraging and roosting habitats (Harrington 2001). Superimposed on an existing threat of late arrivals in Delaware Bay are new threats of asynchronies emerging due to climate change. Rising sea levels associated with climate change are expected to affect the amount, physical shape, and quality of the habitat for this species as well as potentially the community composition of prey species consumed by the red knot and other shorebirds

Issues for Brazos Island Harbor Project: No placement of dredge material, or beach nourishment activities will occur within areas used by this species. As currently proposed, construction activities related to levee repair and expansion will be conducted on and within existing DMPAs. No outward expansion of the levees will occur.

Over the 50 year life-of-project, assessment and review of the maintenance program, particularly for disposal options which currently are not proposed, may in the future become important to re-visit. At that time, impacts to this species will need consideration and consultation.

Draft Biological Assessment for Federally-Listed Threatened and Endangered Species, Brazos Island Harbor Channel Improvement Project, USACE, June 2013

Comments and Recommendations:

Because the red knot is still a candidate species, it has no protection under the Endangered Species Act. Habitat utilized by this species overlaps in part that also used by the wintering piping plover. The Service recommends that the conservation measures recommended for the piping plover should be applied, as well, to the red knot. The red knot is currently being reviewed for listing under the Endangered Species Act with critical habitat. The Service recommends that the USACE continue to coordinate, and the Service will provide updates on this process as they become available.

Sprague's pipit

Description/Habitat: The Sprague's pipit is about 3.9 to 5.9 inches in length, and weighs 0.8 to 0.9 ounce, with buff and blackish streaking on the crown, nape, and underparts. Males and females are similar in appearance. The Sprague's pipit has a plain buffy face with a large eye-ring. The bill is relatively short, slender, and straight, with a blackish upper mandible. The lower mandible is pale with a blackish tip. The wings and tail have two indistinct wing-bars, and the outer retrices (tail feathers) are mostly white. Juveniles are slightly smaller, but similar to adults, with black spotting rather than streaking (Service 2010c).

Sprague's pipits are strongly tied to native prairie (land which has never been plowed) throughout their life cycle. Sprague's pipits will use nonnative planted grassland and vegetation structure may be a better predictor of occurrence than plant species composition (Service 2010c).

The Sprague's pipit's wintering range includes south-central and southeast Arizona, Texas, southern Oklahoma, southern Arkansas, northwest Mississippi, southern Louisiana, and northern Mexico. There have been migration sightings in Michigan, western Ontario, Ohio, Massachusetts, and Gulf and Atlantic States from Mississippi east and north to South Carolina. Sprague's pipits also have been sighted in California during fall migration. Migration and wintering ecology are poorly known, but migrating and wintering Sprague's pipits are found in both densely and sparsely vegetated grassland, and pastures and only are rarely found in fallow cropland. Sprague's pipit's exhibit a strong preference for grassland habitat during the winter and an avoidance of areas with too much shrub encroachment. Their use of an area is dependent on habitat conditions, for example, on their wintering grounds, after a wet year, when grass is denser, Sprague's pipits were dense, compared with few individuals in the same areas after dry years when grasses were sparse. In migration, they may be found near or on trails and roads or near water, and in sunflower fields (Service 2010c).

Threats: The primary threat to the species is from habitat conversion and fragmentation, especially due to native prairie conversion to other uses and fragmentation from energy (oil, gas, and wind) development. Much of the land conversion is from native prairie to agricultural uses. Grazing is a major driver in the prairie ecosystem. An appropriate level of grazing can help to maintain the prairie habitat, while too much or too little may make the habitat unsuitable for Sprague's pipits. Like grazing, fire is a major driver on the prairie ecosystem. While there are still some controlled and wild prairie burns, fire is no longer a widespread regular phenomenon as it was in pre-colonial times. Fire suppression has allowed suites of plants, especially woody species, to flourish (Service 2010c).

Although there have been few studies of non-breeding Sprague's pipits, Sprague's pipits appear to be strongly tied to native prairie habitat during the winter. Sprague's pipit's presence on the wintering grounds in a particular area is related to rainfall the previous year. Pipits move to different parts of the wintering range annually, with densities dependent on local conditions. Therefore, it is likely necessary for sufficient suitable habitat to be available throughout the wintering range so that areas that are too dry one year may be used when conditions improve but are poor elsewhere. However, there have not been specific studies examining Sprague's pipits' habitat use during migration or on the wintering grounds, so it is not possible to determine if the changes to the migration and wintering grounds already constitute a threat to the species that may be placing the species at risk of extinction now or in the future. At present, the magnitude of loss on the breeding grounds is sufficient to determine that the species is at risk of extinction now or in the future even in the absence of specific information on the wintering grounds (Service 2010c).

Issues for Brazos Island Harbor Project: As proposed, the BIH Project will not impact coastal prairies or other grasslands with structure suitable for wintering Sprague's pipits.

Over the 50 year life-of-project, assessment and review of the maintenance program, particularly for disposal options which currently are not proposed, may in the future become important to re-visit. At that time, impacts to this species will need consideration and consultation.

Draft Biological Assessment for Federally-Listed Threatened and Endangered Species, Brazos Island Harbor Channel Improvement Project, USACE, June 2013

Comments and Recommendations:

No additional comments. See issues section above.

Red-crowned parrot (*Amazona viridigenalis*)

Description/Habitat: The red-crowned parrot is a mid-sized parrot, measuring approximately 13 inches (in) in length and weighing approximately 0.70 pounds (Enkerlin-Hoeflich 1997). Average male and female wing length measures approximately 8.2 in and 7.9 in, respectively. Average tail lengths for males and females measure 4.3 in and 4.0 in, respectively (Forshaw 1989). Adults have a bright green overall plumage distinguished by bright yellow-green cheek areas, bright red on the crown (top of head) and lores (area between eye and bill), and a violet-blue band extending from behind each eye down each side of the crown and neck (McKinney 2003). The back of the head and neck is scaled with black-tipped feathers. The flight feathers are bluish-black overall, with the outer secondary flight feathers also bearing a red patch. The tail feathers are tipped with yellowish green. The bill is cream-yellow colored, the iris is yellow, and the orbital ring and feet are pale gray. Juveniles are similar to adults except that the bright red feathers on the head are limited to the forehead and lores, and the violet-blue band on the sides of the crown tends to form a broad band over and behind the eye (Forshaw 1989, Enkerlin-Hoeflich 1997).

In Texas' Lower Rio Grande Valley (LRGV), red-crowned parrots occur primarily in urban (town) areas. Although little information on urban habitat use specific to the LRGV is available, in cities where the species is introduced it is reported to prefer areas with large trees that provide both food and nesting sites. The red-crowned parrot usually forages in the crowns of trees, but will occasionally feed on low-lying bushes. Foraging appears to be opportunistic, including a variety of seeds and fruits and buds and flowers. Nesting by red-crowned parrots occurs from

March to August. As with other *Amazona* species, red-crowned parrots nest in pre-existing tree cavities, including those created by other birds or resulting from tree decay (Hagne 2011).

Threats: Habitat destruction and modification is one of the main threats to the red-crowned parrot. Parrots have been traded commercially in Mexico for centuries and capture of adults and nestlings for the pet trade represents one of the main threats to the red-crowned parrot. Escaped pets and "released" birds in illegal transit are the driving force behind the establishment of additional introduced populations in southern California, Texas, Puerto Rico, Hawaii, and Florida, where the species numbers in the hundreds if not thousands of birds. In South Texas, construction and development projects may impact the red-crowned parrot due to the loss or conversion of native habitat and nesting sites for urbanization. Examples of such projects include residential and commercial development; oil, gas, and water pipelines; commercial scale wind energy facilities; and U.S. Border Patrol activities (Service 2013).

Issues for Brazos Island Harbor Project: As proposed, the BIH Project will not impact existing or potential habitat for this species.

Draft Biological Assessment for Federally-Listed Threatened and Endangered Species, Brazos Island Harbor Channel Improvement Project, USACE, June 2013

Comments and Recommendations:

No additional comments.

South Texas ambrosia (*Ambrosia cheiranthifolia*)

Description/Habitat: South Texas ambrosia is a perennial plant and a member of the Asteraceae Family. It is herbaceous, erect, silvery to grayish-green in color, and rhizomatous. The leaves are simple and oriented alternative above and opposite below. The flowers occur in inconspicuous terminal racemes of 5-10, and appear as hanging bowls containing 10-20 small yellow buds. The species flowers in the fall (July to November) (Service 1995).

South Texas ambrosia is found in grasslands and mesquite dominated shrub lands on various soils ranging from clay loams to sandy loams. It occurs in open grassy, often disturbed areas on clayey soils, and is known to occur on roadway and pipeline rights-of-way. South Texas ambrosia is known from northern Tamaulipas in Mexico, Cameron, Jim Wells, Kleberg and Nueces counties in Texas (Service 1995).

Threats: Reason for decline is clearing of savannas, non-native grass invasion, and maintenance practices on rights-of-way, and weed control (Service 1995).

Issues for Brazos Island Harbor Project: This species is noted for Cameron County based on historic information/range and last collected by Robert Runyon in 1932 and 1938 in the same location within the county. No known recent occurrences have been documented for this species in Cameron County.

Draft Biological Assessment for Federally-Listed Threatened and Endangered Species, Brazos Island Harbor Channel Improvement Project, USACE, June 2013

Comments and Recommendations:

No additional comments.

Texas ayenia

Description/Habitat: The Texas ayenia of the Sterculiaceae Family (Cacao) is a slightly hairy, unarmed shrub approximately 2-5 feet tall with simple, hairy, alternate oval leaves. The few small flowers present on this shrub are clustered in the upper leaves. The color of the flowers may be green, cream, or pink. The plant has a small, round, five-parted fruit that is covered with short, curved, sharp prickles (Service 1995). Texas ayenia occurs in dense brush on alluvial soils in Cameron and Hidalgo Counties (Service 1995).

Threats: Texas ayenia is threatened with habitat destruction and fragmentation through alteration and conversion of native plant communities to commercial use, invasion of non-native grasses, and low population numbers (Service 1995).

Issues for Brazos Island Harbor Project: As proposed, the BIH Project, new work and maintenance activities and DMPAs will not directly impact areas supporting potential habitat for this species. Over the 50 year life-of-project, assessment and review of the maintenance program, particularly for disposal options which currently are not proposed, may in the future become important to re-visit. At that time, impacts to this species will need consideration and consultation.

Draft Biological Assessment for Federally-Listed Threatened and Endangered Species, Brazos Island Harbor Channel Improvement Project, USACE, June 2013

Comments and Recommendations:

No additional comments. Please see issues section above.

FISH AND WILDLIFE CONCERNS AND PLANNING OBJECTIVES

The Service's fish and wildlife concerns relative to the project's proposed construction and maintenance plan have been discussed in the above sections. With regard to the actual implementation of the proposed project; however, POB representatives indicated that, due to funding issues, it is likely that construction of the BIH Project will have to wait 3 years or more. Coastal South Texas, including the project area, is in a dynamic environment, and new information is likely to become available on federal trust species, such as the red knot. The Service therefore recommends that whenever funding becomes available for the project, that the USACE and the POB coordinate with the Service to discuss new information as well as review the status of the project area itself to determine if changes need to be made to the project plan or if consultation under section 7 of the Endangered Species Act should be re-initiated.

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Brazos Island Harbor, Texas
Channel Improvement Project

Appendix K
National Historic Preservation Act Coordination

July 2014

Appendix K

National Historic Preservation Act Coordination
Brazos Island Harbor
Channel Improvement Project
Cameron County, Texas

U.S. Army Corps of Engineers, Galveston District
2000 Fort Point Road
Galveston, Texas 77550

July 2014

TEXAS HISTORICAL COMMISSION
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March 1, 2012

Carolyn Murphy
Chief, Environmental Section
U.S. Army Corps of Engineers
P.O. Box 1229 (PE-PR)
Galveston, Texas 77553-1229

Re: Project review under Section 106 of the National Historic Preservation Act of 1966 and the Antiquities Code of Texas
Draft Report Review, *Remote-Sensing Survey for the Brazos Island Ship Channel Improvement Project, Cameron County, Texas*, TAC Permit No. 6011
COE-VD

Dear Ms. Murphy:

Thank you for your correspondence describing the above referenced project. This letter serves as comment on the proposed federal undertaking from the State Historic Preservation Officer, the Executive Director of the Texas Historical Commission. As the state agency responsible for administering the Antiquities Code of Texas, these comments also provide recommendations on compliance with state antiquities laws and regulations.

The review staff, led by State Marine Archeologist Amy A. Borgens has reviewed the information regarding this project. Additional information was required for magnetometer targets M3, M5, M6, and M10 in order to complete the review of the draft report. The SEARCH Principle Investigator provided additional data, including figures, which greatly clarified the recommendations proposed within the draft report; the inquiry and response are included as Appendix A. The final report will include the new material presented by the authors. We concur that anomalies M1-M4 and M6 are not representative of historic shipwreck sites and that anomalies M5 and M7-M9 are historic in nature but are not significant to warrant additional investigation. We concur that anomaly M10 is potentially associated with the 1864 railroad constructed by General Francis Herron. Both SEARCH and the USACE have indicated that the project impacts should terminate at a distance of 27 meters from M10 and have asked to reduce the 50-m avoidance buffer required by the THC. The 25-m avoidance requested by the USACE (letter dated 13 January 2012) is acceptable. As long as M10 can be avoided by 25 m, the proposed project may proceed without further archeological investigations unless unexpected cultural material is encountered. Further investigation will be required if M10 cannot be avoided by the 25-m buffer. We look forward to the final report.

Thank you for your cooperation in this federal and state review process, and for your efforts to preserve the irreplaceable heritage of Texas. **If you have any questions concerning our review or if we can be of further assistance, please contact Amy Borgens at 512-463-9505.**

Sincerely,

for
Mark Wolfe
State Historic Preservation Officer

MW/ab

APPENDIX A
Additional Information Provided for Review

Amy Borgens

From: Jeff Enright <jeff@searchinc.com>
Sent: Thursday, February 23, 2012 10:27 AM
To: Amy Borgens
Cc: Jerry Androy
Subject: RE: Brazos Island Harbor Improvement Project
Attachments: SHPO_Review_Images.zip

Amy,

Thank you for your thorough review of the draft report in question. Your analysis and questions regarding our conclusions are insightful and the answers to these inquiries definitely will improve the quality of the report. Please see our responses to your questions below. We will incorporate this discussion into the report for the final version. Our goal is to provide the Texas Historical Commission (THC) and the U.S. Army Corps of Engineers, Galveston District (USACE) with as much available data regarding these magnetic anomalies and their unique environmental setting in order to make sound cultural resource management decisions, as well our professional opinion based upon SEARCH's combined years conducting remote-sensing survey and data analyses for archaeological purposes.

We await your decision regarding the magnetic anomalies in question following your review of our answers, and subsequent consultation with Mr. Jerry Androy, Staff Archaeologist for the USACE. If after consultation it is thought best to carry out archaeological diver investigations of these anomalies, SEARCH is more than willing to conduct this work at the request of the THC and USACE.

Thank you,
Jeff

Jeff Enright, M.A., RPA
Maritime Principal Investigator
GIS Specialist

Southeastern Archaeological Research, Inc. (SEARCH)
North Gulf Coast Office
428 E. Government Street, Pensacola, FL 32502
850-607-2846 phone 512-801-5683 cell 850-607-8439 fax
jeff@searchinc.com www.searchinc.com

Archaeology - Architectural History & History - Maritime Archaeology

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From: Amy Borgens [mailto:Amy.Borgens@thc.state.tx.us]
Sent: Sunday, February 19, 2012 7:34 PM
To: Jeff Enright
Cc: Jerry Androy
Subject: Brazos Island Harbor Improvement Project

Jeff,

Thank you for a well-written report. I would, however, like to ask a few questions regarding some of the recommendations before I finish the review. More information needs to be provided for some of these anomalies and the information provided in response to these questions will likely need to be added to the report content.

Magnetometer Anomaly M3. Can there be a better explanation as to why this anomaly has not been recommended for ground-truthing? The sonar image does not provide evidence that this submerged area is associated with shoreline stabilization. Nor is there discussion of a shoreline stabilization project at this location. The association of this anomaly with shoreline stabilization seems speculative especially as the sonar target (isolated rocks) is largely outside of the magnetometer target. It does not preclude the existence of a buried wreck.

[Jeff Enright]

Our intention was not to identify a particular shoreline stabilization project by name; rather the report refers to the current rock stabilization that is extant. Also, we did not intend to insinuate that the isolated rocks were the source of the anomaly, but merely were mentioning that the sonar record revealed nothing other than the rocks. We will clarify both these points. Attached are a couple Google Earth images of this spit of land at [redacted] showing before and after views of the stabilization (M3_1962.jpg and M3_2011.jpg). We have been unable to determine the date when this rock was deposited; however, based upon aerial imagery we believe it occurred subsequent to the EH&A survey, which did not extend this far out from the channel. We also believe that this stabilization likely includes ferrous material (e.g., iron rebar within the concrete blocks). Because M3 is in close proximity to the extant shoreline stabilization material, our connection with this construction is a hypothesis put forward to offer a potential anomaly source. It is plausible to hypothesize that the source of M3 was deposited during this construction activity. Because the extant shoreline stabilization on this spit of land is so near the channel top of slope, it also is plausible to hypothesize that construction related material slipped down the channel slope, as the peak amplitudes of M3 are located on the channel slope in 20-30 feet of water, with the center in 28 feet (see attached image M3_Bathy.jpg).

In my experience interpreting magnetic data for archaeological purposes, Anomaly M3 is not indicative of a shipwreck source. It is complex and its areal extent is relatively large; however, increased complexity and size are not defining characteristics with regards to shipwreck anomalies. Considering all its characteristics collectively, M3 does not fit the model of a shipwreck magnetic signature as we currently understand it.

All this being said, our analysis of Anomaly M3 certainly is open to alternate interpretation and competing hypotheses. Ultimately the decision of whether or not to further investigate M3 resides with the THC and USACE. If our present analysis of M3 lacks sufficient strength to clear it as a potential submerged cultural resource, SEARCH will absolutely investigate it further at the request of the THC and USACE.

Magnetometer Anomaly M5. Anomaly M5 was only partially recorded by the present survey. According to the report, page 40, the rest of the anomaly extends into the channel. The portion of the anomaly that is in the channel was detected by the EH&A survey (Bond et al. 1990) and is the portion investigated by EH&A divers. Though the EH&A dive investigation only identified metal plates, based on comparisons between the SEARCH and EH&A magnetometer targets, did the dive investigation cover any of the anomaly detected in the present survey? Is it possible the anomaly detected by the current survey represents a separate wreck site or is an uninvestigated portion of a shipwreck that produced the metal plates (41CF132)? Based on figure 20, it is improbable that SO88 and SO102 are the source of the magnetometer anomaly as they are at least 50 m from the general area around the center point of the dipole. So far the discussion of this anomaly does not provide enough evidence to preclude it from further examination – especially at its location just inside the jetty.

Is the terminus post quem date of 1953 related to the wreck date of THC No. 841, *Little Chris*? Please explain why target M5 cannot be a historic wreck that predates 1953.

[Jeff Enright]

Clearly our description of Anomaly M5 (41CF132) has led to some confusion and requires rewriting. SEARCH's survey recorded the northern extent of the anomaly (i.e. the portion within the channel) and the statement on page 40, "The anomaly extends approximately 12 m (39 ft) beyond the toe of the channel (i.e. into the channel proper)," is offered as a description for its location. We believe that a portion of the negative lobe of M5 (41CF132) was not recorded during our survey and is located to the south, towards the jetty. We will clarify this.

Attached is an image of a rough geo-referencing of the EH&A survey at this locale (M5_EH&A.jpg). You will notice that their survey recorded the positive lobe of the anomaly, which they designated "Anomaly X." Our survey recorded this lobe, as well as a portion of the negative lobe, the remainder of which resides outside of our survey area (as described above). We believe that EH&A archaeological divers investigated both the portion of this anomaly within the channel and the portion on the south jetty, as Hoyt and Gearhart (1992:129) identified the primary source for Anomaly X (41CF132) as "a group of large steel plates ***wedged among the jetty rocks*** *[emphasis added] near the* [redacted]*." Additionally the THC Archaeological Site Form notes that the Environmental Setting of Site is "wreckage among jetty rocks," and Cultural Features are "steel plates wedged among jetty rocks-- approximately 5 metal plates--all on edge" (see Appendix B: 41CF132 Archaeological Site Form). Anomaly M5 correlates with Anomaly X, and EH&A thoroughly investigated the site. SEARCH does not believe that M5 (41CF132) represents a separate wreck site or an uninvestigated portion of the shipwreck noted by Hoyt and Gearhart (1992). Our chronology for the site formation is based upon the research and assessment done by Hoyt and Gearhart (1992:129), who provide the tentative dates of 1953 and 1970 (rather than include the entire argument here, I'll refer you to the second paragraph on page 129 of their report). Our assessment of NRHP eligibility status is based upon the THC assessment for Site 41CF132, which states that it has no potential for National Register of Historic Places listing (see Appendix B: 41CF132 Archaeological Site Form).*

Our report does not suggest that S0088 or S0102 are the primary sources of Anomaly M5, but merely associated with the anomaly and contributing to its composition. We will clarify and expand our discussion of Anomaly M5 and include a concise statement for the identity of the sonar contacts and their effect upon the anomaly.

Magnetometer Anomaly M6. The discussion of anomaly M6 on page 43 describes the location of the target as the bottom of the Brownsville Channel at a depth of 12 m. According to the description of the project area, the survey did not include the channel but was on either side of the existing toe. Did the close-order survey demonstrate it was in the channel? The location of M6 in Magnetic Contour Sheet 4 of 4 illustrates the approximate center of the dipole, often considered the source of the magnetometer target, is at the edge of the channel and not in the channel. This may just be a misunderstanding based on the scale of the contour image but can you verify the location of the center of the dipole? The anomaly is also close to a wreck icon (Figure 9). Please describe the wreck, give its distance from M6, and provide an idea of the accuracy of the wreck location. Also describe why it is not associated with the nearby wreck icon. It can be inferred from previous channel dredging projects that M6, if it is in the channel, is modern debris as it is deeper than historic water depths in an area that has already been dredged. If this is the reason M6 has not been recommended for avoidance or further investigation this needs to be clearly stated in the discussion on page 43. The description of anomaly M6 needs to be expanded to include its relationship (or lack thereof) to the wreck icon, a more specific assessment of the dipole source to the channel edge and depth, and why it is believed to post date the creation of the channel.

[Jeff Enright]

The description of the survey design on page 27 states that the inner survey transects originated "at the toe of the channel," which is located at the bottom of the channel slope and inside the channel. Therefore, our inner transects were in fact inside the channel (see also Figure 10, page 29). We will add a statement that mentions a portion of the survey occurred within the channel proper.

The attached figure M6_Bathy.jpg illustrates the initial and close-order survey transects, as well as the bathymetry over Anomaly M6. This image should clarify the location of M6 primarily at the toe of the channel and beneath historic water depths. Therefore, the source of M6 likely was deposited subsequent to the most recent maintenance dredging of the channel. This would be more clear were a figure included depicting the channel toe and the bathymetry in relation to the anomaly; we will rectify this oversight.

The nearby wreck is the* Campesino*, a modern fishing vessel lost in 1983. The accuracy of her location is listed as 1 mile, which means she could correlate with M6. This is just an assumption, but if the* Campesino *is the source of M6, it would place her location within the channel limits and she likely would have been removed as an obstruction to navigation during subsequent maintenance dredging. Regardless, the* Campesino *likely is neither historic nor eligible for listing in the NRHP. We will expand our assessment of Anomaly M6 to include a discussion of the* Campesino *and why we do not believe she correlates to the anomaly, as well as why she is not eligible for listing in the NRHP.

Magnetometer Anomaly M10. The discussion of M10 does not clearly demonstrate that the source of the anomaly is related to the 1864 railroad. Figure 31 shows that M10 is approximately 60 m from the nearest rail locale and more than 100 m from the railroad route. What evidence is used to suggest the sonar target is a railroad feature? Is the identification of the sonar target as possible disarticulated railroad features based on their similarity to figure 27? Is the identification of the sonar targets in figure 27 as railroad tracks an assumption based on the EH&A investigation – how was this determined? How does it compare to sonar imagery from the 1992 EH&A report? This report showed a sonar target for anomaly T [M8] but clearly states that railroad tracks were not identified in the sonar data (page 92-93)? The 1992 EH&A sonar does not seem to record a visible feature at anomaly V [M9, SO97]. Is SO97 definitively associated with the EH&A targets or is it something that has been deposited after the EH&A investigation? This should be mentioned in the discussion of both sonar targets. The report needs to provide more evidence to suggest this anomaly is related to the historic railroad.

[Jeff Enright]

It is apparent that we need to clarify this section and the associated map. What is depicted in Figure 31 is not the full extent of the railroad but merely an estimation of the line based upon the rail locations identified by EH&A (Hoyt and Gearhart 1992:96-98). In other words, according to Hoyt and Gearhart (1992:95, cited on page 47 of the report) the railroad would have extended beyond either end of the line illustrated in Figure 31, page 49. Our hypothesis for M10 follows the thought process presented in Hoyt and Gearhart. The "end of the rails in the direction of the dike [northwest] has not been verified" (Hoyt and Gearhart 1992:95). If a hypothetical line is extended to the northwest – towards the unverified "end of the rails" – it crosses close to the M10 locale, an area not surveyed by EH&A (see attached images M10_Extended_Railroad.jpg and M10_EH&A_Mag.jpg; we will include these images in the final version of the report). Therefore, it is plausible that M10 may be associated with the railroad identified by EH&A.

The sonar image on page 92 (Hoyt and Gearhart 1992) that you refer to is described on page 91: "barely visible on the strip chart, at the westernmost corner of the piling grid [labeled 'vicinity of Anomaly T'], is a linear object about 8 m long which may be one of the railroad rails known to be in this corner of the piling

grid." Is the following statement on page 93 the one to which you are referring? "Close examination of survey tracks known to cross existing railroad rails has failed to produce a positive indication of those tracks (Figure 31)." The way I am understanding this particular statement is a description of the success, or lack thereof, of the sub-bottom profiler to resolve the rails. I am not finding a statement that railroad tracks were not identified in the sonar data. Subsequent diver investigations identified 3 lengths of exposed rail at Anomaly T (presently M8), and 5 lengths of exposed rail at Anomaly V (presently M9) (Hoyt et al. 1991:80-82). The identification for the source of sonar target S0097 (Figure 27), which correlates with EH&A Anomaly V, is not an assumption but rather based upon physical verification. The sonar image for Anomaly T provided by EH&A (Figure 30, page 92) unfortunately is too low quality to make any sort of comparison, and no sonar image is provided for Anomaly V. Sonar images collected in our survey, however, merit comparison. We can compare the image of M10 (Figure 32) to the image of M9 (Figure 27), which has been diver verified as rails, and note the similarities. We are only able to speculate on sonar target S0096 as we have no comparison from EH&A's survey. Upon initial examination of our sonar image (Figure 29, page 47), S0096 appears to be a length of cable; however, it could just as likely be the "twisted rail" described by EH&A divers (Hoyt et al. 1991:80). This is an alternate identification we will include in the final report.

In summary, several key pieces of circumstantial evidence for the identity of M10 exist:

- *the location of Anomaly M10 in line with the diver verified railroad route and the linear magnetic anomaly recorded over the railroad by EH&A (M10_Extended_Railroad.jpg and M10_EH&A_Mag.jpg)*
- *the fact that EH&A did not survey this area, nor were they able to locate the "end of the rails"*
- *the similarities between the M10 sonar image and the M9 sonar image, which has been diver verified as rails*
- *the location of 2 additional diver verified rails to the north of M10 (see Figure 31, page 49and attached image M10_Extended_Railroad.jpg)*

We agree that the analysis of Anomaly M10 in the draft report is insufficient and we will certainly rewrite it for the final, being sure to include the above discussion.

Again, this is a hypothesis open to alternate interpretation, and ultimately a decision for the THC and USACE. If you feel diver investigation is still warranted, SEARCH will investigate M10 further at the request of the THC and USACE.

Summary

On page 51 of the recommendations it is stated that all but one anomaly, M10, has been identified as known sources or modern debris. I do not think this evidence has been provided for any of the above-listed magnetometer targets based on the current descriptions provided; these may simply need to be expanded by adding additional information to the report based on above-listed inquiries. Unless more evidence is provided to strengthen or clarify the identification for some of these anomalies, they may require ground-truthing. The location of many of these anomalies are in areas defined in historic maps as having breakers or shallow water depths which are frequently the cause of wrecking events.

[Jeff Enright]

We will include the above discussions in the report and expand our analyses of these anomalies. If you still feel, however, that our conclusions and recommendations lack sufficient strength, SEARCH is prepared to investigate these anomalies further at the request of the THC and USACE.

On a similar note, the avoidance margin for M10 should not be reduced from 50 m based only on a hypothesis it is a railroad feature when this has not been proven. The discussion in the recommendations on page 51 that describes why M10 is not a shipwreck should be moved or repeated in the analysis of M10. It is feasible to reduce the avoidance margin if the anomaly is not synonymous with a shipwreck target but I don't see enough evidence to claim this is a historic railroad feature. Based on the evidence provided in the report I believe the most that can be stated is that the anomaly is potentially associated with the 1864 railroad – it does not actually appear to be the 'unverified "end of the rails."'

[Jeff Enright]

As stated previously, this is a hypothesis based upon the available circumstantial evidence, and as such, subject to competing hypotheses. We agree that we can only conclude that M10 <u>potentially</u> is associated with the 1864 railroad, and our report states this: "One site, Anomaly M10, may be associated with the Brazos Santiago Depot NRHP property (41CF4)" (page iii), and "Anomaly M10 potentially is a submerged cultural resource associated with the Brazos Santiago Depot (41CF4)" (page 51). Absolute proof of course will require diver investigation.

Although it is possible that the entire extent of Anomaly M10 has not been captured in our survey (it is located on an outside survey transect), we are able to analyze its characteristics as a potential shipwreck. It is clear that M10's northern hemisphere is dominated by a relatively intense, positive magnetic lobe. In my experience interpreting magnetic data for archaeological purposes, and comparison to the model of a shipwreck magnetic signature as we currently understand it, M10 is not indicative of a shipwreck source. This analysis, coupled with the above hypothesis and the description of the preservation potential of the rails provided in Hoyt and Gearhart (1992:131, cited on page 51 of the report), led to the suggestion that applying an avoidance zone typically reserved for potential shipwreck anomalies might not be necessary in this instance. Of course this merely is a recommendation. If the USACE design plan requires latitude with the avoidance zone and the THC feels it best to verify the source of M10, SEARCH is prepared to conduct such an investigation at the request of the THC and USACE.

In addition,

According to the Texas Administrate Code, the magnetometer contour figures are to illustrate the magnetometer anomalies and the actual, not planned, survey transects. I do not see the actual transects or close-order transects illustrated.

The Texas Administrate Code also requires a figure that shows both the planned survey transects and actual transects together in a figure. This image has not been included.

The overall sonar coverage figure needs to be produced at a larger scale.

In the legend for the Magnetic Contours, the lines that represent 5 nT (positive and negative) are not visible in the printed report.

[Jeff Enright]

These comments will be addressed completely in the final report.

In the Introduction at the bottom of page 1, it is stated that the peak of maritime history (activity is a more accurate term) in the region was the 17^{th} and 18^{th} centuries. Shouldn't this be 19^{th} and 20^{th} centuries as it is stated on page 25? The latter centuries are accurate for maritime traffic and frequency of wreck events.

[Jeff Enright]

This will be remedied in the final report.

Thank you Jeff for your patience with these inquiries. I look forward to hearing from you.

[Jeff Enright]

Not a problem. I welcome your comments in an effort to produce a professional report that adequately addresses the Section 106 concerns of the project and protects the potential submerged cultural resources in the State of Texas.

Amy

Amy A. Borgens, MA

State Marine Archeologist

Archeology Division

Texas Historical Commission

P.O. Box 12276

Austin, Texas 78711

(office) 512.463.9505

(fax) 512.463.8927

www.thc.state.tx

Brazos Island Harbor, Texas
Channel Improvement Project

Appendix L
Plan Formulation

July 2014

Brazos Island Harbor Channel Improvement Project

Plan Formulation Appendix L

U.S. Army Corps of Engineers
Southwestern Division
Galveston District
July 2014

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PLAN FORMULATION APPENDIX

1.0 PLAN FORMULATION RATIONALE

Plan formulation is the process of building alternative plans that meet the planning objective and developing alternatives within the planning constraints. Alternative plans are a set of one or more management measures functioning together to address the planning objective. A management measure is a feature that can be implemented at a specific geographic site to address the planning objective. A feature can be a structural element that requires construction or a nonstructural action.

Preliminary plans were formulated by combining management measures. Each plan was formulated in consideration of the following four criteria described in the Principles and Guidelines (P&G):

- Completeness: Extent to which the plan provides and accounts for all necessary investments or actions to ensure realization of the planning objective
- Effectiveness: Extent to which the plan contributes to achieving the planning objective
- Efficiency: Extent to which the plan is the most cost-effective means of addressing the specified problems and realizing the specified opportunities, consistent with protecting the nation's environment
- Acceptability: Workability and viability of the alternative plan with respect to acceptance by Federal and non-Federal entities and the public, and compatibility with existing laws, regulations, and public policies

The USACE is required to consider the option of "No Action" as one of the study alternatives in order to comply with the requirements of the NEPA. With the No Action Plan (i.e., the FWOP Condition), it is assumed that no project would be implemented by the Federal Government or by local interests to achieve these particular planning objectives. However, normal operation and maintenance activities, along with other probable channel improvements, are assumed to be performed over the period of analysis. The No Action Plan, therefore, forms the basis to which all other alternative plans are measured. Details of the No Action plan are included in Future Without Project Conditions section of the main report.

Initial study efforts involved a determination of the magnitude and extent of the problems along BIH in order to develop and evaluate an array of alternative solutions that meet the existing and long-range future needs of the non-Federal sponsor and the public. At the initiation of the feasibility phase of the project, lines of communication were opened with Federal, state, and local agencies, private groups, and the affected public. A public scoping meeting was held in Brownville, Texas on January 31, 2007. Attendees were overwhelmingly in favor of the project for the economic benefits it would likely generate for the South Texas area. The public was assured that their involvement would occur throughout the planning process.

2.0 MANAGEMENT MEASURES

The main problems with the existing channel are constraints in accommodating deeper draft vessels like the post-Panamax vessels and the inability to accommodate larger offshore rigs. Nonstructural and structural measures were developed to address the planning objective, alone or in combination with other measures. These measures were later combined to form alternatives to be evaluated in this study process. New measures identified in later phases of the Plan Formulation process were also reviewed and considered in the alternative analysis. Measures were formulated to avoid or minimize the following constraints:

- Minimize impacts to designated critical habitat for Threatened and Endangered species in the study area;
- Minimize impacts to Threatened and Endangered species in the study area;
- Minimize impacts to cultural resources listed or eligible for the National Register of Historic Places (defined as historic properties);
- Develop alternatives within Coastal Barrier Resources Act (CBRA) guidelines which prohibit new Federal expenditures or financial assistance within any CBRA unit with the exception of improvements to existing navigation channels, disposal areas and related improvements; and
- Limit channel traffic to single lane/one way only.

2.1 Nonstructural Measures

Based on the economic forecasts discussed in Section 3.1 of the main report, existing vessel management practices and scheduling is sufficient to maintain efficient channel operation in the future. Therefore, no nonstructural alternatives related to vessel management were included.

The nonstructural measures considered included:

- Utilize another port; and
- Alternative modes of commodity transport.

A multiport analysis was used to assess whether or not improvements at BIH would result in a diversion of cargo traffic that would either shift to or from competing ports to or from BIH. The analysis is included in the Economic Appendix (Appendix A) and did not find any reason to assume a shift in cargo to or from BIH. If it was determined that there is an impact, the forecasted cargo traffic at BIH would be adjusted by an amount derived from the cargo movements analysis and transportation costs at competing ports; however, in this case, there was no evidence that such a shift would occur.

Further, the multiport analysis was used to determine that the nonstructural measures developed to address at least one of the planning objectives are not reasonable. Utilizing another port would require additional transportation to the subject hinterland and the use of another port and alternative modes of commodity transport would add additional cost. Therefore, the additional cost compared to the transport to BIH leads to the nonstructural measures being removed from further consideration.

2.2 Structural Measures

Structural measures included:

- Deepen only;
- Widen only;
- Deepen and widen channel;
- Widen only up to location of existing offshore rig fabrication operations;
- Relocate turning basin to new location closer to the channel entrance; and
- Widen using shelves to facilitate rig movements on the outer Main Channel

The purpose of the deepening and/or widening measures of the existing 42-foot channel would be to allow existing ships to more fully utilize the channel while also allowing larger offshore rigs to come into the Port for fabrication, maintenance, and repair. The deepening and/or widening measures could also be considered at different scales (various channel depths and widths). Widening specific parts of the channel include widening using shelves on either side of the deep-draft channel to accommodate rigs that need additional widths but not at the deeper channel depth. Widening the channel only up to the existing rig facilities located near the turning basin was also considered as part of the formulation to accommodate wider rigs. Widening considered in any alternative would be limited since the channel would continue to operate for one-way traffic only in the future.

Another measure considered was construction of a new turning basin closer to the channel entrance. This measure would allow for a shorter segment of channel to be improved, allowing the vessels to travel only as far as this new turning basin. For this measure, the remainder of the channel would continue to be maintained at existing conditions and would not be able to serve any future vessels and rigs that require channel improvements. With this new turning basin measure, considerable upland development would be required after completion of channel improvements, with no benefits from the improved channel being realized by existing tenants unless their operations are relocated to this new turning basin area.

Figure 3-1 shows the proposed location of the new turning basin relative to the existing turning basin. This location has a naturally lower elevation to limit dredging requirements. This new basin would allow for shortening the channel length by approximately 10 miles. The addition of the new 2,000-foot by 2,000-foot turning basin provides no increased benefit to navigation unless deepening and widening improvements to the channel were made up to the new turning basin. Therefore, the turning basin measure must be combined with deepening or deepening and widening to be considered viable to carry forward for consideration in the next phase of screening. The non-Federal sponsor also indicated a preference that the channel's widening extends farther up the channel beyond the location of the proposed turning basin.

Figure 3-1. Location of New Turning Basin

3.0 SUMMARY OF ALTERNATIVE ANAYLSIS

Measures were evaluated and screened by the team through several arrays of alternatives. Consistent with new SMART Planning concepts this effort included a qualitative analysis of an Initial Array, and quantitative analysis of an Evaluation and Final Array of alternatives.

In the evaluation of the Initial Array, a combination of deepening and widening alternatives were evaluated qualitatively based on several factors including potential to improve navigation efficiencies, scale of possible environmental and cultural impacts, potential for significant increases in costs, both O&M and construction, as well as possibility for public concern with the different alternatives. The alternatives were scored based on the team's assessment and a reduced combination of widening and deepening alternatives was carried forward into the Evaluation Array.

The Evaluation Array included deepening alternatives at 45, 48 and 50 feet. In this analysis, the sponsor had limited the team to considering only depths up to 50 feet because of cost limitations and the belief at that time that no vessels would utilize depths greater than that. Widening alternatives evaluated were a full 200-foot widening and a 75-foot widening in limited areas (shelves). The 200-foot widening was driven by the possibility for large rig access in the channel. The team also evaluated creation of a new turning basin and associated facilities that would allow rigs to travel a shorter distance to reach their destination.

For the Evaluation Array, the team prepared qualitative assessments, again looking at the potential for improved navigation and environmental impact, as well as quantitative measures that detail costs and economic benefits. Based on the scores the team determined that all three deepening only alternatives as well as the three alternatives that combined deepening with 200-foot widening had the greatest potential for success.

From those results, the team developed a final array that would be evaluated quantitatively for selection of the Recommended Plan. In the quantitative results calculated for the Evaluation Array, the 50-foot deepening alternative had the greatest net excess benefits for the deepening only alternatives. Based on this result the team added an alternative to the Final Array of deepening to 52 feet in an attempt to determine whether the 50-foot alternative was in the fact the NED Plan. In addition, during the analysis performed for the Evaluation Array, changes to vessel fleet forecasts were realized that would impact the widening alternatives that would need to be evaluated. Changes were made to both expected tanker traffic and rig movements. Also, oil exploration is expected to switch away from rigs to drill ships which do not require large widths but would benefit from deeper depths. Based on these considerations the 200-foot widening was dropped from consideration. However, 50-foot and 100-foot widening were added to insure that sufficient analysis was conducted to determine if widening would be part of the Recommended Plan.

4.0 BASIS FOR CHOICE

The measures identified above were screened to determine if they adequately addressed the problems with BIH. As stated previously, measures that did not meet one of the objectives for this study were dropped from further consideration. The remaining measures were then formed into arrays of alternatives plans, which were screened to determine the most effective alternatives. The screening consisted of three levels:

- Initial Array of Alternatives;
- Evaluation Array of Alternatives; and
- Final Array of Alternatives.

Each level consisted of more detailed analysis when compared to the previous level. The Initial Array was screened on a qualitative level, using screening criteria, scientific judgment from use of mapping and alternative footprints, as well as the professional expertise of a multidisciplinary Project Delivery Team (PDT) to identify the implications of each alternative. Professional judgment was used to provide qualitative assessments of environmental and economic conditions. With the Evaluation Array, a screening matrix was developed, which included quantitative criteria such as quantities, costs, and Benefit-to-Cost Ratios (BCRs), as well as qualitative analysis for improving navigation and environmental concerns. The Final Array of alternatives was evaluated on more detailed calculations for BCRs and on their ability to effectively meet the four criteria in the P&G.

During analysis of the Final Array of alternatives, ship simulation modeling was performed to determine the necessary channel dimensions for ships. A rig geometric analysis was also performed for accommodation of rig movements. In addition, economic analysis was performed to calculate the net excess benefits and BCRs for each of the alternative plans.

The following are the methodology and evaluations that were used to develop the criteria used for screening the three separate arrays of alternatives.

4.1 Methodology to Develop Technical Criteria

Technical criteria require the preservation of adequate project dimensions to provide safe passage of commercial navigation traffic while minimizing environmental impacts. These criteria require plans to be compatible with navigation needs and consistent with the requirements of the navigational equipment using this portion of the waterway and to provide a long-term plan for the placement of dredged materials in order to continue maintenance of the waterway in the future.

The plans must consider specific environmental conditions of the area including soil conditions, topography, and terrestrial and aquatic ecosystems. Formulation of alternative alignments and dredged material placement alternatives and their evaluation are accomplished by analysis of historical and projected shoaling rates in cubic yards per year (cy/yr) and general structural and nonstructural alternatives applicable for conditions in the study area. Initial screening of the alternatives was completed using basic screening criteria, use of mapping and alternative footprints, and professional expertise and scientific judgment of the PDT. More detailed technical information (both historical data and specific information and analyses prepared for this project) would be used during screening of the Evaluation and the Final Arrays of alternatives. Technical information and the corresponding screening level in which this information was used include, but are not limited to, the following:

- Aerial photography (all arrays);
- Historical dredging records (all arrays);
- Previously published scientific reports related to the study area (all arrays);
- Marine and estuarine resource investigations (all arrays);
- HarborSym Widening Modeling (Evaluation and Final Arrays);
- HarborSym Deepening Modeling (Final Array only);
- Ship Simulation Study (Final Array only);
- Geometrical Analysis of Rig Movement (Final Array only);
- Hydrodynamic Modeling (Final Array only);
- RSLR Analysis (Final Array only);
- Storm Surge Modeling (Final Array only);
- Sediment and water quality analysis (Final Array only);
- 50-year Dredged Material Management Plan (DMMP) (Final Array);
- Threatened and Endangered Species Considerations (Final Array), and
- Habitat Evaluation Procedure/Habitat Suitability Models (Final Array, if needed).

4.2 Methodology to Develop Economic Criteria

The economic criteria require that tangible benefits attributable to projects exceed project costs. Project benefits and costs are reduced to average annual equivalent (AAEQ) values and related in a BCR. This ratio must exceed unity to meet the NED objective. Selected plans, whether structural, nonstructural, or a combination of both, should maximize excess benefits over costs;

however, unquantifiable features must be addressed subjectively. These criteria are used to develop plans that achieve the objective of NED and provide a base condition for consideration of economically unquantifiable factors, which may impact project proposals.

The USACE planning guidelines required that the alternative that most reasonably maximizes net economic benefits, consistent with protecting the Nation's environment, be identified as the NED Plan. This NED Plan may be selected as the Recommended Plan. However, for a navigation project, if a plan with lesser benefits is preferred by the sponsor due to financial constraints, guidance allows for a categorical exemption to be granted and this lesser plan to be selected as the Recommended Plan. This process is addressed in more detail later in this report.

All structural and nonstructural measures for navigation projects would be evaluated using the appropriate 50-year period of analysis and the applicable interest rate at the time of analysis. The study was developed over time necessitating the use of different annual discount rates. Total annual costs should include amounts for operation, maintenance, major replacements, and mitigation, as well as amortization and interest on the investment.

4.3 Methodology to Develop Environmental Criteria

The general environmental criteria for navigation projects are identified in Federal environmental statutes, executive orders (EOs), and planning guidelines. It is national policy that fish and wildlife resource conservation be given equal consideration with other study purposes in the formulation and evaluation of alternative plans. Care must be taken to preserve and protect significant ecological, aesthetic, and cultural values, and to conserve natural resources. These efforts also should provide the means to maintain and restore, as applicable, the desirable qualities of the human and natural environments. Alternative plans formulated to improve navigation should avoid damaging the environment to the extent practicable and contain measures to minimize or mitigate unavoidable environmental damages.

Throughout the study process, USACE Environmental Operating Principles (EOP) should be considered. The re-energized EOP principles are considered at the same level as economic issues. The seven EOP principles are:

- Foster a culture of sustainability throughout the organization;
- Proactively consider environmental consequences of all USACE activities and act accordingly;
- Create mutually supporting economic and environmental solutions;

- Continue to meet our corporate responsibility and accountability under the law for activities undertaken by the USACE which may impact human and natural environments;
- Consider the environment in employing a risk management and systems approach throughout life cycles of projects and programs;
- Leverage scientific, economic, and social knowledge to understand the environmental context and effects of USACE actions in a collaborative manner; and
- Employ an open, transparent process that respects views of individuals and groups interested in USACE activities.

4.4 Methodology to Develop Social and Other Criteria

Plans proposed for implementation should have an overall favorable impact on the social well-being of affected interests and have overall public acceptance. Structural and nonstructural alternatives must reflect close coordination with interested Federal and state agencies and the affected public. The effects of these alternatives on the environment must be carefully identified and compared with technical, economic, and social considerations and evaluated in light of public input.

4.5 USACE Campaign Plan

In August 2006, as a result of lessons learned from hurricanes Katrina and Rita, the USACE Chief of Engineers initiated the "Actions for Change" in an effort to transform the USACE planning, design, construction, and operation and maintenance principles and decision-making processes. This program has been further developed into the Campaign Plan which was updated in June 2013. The USACE is moving forward with this Campaign Plan to transform the way business is done. The USACE Campaign Plan is available on the internet at: http://www.usace.army.mil/About/CampaignPlan.aspx.

The successful achievement of the goals and objectives contained in this Campaign Plan are dependent on actions implemented by the entire USACE team. The Campaign Plan included four goals for USACE. These goals are:

Goal 1: Support the Warfighter – Deliver innovative, resilient, and sustainable solutions to DoD and the Nation.

Goal 2: Transform Civil Works – Deliver enduring and essential water resource solutions, utilizing effective transformation strategies.

Goal 3: Reduce Disaster Risks – Deliver support that responds to, recovers from, and mitigates disaster impacts to the Nation.

Goal 4: Prepare for Tomorrow – Build resilient People, Teams, Systems and Processes to sustain a diverse culture of collaboration, innovation and participation to shape and deliver strategic solutions.

Goals 1 and 3 do not apply directly to the USACE planning process and are not discussed in detail. Goals 2 and 4 pertain to water resources planning and directly to the BIH study. These goals are described in more detail below.

Goal 2: Transform Civil Works

With Goal 2 USACE will focus its talents and energy on comprehensive, sustainable and integrated solutions to the nation's water resources and related challenges through collaboration with stakeholders (internal, regional, states, local entities, other Federal agencies, etc.), playing traditional or emerging roles (leadership, technical support, broker, data and knowledge provider, etc.), and evaluating the current and required portfolio of water resources infrastructure. This goal refers to not only developing and delivering comprehensive and lasting solutions and products but also, ensuring that the deliverables are sustainable (long lasting, integrated and holistic) to respond to today's and future challenges.

Goal 4: Prepare for Tomorrow

Goal 4 emphasizes that a USACE will employ a workforce with proven capability to consistently and reliably deliver the highest quality solutions to the Nation's public engineering challenges today. The BIH product delivery team could be relied upon to provide innovative concepts for building strong into our future.

The Campaign Plan results are discussed in Section 8.6 of the Main Report.

4.6 Key Uncertainties

The key uncertainties for this study are:

- Economic forecasts - There is always a degree of uncertainty in the economic forecasts due to unknown factors, but these are minimized to the greatest extent possible through the process.

- RSLR - While the future rate of RSLR in the BIH study area is uncertain, it must be considered in project planning. RSLR consists of two components: global (eustatic) sea level rise and local subsidence. The uncertainty in the rates of eustatic sea level rise is evident in the variability of the different modeled rates given for the National Research Council (1987) projections and the 2007 Intergovernmental Panel on Climate Change. A similar degree of uncertainty exists with the rate of local subsidence although it is considered minor in this area of the coast.

5.0 INITIAL ARRAY OF ALTERNATIVE PLANS

Individual measures were developed to satisfy the planning objectives in providing more efficient navigation along the waterway (for vessels and offshore rigs). Alternative plans were formulated through combinations of remaining management measures.

5.1 Future Without-Project Condition (No Action Alternative)

The No Action Alternative provides a baseline against which the benefits and impacts of action alternatives may be measured, and it is required by NEPA to be included among the alternative plans in the Final Array of alternatives. It is described in more detail in Section 3 of the main report.

5.2 Initial Array of Alternatives

Based on the measures identified previously, four structural alternatives and a no-action alternative were included in the Initial Array. Various scales of these four structural alternatives were screened with a total of 13 plans evaluated. The specific structural alternatives are identified below:

DEEPENING ONLY
I-1a Deepen existing channel from 42 to 45 feet;
I-1b Deepen existing channel from 42 to 48 feet;
I-1c Deepen existing channel from 42 to 50 feet;
I-1d Deepen existing channel from 42 to 55 feet;

WIDENING ONLY
I-2a Widen channel bottom from 250 to 350 feet;
I-2b Widen channel bottom from 250 to 450 feet;
I-2c Widen channel only to rig fabrication facility;

DEEPENING AND WIDENING
I-3a Deepen from 42 to 45 feet and widen channel bottom from 250 to 350 feet;
I-3b Deepen from 42 to 50 feet and widen channel bottom from 250 to 350 feet;
I-3c Deepen from 42 to 55 feet and widen channel bottom from 250 to 350 feet;
I-3d Deepen channel from 42 to 48 feet and widen with shelves – each side by 75 feet at 45-foot depth;

WITH NEW TURNING BASIN
I-4a Add new turning basin (2,000 feet by 2,000 feet)/deepen to new location;
I-4b Add new turning basin (2,000 feet by 2,000 feet)/deepen and widen to new location;

NO ACTION
I-5 No Action alternative.

5.3 Initial Screening Criteria

To evaluate and screen the Initial Array of alternative plans to determine those that best meet the study objectives, an initial screening matrix was developed. The first two criteria measure outputs associated with the alternatives as they relate to the study planning objectives. These criteria include:

Improves Deep-Draft Navigation - Potential to increase vessel efficiency by deepening channel; and
Improves Navigation (widening needs) - Potential to increase vessel and rig traffic by widening channel.

The remaining criteria identify outputs as they relate to the overall Federal objective and compliance with environmental protection requirements. These criteria include:

Environmental Impact – Potential to negatively impact environmental and physiographic resources;
Cultural Resource Impacts - Potential to negatively impact existing cultural resources;
Operation and Maintenance Cost – Potential to increase life cycle cost for operating and maintaining the channel;
Construction Cost - Cost to construct the channel design relative to other alternative configurations; and
Long-term Disposal Issues - Anticipated issues with disposal of new work and/or maintenance material.

Real estate issues were not included in the screening because the non-Federal sponsor owns all of the lands adjacent to the channel.

5.4 Initial Screening of Alternatives

An initial screening of the alternatives was conducted to eliminate any alternatives that was rated low on the screening criteria. The remaining alternatives were carried forward in the study process to undergo more detailed analyses as a part of the Evaluation Array.

This initial screening was conducted using the screening criteria listed above, scientific judgment from use of mapping and alternative footprints, as well as the professional expertise of the PDT to identify the implications of each alternative. Environmental benefits or costs (e.g. mitigation, construction, O&M, etc.) were not calculated for the alternatives during this initial screening process. The Initial Array of structural improvements was assessed for potential effects to the environment qualitatively. Screening values were determined based on the professional judgment of the PDT.

Table 5-1 presents the results of this initial screening. Each of the alternatives was rated on a qualitative scale of 1 to 10 with 1 having the worst outcome and 10 the best outcome. The rating explanation for each alternative is presented below.

5.4.1 Criteria 1 (Objective 1) – Improves Deep-Draft Navigation

Deepening Only – It was assumed that the first scale of channel deepening from 42 to 45 feet (I-1a) provides substantial benefits to deep-draft vessel operating costs and was, therefore, assigned a 7. Each scale of channel depth after 45 feet provides greater benefits at roughly the same rate, with 48 feet (I-1b) and 50 feet (I-1c) assigned 8 and 9 scores, respectively. For the last scale (I-1d - 55 feet), it is assumed that benefits taper off because the biggest vessel classes cannot utilize this channel, and it, therefore, was assigned the same score as the 50-foot depth.

Widening Only – Widening provides incidental benefits to deep-draft navigation because a wider channel provides better maneuverability for deep-draft vessels as the depth increases. It was assumed that the first alternative I-2a (widening from 250 to 350 feet) would provide average benefits and was assigned a score of 5. The second scale for alternative I-2b (widening from 250 to 450 feet) would provide slightly higher benefits and was assigned a score of 6. The third scale (I-2c widening the channel only to rig fabrication facility) would not widen the entire channel and tfewer benefits would accrue to deep-draft vessels, therefore it was assigned a score of 3.

Table 5-1. Initial Array of Alternatives Screening Matrix

ALTERNATIVE Scoring: (1= Worst Outcome 10= Best Outcome)		Obj. 1 Improves Deep-Draft Navigation	Obj. 2 Improves Nav. widening needs	Environmental Impact	Cultural Resource Concerns	O&M Costs	Construction Costs	Long-Term Disposal Issues	Total
DEEPENING ONLY									
I-1a	Deepen existing channel from 42 to 45 feet	7	2	7	9	9	9	9	52
I-1b	Deepen existing channel from 42 to 48 feet	8	2	6	9	8	8	8	49
I-1c	Deepen existing channel from 42 to 50 feet	9	3	5	9	7	7	7	47
I-1d	Deepen existing channel from 42 to 55 feet	9	4	4	9	6	6	6	44
WIDENING ONLY									
I-2a	Widen channel bottom from 250 to 350 feet	5	8	7	8	7	7	7	49
I-2b	Widen channel bottom from 250 to 450 feet	6	9	6	7	5	6	6	45
I-2c	Widen channel only to rig fabrication facility	3	6	7	7	5	6	6	40
DEEPENING AND WIDENING									
I-3a	Deepen from 42 to 45 feet and widen channel bottom from 250 to 350 feet	7	8	7	8	7	7	7	51
I-3b	Deepen from 42 to 50 feet and widen channel bottom from 250 to 350 feet	9	9	5	8	6	6	6	49
I-3c	Deepen from 42 to55 feet and widen channel bottom from 250 to 350 feet	9	9	3	5	5	4	4	39
I-3d	Deepen from 42 to 48 feet and widen with shelves - each side by 75 feet at 45-foot depth	8	8	6	6	6	5	6	45
WITH NEW TURNING BASIN									
I-4a	Deepen only up to new turning basin location	8	4	5	5	8	9	8	47
I-4b	Deepen and widen up to new turning basin location	9	7	4	5	7	7	7	46
NO ACTION									
I-5	No Action Alternative	1	1	10	10	10	10	10	52

Note: Obj. 1 – Reduce costs of navigation associated with vessel movement entering and leaving POB

Obj. 2 – Improve channel dimensions to accommodate current and future offshore rigs into POB for fabrication, maintenance, and repair

Deepening and Widening – The first three scales of this alternative assume deepening to 45, 50 and 55 feet, respectively, with widening to 350 feet. These scales combine the benefits of deepening and widening and therefore were assigned scores equivalent to the highest of the corresponding deepening or widening benefits. The 45-foot (I-3a), 50-foot (I-3b), and 55-foot (I-3c) depths received scores of 7, 9 and 9 respectively. The fourth scale would deepen the channel to 48 feet and widen using shelves that are each 75 feet wide at a 45-foot depth (I-3d), resulting in a total widening of 150 feet. This scale received a score of 8 because it would provide deep-draft benefits intermediate of those for the 45- and 50-foot scales.

With New Turning Basin – The first scale would create a new turning basin near Port Isabel and deepen only up to the new turning basin (I-4a). The second scale create the same new turning basin and deepen and widen to the same location (I-4b). It was assumed that most facilities would relocate to the new turning basin to reduce transit costs on the channel. Based on substantial potential reductions in transportation costs, the first scale was assigned a score of 8, and the second scale was assigned a score of 9 since widening would provide incidental benefits of vessel maneuverability.

5.4.2 Criteria 2 (Objective 2) – Improves Navigation Widening Needs

Deepening Only – It was assumed that the first two scales of channel deepening from 42 to 45 feet (I-1a), and from 42 to 48 feet(I-1b) provide minor incidental widening benefits as new side slopes are established for the deeper cross-section. These two depth scales, therefore, each received a score of 2. The 48-foot (I-1c) and 55-foot (I-1d) scales would provide additional incidental widening and were assigned scores of 3 and 4, respectively.

Widening Only – It was assumed that greater channel widths would provide significant benefits for large oil rigs and other large deep-draft vessels using the channel. The largest scale (I-2a widening to 450 feet) would provide the most benefits and was assigned a score of 9 while widening to 350 feet (I-2b) would provide fewer benefits and was assigned a score of 8. The third scale would widen the channel only to the existing rig fabrication facility (I-2c), and fewer benefits would accrue to other deep-draft vessels that need to access the remainder of the channel. Therefore, the third scale was assigned a score of 6.

Deepening and Widening – The first three scales of this alternative assume deepening to 45, 50 and 55 feet, respectively, with widening to 350 feet. These scales combine the benefits of deepening and widening and therefore were assigned scores equivalent to the highest of the corresponding deepening or widening benefits. The 45-foot (I-3a), 50-foot (I-3b), and 55-foot (I-3c) depths received scores of 8, 9 and 9 respectively. The fourth scale would deepen the channel to 48 feet and widen using shelves that are each 75 feet wide at a 45-foot depth (I-3d), resulting in a total widening of 150 feet. This scale received a score of 8 because it would provide widening benefits similar to that of the 350-foot widening scale.

With New Turning Basin – The first scale would create a new turning basin near Port Isabel and deepen only up to the new turning basin (I-4a). The second scale create the same new turning basin and deepen and widen to the same location (I-4b). It was assumed that most facilities would relocate to the new turning basin to reduce transit costs on the channel. Based on substantial potential reductions in transportation costs for vessels needing a wider channel, the first scale was assigned a score of 4, and the second scale was assigned a score of 7.

5.4.3 Criteria 3 – Environmental Impact

Deepening Only – It was assumed that deepening only would impact submerged lands immediately adjacent to the channel because incidental widening would occur as new side slopes are established and that impacts to uplands would be minimal. Impacts to channel bottom and aquatic organisms would be the lowest for the first scale of channel deepening from 42 to 45 feet (I-1a) and was therefore assigned a 7. Increasing impacts would result in lower scores as the lowest score represents the worst outcome. Each scale of channel depth after 45 feet provides larger respective impacts, and therefore the 48- (I-1b), 50- (I-1c) and 55- (I-1d) foot scales were assigned scores of 6, 5, and 4, respectively.

Widening Only – It was assumed that widening from 250 to 350 feet (scale I-2a) would only impact submerged lands along the top of the channel cut. This would result in low to moderate impacts of aquatic and was assigned a score of 7. It was assumed that widening from 250 to 450 feet (scale I-2b) would impact an upland corridor up to 100 feet wide along both sides of the channel. Much of this corridor does not contain environmentally sensitive habitats, and most of the area within the corridor on the south side of the Main Channel is comprised of existing PAs. However, the corridor south of the channel across from Port Isabel is part of a CBRA unit and is designated critical habitat for the piping plover. Channel widening in this area might be prohibited by CBRA, but significant impacts to critical habitat would not be expected. Based on these considerations, Scale I-2b would cause more impacts and was assigned a score of 6. Scale I-2c (widening the channel only to the existing rig fabrication facility) would widen most of the channel and was assigned a score of 7.

Deepening and Widening – The first three scales of this alternative assume deepening to 45, 50 and 55 feet, respectively, with widening to 350 feet. These scales combine the environmental impacts of deepening with widening to 350 feet. Impacts would increase and scores would decrease as the depth increases. The 45-foot (I-3a), 50-foot (I-3b), and 55-foot (I-3c) depths received scores of 7, 5 and 3, respectively. The fourth scale would deepen the channel to 48 feet and widen using shelves that are each 75 feet wide at a 45-foot depth (I-3d), resulting in a total widening of 150 feet. This scale received a score of 6 because it would cause impacts intermediate of those of the 45- and 50-foot scales.

With New Turning Basin – The first scale would create a new turning basin near Port Isabel and deepen only up to the new turning basin ((I-4a). The second scale create the same new turning basin and deepen and widen to the same location (I-4b). Creation of the new turning basin would create more environmental impacts than any of the other alternatives because it would impact sensitive uplands adjacent to the Bahia Grande. Based on substantial expected impacts only through the Port Isabel area, the first scale was assigned a score of 5, and the second scale was assigned a score of 4 since widening would provide channel bottom impacts.

5.4.4 Criteria 4 – Cultural Resource Impacts

Deepening Only – It was assumed that deepening only would impact submerged lands immediately adjacent to the channel because incidental widening would occur as new side slopes are established and that impacts to uplands would be minimal to none. Research has identified no historic shipwrecks along the channel which could be impacted, and therefore cultural resource impacts would not be expected for any of the deepening scales. All of the scales (I-1a, I-1b, I-1c, and I-1d) were, therefore, assigned a score of 9.

Widening Only – It was assumed that widening from 250 to 350 feet (I-2a) would only impact submerged lands along the top of the channel cut, while the 450-foot widening (I-2b) would impact an upland corridor up to 100 feet wide along the channel. Much of this corridor does not contain landforms with a high probability for the presence of archeological sites, so cultural resource impacts would not be extensive. It does contain some high probability areas near Port Isabel and, therefore, the first widening scale (from 250 to 350 feet) could result in some cultural resource impacts and was assigned a score of 8. The second scale (from 250 to 450 feet) could result in more impacts and was assigned a score of 7. The third scale (I-2c widening the channel only to rig fabrication facility) would impact the area near Port Isabel and, therefore, was assigned the score of 7.

Deepening and Widening – The first three scales of this alternative assume deepening to 45, 50 and 55 feet, respectively, with widening to 350 feet. Few cultural resource impacts would be anticipated for scales I-3a and I-3b (deepening to 45 and 50 feet, respectively, and widening to 350 feet) since all impacts would be to submerged lands with low potential for the presence of historic shipwrecks. Scales I-3a and I-3b were, therefore, both assigned scores of 8. The 55-foot depth with 350-foot widening, however, would result in substantial incidental widening of the top of cut. As this would increase the potential for cultural resource impacts, scale I-3c received a score of 5. The fourth scale (I-3d) would deepen the channel to 48 feet and widen using shelves that are each 75 feet wide at a 45-foot depth, resulting in a total widening of 150 feet. This scale received a score of 6 because it would cause impacts slightly less than those of scale I-3c.

With New Turning Basin – Scale I-4a would create a new turning basin near Port Isabel and deepen only up to the new turning basin. Scale I-4b would create the same new turning basin and deepen and widen to the same location. Creation of the new turning basin would create more cultural resource impacts than any of the other alternatives because it would impact high potential landforms adjacent to the Bahia Grande. Based on substantial expected impacts in the Port Isabel area, scales I-4a and I-4b were both assigned a score of 5.

5.4.5 Criteria 5 – O&M Costs

Deepening Only – It was assumed that deepening would increase shoaling by small amounts, with the shoaling increasing with increasing depths. Scale I-1a (deepening to 45 feet) would cause the lowest increase and was assigned a score of 9. Scales I-1b, I-1c, and I-1d were assigned scores of 8, 7, and 6, respectively, based on the assumption that shoaling would increase at roughly the same rate as the depth increased.

Widening Only – It was assumed that widening would have a greater impact on shoaling than deepening, as the wider cross-section would have a greater dampening effect on velocities within the channel than a deeper cross-section. Further, it was assumed that shoaling would increase as the widening increased. Scale I-2a (widening from 250-350 feet) was assigned a score of 7, and scale I-2b was assigned a score of 5. Scale I-2c (widening the channel to the existing rig fabrication facility) would impact shoaling over most of the channel and was assigned a score of 5.

Deepening and Widening – Scales I-3a, I-3b, and I-3c of this alternative assume deepening to 45, 50 and 55 feet, respectively, with widening to 350 feet. These scales combine the shoaling impacts of deepening to various depths with widening to 350 feet. Impacts of a combination of widening and deepening were assumed to be similar to those discussed above. Therefore, scales I-3a, I-3b, and I-3c were assigned scores of 7, 6, and 5 respectively. Scale I-3d would deepen the channel to 48 feet and widen using shelves that are each 75 feet wide at a 45-foot depth, resulting in a total widening of 150 feet. This scale received a score of 6 because it would cause shoaling impacts slightly less than those of scale I-3c.

With New Turning Basin – Scale I-4a would create a new turning basin near Port Isabel (approximately Station 20+000) and deepen only up to the new turning basin. Scale I-4b would create the same new turning basin and deepen and widen to the same location. Creation of the new turning basin at Port Isabel would significantly reduce the channel length over which shoaling would increase, and scales I-4a and I-4b were assigned scores of 8 and 7, respectively.

5.4.6 Criteria 6 – Construction Costs

Deepening Only – It was assumed that construction costs would increase as the channel excavation increased. Thus, scale I-1a (deepening to 45 feet) with a deepening of only 3 feet was assigned a score of 9, and scales I-1b, 1-1c, and I-1d were assigned scores of 8, 7, and 6, respectively.

Widening Only – It was assumed that construction costs would increase as the channel widening increased, and that channel widening would generally result in more excavation than deepening. Scale I-2a (widening from 250 to 350 feet) was assigned a score of 7, and scale I-2b was assigned a score of 6. Scale I-2c (widening the channel to the existing rig fabrication facility) would cost nearly the same as scale I-2b and was assigned the score of 6.

Deepening and Widening – Scales I-3a, I-3b, and I-3c of this alternative assume deepening to 45, 50 and 55 feet, respectively, with widening to 350 feet. These scales roughly combine the construction costs of deepening to various depths with widening to 350 feet as discussed above. Therefore, scales I-3a, I-3b, and I-3c were assigned scores of 7, 6, and 4 respectively. Scale I-3d would deepen the channel to 48 feet and widen using shelves that are each 75 feet wide at a 45-foot depth, resulting in a total widening of 150 feet. This scale received a score of 5 because construction costs would be slightly less than those of scale I-3c.

With New Turning Basin – Scale I-4a would create a new turning basin near Port Isabel (approximately Station 20+000) and deepen only up to the new turning basin. Scale I-4b would create the same new turning basin and deepen and widen to the same location. Creation of the new turning basin at Port Isabel would significantly limit the length of channel to be improved and therefore scales I-4a and I-4b were assigned scores of 9 and 7, respectively.

5.4.7 Criteria 7 – Long-Term Disposal Issues

Deepening Only – It was assumed that sufficient capacity would be available within existing PAs to accommodate all dredged material from the various channel depths. Offshore PAs are located in dispersive environments and essentially have no maximum capacity. For upland PAs, containment dikes would need to be raised to a higher final elevation for the deeper channel depths. Scale I-1a (deepening to 45 feet) would cause the lowest increase in costs for containment dikes and was assigned a score of 9. Scales I-1b, I-1c, and I-1d were assigned scores of 8, 7, and 6, respectively, based on the assumption that costs to raise the dikes would increase at roughly the same rate as the depth increased.

Widening Only – It was assumed that widening would have a greater impact on shoaling than deepening, and that costs to raise containment dike heights around upland PAs would be correspondingly higher. Scale I-2a (widening from 250-350 feet) was assigned a score of 7, and scale I-2b was assigned a score of 6. Scale I-2c (widening the channel to the existing rig fabrication facility) would result in dike raising costs roughly equivalent to scale I-2b and was assigned the score of 6.

Deepening and Widening – Scales I-3a, I-3b, and I-3c of this alternative assume deepening to 45, 50 and 55 feet, respectively, with widening to 350 feet. These scales combine the long-term disposal needs of deepening to various depths with widening to 350 feet. Therefore, scales I-3a, I-3b, and I-3c were assigned scores of 7, 6, and 4, respectively. Scale I-3d would deepen the channel to 48 feet and widen using shelves that are each 75 feet wide at a 45-foot depth, resulting in a total widening of 150 feet. This scale received a score of 6 because it would result in dike raising cost slightly lower than those of scale I-3c.

With New Turning Basin – Scale I-4a would create a new turning basin near Port Isabel (approximately Station 20+000) and deepen only up to the new turning basin. Scale I-4b would create the same new turning basin and deepen and widen to the same location. Creation of the new turning basin at Port Isabel would significantly reduce the incremental cost to raise containment dikes, and therefore scales I-4a and I-4b were assigned scores of 8 and 7, respectively.

Table 5-2 presents numerical rankings for each alternative, which were calculated by adding the individual rankings for the criteria together. These alternative rankings have been sorted from highest (best) to lowest (worst) and are a basis for comparison of the alternatives from this qualitative analysis. This comparison supports the screening out of the plans discussed above and resulted in Alternatives I-1d, I-2c, I-3, and I-5 being dropped from further consideration. The remaining alternatives were reformulated and carried into the next phase: development of the Evaluation Array of alternatives. These alternatives being brought into the next phase had higher total scores than those that were disregarded from further study.

Table 5-2. Numerical Ranking of Initial Array of Alternatives			
ALT NO.	**ALTERNATIVE DESCRIPTION (Higher Score = Best Outcome; 60 possible points)**	**TOTAL SCORE***	**RETAINED FOR NEXT PHASE**
I-1a	Deepen existing channel from 42 to 45 feet	52	Yes
I-5	No Action Alternative	52	Yes
I-3a	Deepen from 42 to 45 feet and widen channel bottom from 250 to 350 feet	51	Yes
I-1b	Deepen existing channel from 42 to 48 feet	49	Yes
I-2a	Widen channel bottom from 250 to 350 feet	49	Yes
I-3b	Deepen from 42 to 50 feet and widen channel bottom from 250 to 350 feet	49	Yes
I-1c	Deepen existing channel from 42 to 50 feet	47	Yes
I-4a	Deepen only up to new turning basin location	47	Yes
I-4b	Deepen and widen up to new turning basin location	46	Yes
I-2b	Widen channel bottom from 250 to 450 feet	45	Yes
I-3d	Deepen channel from 42 to 48 feet and widen with shelves - each side by 50 to 75 feet at 45-foot depth	45	Yes
I-1d	Deepen existing channel from 42 to 55 feet	44	No
I-2c	Widen channel only to rig fabrication facility	40	No
I-3c	Deepen from 42 to55 feet and widen channel bottom from 250 to 350 feet	39	No
* summation of screening criteria determined by PDT consensus (see Table 5-1)			

6.0 EVALUATION ARRAY OF ALTERNATIVE PLANS

6.1 Evaluation Array of Alternatives

During the evaluation screening, offshore rig width was considered the primary driver for widening the channel. Input from the non-Federal sponsor regarding needs by the shipping industry and rig facilities also supported the need for an increase beyond the 350-foot channel width that was carried forward from the initial screening. The comparison of the world fleet and the Brownsville offshore rig fleet presented in Section 2 of the main report indicates that only 20 percent of the world fleet uses Brownsville with 32 percent of the world fleet with widths between 350 and 399 feet that could possibly benefit from widening beyond the 350-foot width. This economic data supported a change of all evaluation screening to widening from 250 to 450 feet, rather than maintaining both original widening alternatives (widening from 250 to 350 and 450 feet, respectively).

The Evaluation Array was developed based on the same four main structural alternatives considered in the initial screening with changes to the scales evaluated. Once the evaluation screening was completed and more detailed analysis of the economics for the rig fleet was done, the channel width could be revisited and possibly reformulated based on the latest forecasts. The Evaluation Array of alternative plans included:

DEEPENING ONLY

E-1a Deepen existing channel from 42 to 45 feet;

E-1b Deepen existing channel from 42 to 48 feet;

E-1c Deepen existing channel from 42 to 50 feet;

WIDENING ONLY

E-2 Widen channel bottom from 250 to 450 feet;

DEEPENING AND WIDENING

E-3a Deepen from 42 to 45 feet and widen channel bottom from 250 to 450 feet;

E-3b Deepen from 42 to 48 feet and widen channel bottom from 250 to 450 feet;

E-3c Deepen from 42 to 50 feet and widen channel bottom from 250 to 450 feet;

E-3d Deepen from 42 to 45 feet and construct 75-foot wide and 42-foot deep shelves on either side of the channel;

E-3e Deepen from 42 to 48 feet and construct 75-foot wide and 42-foot deep shelves on either side of the channel;

E-3f Deepen from 42 to 50 feet and construct 75-foot wide and 42-foot deep shelves on either side of the channel;

WITH TURNING BASIN

E-4a Construct new turning basin, deepen channel from 42 to 45 feet from channel entrance to new turning basin, widen entire channel from 250 to 450 feet;

E-4b Construct new turning basin, deepen channel from 42 to 48 feet from channel entrance to new turning basin, widen entire channel from 250 to 450 feet;

E-4c Construct new turning basin, deepen channel from 42 to 50 feet from channel entrance to new turning basin, widen entire channel from 250 to 450 feet; and

NO ACTION

E-5 No Action alternative.

Screening of the evaluation array of alternatives resulted in a Final Array of alternative plans, which were carried forward for detailed analysis and evaluation, and selection of the

Recommended Plan. The Final Array of alternative plans is presented in the next section of this report.

6.2 Evaluation Screening Criteria

In order to evaluate and screen the Evaluation Array of alternatives to best meet the study and non-Federal sponsor objectives, a more detailed screening matrix was developed, which included quantitative criteria such as quantities, costs, and BCRs. Other criteria were qualitative in nature with these screening values being determined by consensus of the PDT. The following screening criteria were identified and used in screening the alternatives:

Dredging Quantities in million cubic yards (MCY)
Navigational Improvement
Environmental Considerations
Cultural Resource Concerns
HTRW Considerations
Real Estate Issues
Mitigation Costs
O&M Costs
Construction Costs
Average Annual Costs
Net Excess Benefits
BCRs

Screening values were determined using the professional judgment of the PDT. Based on preliminary analyses of the structural alternatives, a deeper and wider channel should not require additional PAs since new work construction and maintenance material could be placed in existing PAs (with necessary containment dike raisings) or in the existing ODMDSs. Structural alternatives evaluated during this screening appeared to address the problems with the existing BIH while having minimal impact on the environment.

The construction costs were developed by USACE – Galveston Cost Engineering using October 2011 price levels that were the current price levels at the time of this screening. The BCRs were calculated using an interest rate of 4.625 percent. These costs are preliminary costs to be used for comparative purposes only.

6.3 Evaluation Screening of Alternatives

A summary of the screening analysis is provided in Table 6-1. Mitigation costs for each of the alternatives were calculated and included in the first cost of construction. The criteria for Objectives 1 and 2 were combined into one score for navigation improvement during this analysis. Deepening and widening alternatives have the greatest potential for improving navigation while widening only has the least.

Environmental and cultural analyses of the alternatives indicate that the new turning basin alternative would be the most environmentally damaging of the alternatives and would require the greatest amount of mitigation for both resources, as reflected in the scores presented in Table 6-1. This turning basin alternative could potentially require removal of a large area of sand/algal/mud flats in Vadia Ancha and the removal of some upland habitat on the Loma de la Draga. Moving the turning basin closer to the Gulf provided only minor economic benefits from shorter transit times in the channel and could increase the facility's vulnerability to hurricane damages and RSLR effects. The least environmentally damaging alternatives would be the deepening only ones.

Differences between the deepening and widening alternatives could not be greatly distinguished environmentally, as was reflected in the mitigation costs developed for each. Widening would also have the potential to affect piping plover critical habitat and a CBRA unit on the south side of the Main Channel near PAs 2, 4A and 4B.

For cultural resource impacts, the more the upland areas are impacted by project activities, the greater the potential for impacting currently unrecorded cultural resources. The area near the Laguna Madre and Brazos Island has the highest probability for cultural impacts while the work within the channel has the lowest probability.

Additionally, work that enlarges the footprint of the channel has potential for HTRW impacts. Deepening only alternatives have little concern for HTRW impacts while the alternatives that widen the channel, especially in the developed portion near the turning basin, have a much greater potential for impacts, dependent on the area to be widened.

Real Estate acquisition issues are expected to be minimal because all of the property within the study area is already owned by the POB.

Table 6-1. Evaluation Array of Alternative Screening Matrix
(Cost in 1,000s, October 2011 price levels)

STRUCTURAL ALTERNATIVES Scoring: (1= Greatest Impacts, 10= Least Impacts)		SUMMARY OF PRELIMINARY ANALYSES										
		Dredging Quantities (MCY)	Obj. 1&2 Navigation Improvement	Environmental Considerations	Cultural Resource Concerns	HTRW Concerns	Mitigation Costs	O&M Costs Over 50 years	First Cost of Construction	Average Annual Construction Costs	Net Excess Benefits	BCR
DEEPENING ONLY												
E-1a	Deepen existing channel from 42 to 45 feet	7	6	8	8	9	$0	$354,301	$123,210	$6,975	$142	1.0
E-1b	Deepen existing channel from 42 to 48 feet	12	6	8	8	9	$0	$354,390	$190,446	$10,752	$2,077	1.2
E-1c	Deepen existing channel from 42 to 50 feet	15	6	8	8	9	$0	$358,648	$239,098	$13,589	$7,369	1.5
WIDENING ONLY												
E-2	Widen channel bottom from 250 to 450 feet	24	5	4	5	3	$550	$364,394	$364,394	$20,310	-$7,604	0.6
DEEPENING AND WIDENING												
E-3a	Deepen from 42 to 45 feet and widen from 250 to 450 feet	26	9	4	5	3	$550	$364,860	$407,217	$23,226	-$3,432	0.9
E-3b	Deepen from 42 to 48 feet and widen from 250 to 450 feet	32	9	4	5	3	$550	$369,189	$495,756	$28,322	-$2,786	0.9
E-3c	Deepen from 42 to 50 feet and widen from 250 to 450 feet	36	9	4	5	3	$550	$372,654	$554,589	$31,720	$1,945	1.1
E-3d	Deepen from 42 to 45 feet and widen with 75-foot shelves at 42 feet deep	21	7	6	6	4	$550	$364,397	$324,146	$18,515	-$7,710	0.6
E-3e	Deepen from 42 to 48 feet and widen with 75-foot shelves at 42 feet deep	26	7	6	6	4	$550	$363,348	$393,084	$22,397	-$5,849	0.7
E-3f	Deepen from 42 to 50 feet and widen with 75-foot shelves at 42 feet deep	29	7	6	6	4	$550	$364,664	$440,460	$26,303	-$1,625	0.9
WITH NEW TURNING BASIN												
E-4a	Deepen from 42 to 45 feet up to and creation of new turning basin, widen entire channel to 450 feet	24	6	1	1	3	$3,2776	$363,258	$419,917	$23,916	-$6,748	0.7
E-4b	Deepen from 42 to 48 feet up to and creation of new turning basin, widen entire channel to 450 feet	26	6	1	1	3	$3,2776	$364,420	$448,335	$25,545	-$4,763	0.8
E-4c	Deepen from 42 to 50 feet up to and creation of new turning basin, widen entire channel to 450 feet	28	6	1	1	3	$3,2776	$366,776	$469,032	$26,763	-$3,930	0.9
NO ACTION												
E-5	No Action Alternative		1	10	10	10		$353,766				

Note: Obj. 1 – Reduce costs of navigation associated with vessel movement entering and leaving POB

Obj. 2 – Improve channel dimensions to accommodate current and future offshore rigs into POB for fabrication, maintenance, and repair

Based on the economic analyses, which included benefits for commodities such as steel, iron ore, and rigs and the estimated costs for O&M and mitigation costs as well as the cost of construction of the project, the deepening only alternatives (E-1a, E-1b, and E-1c) and the alternative that deepened the channel from 42 to 50 feet while widening from 250 to 450 feet (E-3c) were considered to be economically justified (positive net excess benefits and a BCR of 1.0 or higher). Alternatives with shallower depths while widening from 250 to 450 feet (E-3a and E-3b) and widening from 250 to 450 feet alone (E-2) have BCRs below unity.

The alternatives, which deepened the channel and widened with shelves (E-3d, E-3e, and E-3f), did not provide the depth and width combination needed to accommodate thrusters that are attached below the rigs. These thrusters help to propel rigs when they are being moved from one location to another. These alternatives were disregarded from further analysis.

The BCR of the turning basin alternatives (E-4a, E-4b, and E-4c) was slightly below the justified BCR of 1.0. However, the costs developed in this screening for such an extensive undertaking of building a new turning basin in an environmentally sensitive area were preliminary in nature. Any further analysis would most likely increase the costs and result in the alternative not being viable. Therefore, this alternative was removed from further consideration in determining the Recommended Plan.

Table 6-2 presents a summary of the alternatives screened from the Evaluation Array of alternatives. This screening was performed using the BCRs and a summation of the criteria presented in Table 6-1. Additionally, this table shows which alternatives were retained for the Final Array of alternatives.

From Table 6-2, it is shown that the deepening only alternatives E-1a, E-1b, and E-1c and deepening and widening alternatives E-3a, E-3b, and E-3c were carried forward into the Final Array of alternatives for more detailed analyses. The remaining alternatives that had BCRs below unity were dropped from further consideration with the exception of the alternatives that deepened from 42 to 45 and 48 feet with widening from 250 to 450 feet (E-3a and E-3b). Although these alternatives that widen from 250 to 450 feet had BCRs below one, there is a potential to decrease the cost for these alternatives by decreasing the change in width. This reformulation in the widening would result in a decrease in cost and could result in an economically justified project because this cost savings for less widening translates into an increase in net excess benefits and BCRs. Additional economic analysis found that the 450 foot width was excessive for the vessels and rigs expected to utilize the channel in the future. These alternatives are also needed for optimization of the 50-foot depth. Therefore, when being carried into the Final Array of alternatives, the widening alternatives were scaled back to lower the cost and to avoid violating planning constraints to minimize impacts to designated critical habitat and comply with CBRA guidelines.

Table 6-2. Numerical Ranking by BCRs for Evaluation Array				
ALT NO.	ALTERNATIVE DESCRIPTION	BCR	CRITERIA TOTAL SCORE	RETAINED FOR NEXT PHASE
E-5	No Action Alternative		31	Yes
E-1c	Deepen existing channel from 42 to 50 feet	1.5	31	Yes
E-1b	Deepen existing channel from 42 to 48 feet	1.2	31	Yes
E-3c	Deepen from 42 to 50 feet and widen from 250 to 450 feet	1.1	21	Yes
E-1a	Deepen existing channel from 42 to 45 feet	1.0	31	Yes
E-3a	Deepen from 42 to 45 feet and widen from 250 to 450 feet	0.9	21	Yes
E-3b	Deepen from 42 to 48 feet and widen from 250 to 450 feet	0.9	21	Yes
E-3f	Deepen from 42 to 50 feet and widen with 75-foot shelves at 42 feet deep	0.9	23	No
E-4c	Deepen from 42 to 50 feet up to and creation of new turning basin, widen entire channel to 450 feet	0.9	11	No
E-4b	Deepen from 42 to 48 feet up to and creation of new turning basin, widen entire channel to 450 feet	0.8	11	No
E-3e	Deepen from 42 to 48 feet and widen with 75-foot shelves at 42-foot depth	0.7	23	No
E-4a	Deepen from 42 to 45 feet up to and creation of new turning basin, widen entire channel to 450 feet	0.7	11	No
E-3d	Deepen from 42 to 45 feet and widen from 250 to 450 feet	0.6	23	No
E-2	Widen channel bottom from 250 to 450 feet	0.6	17	No

6.4 Final Array of Alternative Plans Carried Forward

The evaluation screening discussed above resulted in the identification of the Final Array of alternatives to be carried to the final screening. The Final Array of alternatives included deepening and/or widening of the channel. The existing 42-foot channel could be deepened to 45, 48, 50, or 52 feet without widening or any of these depths could be combined widening from 250 feet to 300 or 350 feet. These width increases were reformulated to scale back from the 450-foot channel widening and were selected from examination of project economics and the expected vessel traffic to utilize the channel in the future. Additionally, since deepening only to 50 feet had the highest BCR, a depth of 52 feet was added back into the analysis to attempt to identify the NED plan. For the 45-foot deep channel, the current offshore section would extend from Station -13+000 to -15+000, adding approximately 2,000 feet to the length of the existing channel. The 48-foot deep channel would extend to Station -16+000, lengthening the channel 3,000 feet while the 50-deep channel would terminate at Station -16+400 or 3,400 feet more. The 52-foot deep channel would extend to Station -17+000 or 4,000 feet more. Detailed discussion on this economic information is included in Section 7.3 below and in the Appendix A – Economic Appendix. This Final Array is discussed in more detail in the Section 7.0.

7.0 FINAL ARRAY OF ALTERNATIVE PLANS

7.1 Description of Final Array of Alternatives

Reformulation between the evaluation and the final screenings resulted in different widening options being developed for the final screening. The evaluation screening results indicated the need for this reformulation to less widening, as described previously in Section 6.3. These final array-widening options were based on the updated economic forecasts for potential vessels and rigs expected in the channel.

Additionally, the 52-foot deepening was added back into the array to attempt to bracket the NED plan. The non-Federal sponsor originally indicated during the initial screening that they did not support deepening beyond 50 feet. However, after more detailed economics was developed indicating the possibility of the NED plan at a depth beyond 50 feet, the non-Federal sponsor reconsidered this limitation and fully supports alternatives up to 52-foot depths.

For the Final Array of alternatives, the alternatives considered at various scales in depths that were screened included channel widths of 250 feet, 300 feet, and 350 feet. These alternatives included:

DEEPENING ONLY

F-1a Deepen from 42 to 45 feet;
F-1b Deepen from 42 to 48 feet;
F-1c Deepen from 42 to 50 feet;
F-1d Deepen from 42 to 52 feet;

DEEPENING AND WIDENING (300 feet)

F-2a Deepen from 42 to 45 feet and widen channel from 250 to 300 feet;
F-2b Deepen from 42 to 48 feet and widen channel from 250 to 300 feet;

F-2c Deepen from 42 to 50 feet and widen channel from 250 to 300 feet;
F-2d Deepen from 42 to 52 feet and widen channel from 250 to 300 feet;

DEEPENING AND WIDENING (350 feet)
F-3a Deepen from 42 to 45 feet and widen channel from 250 to 350 feet;
F-3b Deepen from 42 to 48 feet and widen channel from 250 to 350 feet;
F-3c Deepen from 42 to 50 feet and widen channel from 250 to 350 feet;
F-3 Deepen from 42 to 52 feet and widen channel from 250 to 350 feet; and

NO ACTION
F-4 No Action alternative.

7.2 Final Screening Criteria

In order to evaluate and screen the Final Array of alternatives to best meet the study and non-Federal sponsor objectives, screening was performed using quantitative criteria such as quantities, costs, and BCRs. The following screening criteria were identified and used in screening the alternatives:

Dredging Quantities
Environmental Considerations
Construction Costs
Navigation Benefits
Net Excess Benefits
BCRs

As a result of additional detailed analyses of the structural alternatives, none of the alternatives would require additional PAs since new work construction and maintenance material could be placed in existing PAs (with necessary containment dike raisings) or in the ODMDSs. Structural alternatives evaluated during this screening appeared to address the problems with the existing BIH while having minimal impact on the environment.

The construction costs were developed by USACE – Galveston Cost Engineering using October 2012 price levels, the price level at the time of these calculations. Benefits and costs were calculated with a base year of 2017 using the FY2013 discount rate of 3.5 percent and the Office of Management and Budget required 7.0 percent. These costs are preliminary costs to be used for comparative purposes only. Final detailed costs would be completed on the Recommended Plan only.

Benefits were calculated using HarborSym deepening and widening models for the traditional benefits. These benefits are the difference in benefits from the improved channel and any benefits realized in the most likely without-project condition, previously described in Section 2 of the main report.

7.3 Economic Analysis for Final Screening

7.3.1 Traditional NED Benefit Analysis

To calculate economic benefits for the Final Array of alternatives, alternatives for 45-, 48-, 50-, and 52-foot depths with channel widths of 250 feet, 300 feet, and 350 feet were evaluated. These alternatives were each modeled in HarborSym for the years 2017, 2037, and 2067. The project benefits were calculated based on reductions in transportation costs generated for more efficient vessel transportation and less restrictions on transit of larger oil drilling rigs. The proposed channel improvements are in response to the need for deeper access by allowing the existing fleet to load more fully and for the introduction of larger vessels, to include oil drilling rigs.

A multiport analysis was used to assess whether improvements at BIH would result in a diversion of cargo traffic that would either shift to or from competing ports to or from BIH. Diverted traffic from competing U.S. ports is not a NED benefit as there is no increase in the net value of the national output of goods and services, except when the diversion results in a net reduction in transportation costs. This analysis identified those commodities that would benefit from improvements to the Federal project. For each benefiting cargo group, it identified their cargo volumes at competing ports, assessed the extent of the overlap in the flow of these commodities and in the hinterlands served by each of the potential competing ports, and identified any advantageous/disadvantageous transportation costs and institutional and/or cargo capacity constraints resulting from port administration, terminal operators, and/or stevedore companies' policies, and/or future growth. The analysis did not find for any reason to assume a shift in cargo to or from BIH would occur.

The growth rates used for the commodity forecast were based on several variables, including the historical tonnage trends as calculated from the Waterborne Commerce Statistics, interviews with end-users, as well as similar rates used in other regional projects based on Department of Energy forecasts. Current transit rules established by the Pilots are expected to continue with an improved channel and were used in the analysis.

The current deep-draft vessel calls do not come into the POB fully loaded. Therefore, it was assumed that in the future, vessels would come in loaded at capacity, thereby reducing the number of calls. Larger vessels than the largest currently traversing the channel are not anticipated, but the number of vessel calls of the largest vessels would increase over time. It is anticipated that in the future, the fleet would transition from smaller vessels to larger vessels as efficiencies are realized. The number of vessel calls would increase through 2037 as the tonnage increases, but would decrease through 2067 as the fleet transitions from smaller vessels to larger vessels. The underkeel clearance of 3 feet used was based on information from the Pilots.

Offshore oil rigs are routinely required to come into dock for inspections or when they require maintenance and repair. One of the closest current locations for rigs operating in the Gulf of Mexico to have such inspections or repairs performed is the Keppel-AmFELS location at BIH. Keppel-AmFELS' work typically consists of jack-ups and semi-submersible oil rigs. However, over time the semi-submersible rigs have been built wider and deeper, reaching the limitations of the current BSC dimensions, which risks the operations being moved to Mexico without channel improvements. The underkeel clearance of 4 feet used for the rigs was based on information from the Pilots.

Some semi-submersibles would be able to traverse the channel if the thrusters are removed at sea, as they add extra depth to the rig. However, this removal costs several millions of dollars, which can be a limitation for owners when deciding to bring a rig to BIH. As this adds to the transportation costs of the rig, the thruster removal was modeled in HarborSym. A range of $2,000 to $4,000 was used for the hourly foreign cost in port for the largest semi-submersible rigs in the without-project condition. No costs were included in the with-project alternatives because it assumed the thrusters would not be required to be removed. Also, because the rigs would be in dry-dock for a minimum of two months, depending on the work required, costs were not included for the at-sea or in-port conditions since it would be unreasonable for costs to accrue like a bulker that spends a week in-port unloading its commodities.

The number of oil rig calls in HarborSym was held constant throughout the period of analysis and was based on historical capacity limits at Keppel-AmFELS, as well as interviews with the Keppel-AmFELS officials. However, the average mix of eight rig calls was varied depending on the channel dimensions. For example, a 50-foot deep channel would accommodate more semi-submersibles than a 43-foot deep channel, which would expect more jack-up rigs.

7.3.2 Section 6009 Benefit Analysis

An economic analysis was completed using the September 13, 2012 USACE implementation guidance for Section 6009 of the Emergency Supplemental Appropriations Act for Defense, the Global War on Terror, and Tsunami Relief, 2005 (Public Law 109-13) – Offshore Oil and Gas Fabrication Ports (Section 6009). This analysis calculated additional benefits for the oil rigs beyond the traditional NED benefits with the value of future energy exploration and production fabrication contracts for offshore oil rigs.

Separate BCRs were calculated to include the Section 6009 benefits. These calculations include proprietary information, and therefore, are included in a separate addendum for official use only.

7.4 Engineering Considerations for Final Screening

7.4.1 Ship Simulation Results

In May and September of 2010, the Engineer Research and Design Center (ERDC) performed ship simulations for BIH for depths of 42, 45, and 48 feet and various widths. This simulation included a 2-foot allowance so it could also be applied to the 50-foot depth. ERDC modeled two vessels, a tanker with dimensions of 846 feet by 157 feet by 47 feet and a Very Large Crude Carrier (VLCC) with dimensions of 1087 feet by 195 feet by 24 feet. The tanker was selected because it was one of the vessels ERDC had in their database that was larger than any vessels currently coming into the channel. The VLCC was selected because it was a part of ERDC's database and represented the largest vessel that would come in to be scrapped. Originally a bulker vessel was to be modeled for future conditions, but the one selected could already safely travel in the existing channel dimensions.

During the preliminary simulation runs, it was found that deepening only along the channel was not adequate for the expected traffic and the 200-foot widening was excessive. Additional runs were completed with 300-, 350- and 400-foot channel widths. The results found that 300-foot width was not sufficient for either of the design vessels with numerous runs leaving the channel. The 350-foot width runs were much more successful with only one run for the larger vessel nearing the channel edge but not leaving the channel. The Pilots felt that the 400-foot width was wider than necessary and were comfortable traversing the channel that was widened to 350 feet. The study noted the current channel varied in width and widening should be limited to a total of 350 feet rather than widening by 100 feet beyond the current channel. If the channel width was currently equal to or wider than 350 feet, that portion would remain at its current width. Based on the ship simulation study, the remainder of the channel should be widened to the 350-foot wide channel.

However, during analysis of the Final Array of alternatives, the economics were reexamined. The previous forecasts for future traffic patterns utilizing the facilities at BIH were no longer expected to come to BIH. The design vessel that was used in the ship simulation was selected based on current traffic patterns at the time and forecasts for those industries. Recent forecasting indicates that no tankers are expected to come in with the size that was previously modeled and it is not expected that this forecast would change. The largest vessel expected in the future is a tanker with dimensions of 793 feet by 138 feet by 46 feet, but this would only come in a maximum of three times a year, and represents less than 3 percent of the deep-draft vessel fleet forecasted.

Additionally, the BIH shipbreaker industry recently conducted a separate ship simulation study with ERDC to model transits of aircraft carriers, which is now the largest vessel that facility expects to service. This simulation study indicated these aircraft carriers can come in under the current channel dimensions. Based on these results, the modeled VLCC should also be able to use the existing channel with no restrictions. The updated forecast and the shipbreaker modeling outcome have negated the results of the 2010 ship simulation so that ship simulation's recommendations should no longer be used as the basis to increase the size of the channel. The ship simulation results were used to determine the modified channel's functionality in vessel transit, which is discussed in detail in the Recommended Plan section below, and the Engineering Appendix.

7.4.2 Geometric Analysis of Rig Movements Results

In May 2010, a geometric analysis was performed by DOF Subsea to show a real time oil rig movement simulation for two rigs. The design rig for the modeling was based on the widest beam and deepest draft expected to be accommodated in future transit of the POB navigation channel. The analysis was performed with the rig's thrusters in place. These thrusters require additional channel depth beneath the oil rig. Significant savings could occur if these thrusters did not have to be removed because the removal process requires additional time and specialized diver expertise. The geometric analysis included channel widths of 300 and 350 feet. This geometric analysis results supported the need for the 50-foot channel depth and 350-foot width.

For the rigs, 43 percent of the original list of rigs used in the rig geometric analysis needed a maximum width of 300 feet, 11 percent more, or 54 percent of total, require 325 feet, and 74 percent of all the rigs could get in with a width of 350 feet. However, the recent report developed for the Section 6009 benefits forecasts more drillships working in the Gulf of Mexico rather than semi-submersibles in the future. These drillships need more depth to traverse the channel and would not need additional widening. This has negated the need to widen the channel to the 350-foot width as was shown in the rig movement analysis.

7.4.3 Value Engineering Study

During the early evaluation of the Final Array of alternative plans, a Value Engineering (VE) study was performed to identify potential savings of project costs and increase the BCR of the final plan. The VE study was limited to a plan for deepening the channel to 50 feet and widening to a 350-foot wide channel. This VE study was performed after the ship simulation and rig geometric analysis so it was based on the preliminary results from those studies. Any recommendations for design changes from the VE study could be applied to the other channel depths or widths that are evaluated in the Final Array.

The VE study resulted in three alternative suggestions:

VE-1 Only widen the channel to 300 feet from Station 28+000 to 79+415 in lieu of 350 feet;
VE-2 Only deepen the channel to 48 feet from Station 84+200 to the end of the Turning Basin in lieu of 50 feet; and
VE-3 Do not deepen the Turning Basin.

For Alternative VE-1, a 300-foot channel width in the majority of the channel was recommended in lieu of the recommended 350-foot width from the three-dimensional geometric analysis for rig movement. As discussed previously, reanalysis of future vessel calls at BIH indicated few of the potential ships used in the ship simulation and rig geometric analysis would actually come to BIH; therefore, the costs to widen the channel to 350 feet were not found to be justified. Additionally, it was determined that the offshore oil rigs would be transitioning to drillships in the future, and therefore would not need the wider channel. This VE-1 alternative was recommended at a time when channel widening appeared to be supported by preliminary economics. Based on this change in economic forecasts, alternatives which widen the channel are not expected to be justified. Widening alternatives are included in the Final Array to attempt to bracket the widths for the NED plan. If widening is the selected plan, evaluation of this VE alternative will be revisited.

For Alternative VE-2, USACE, Galveston concurred with the VE study recommendations with some modifications. The existing channel transitions from 42 feet to 36 feet in depth at Station 86+000, and remains at 36 feet through the end of the Turning Basin at 89+500. Economic and operational analysis have determined that deepening to 52 feet beyond Station 84+200 may be needed, but that deepening all the way through the Turning Basin is definitely not needed. Deepening the channel to 48 feet beyond Station 84+200 may not accommodate access by deeper draft vessels to oil docks just beyond that location, as well as the TransMontaigne dock which brings in petroleum products. Further economic analysis will be needed to determine the point (between Stations 84+200 and 86+000) through which deepening to 52 feet is needed, but this analysis will be delayed until the final feasibility level design. Additional analysis will be needed to determine the future design drafts expected at these docks. However, it was assumed that there is little risk in delaying this analysis because expected changes would only result in minor changes to dredging quantities and cost.

Alternative VE-3 was implemented in the final screening of alternatives with no deepening of the Turning Basin (from Station 86+000 through 89+500) being considered for any of the plans. It is assumed that vessels utilizing the channel would offload their products prior to using the Turning Basin in order for the vessel to navigate the 36-foot depth of the Turning Basin.

In summary, from the VE study recommendations Alternative VE-1 and VE-3 were used in the development of the quantities for alternatives and analysis of economics in HarborSym for the final screening. Because the depth for Alternative VE-2 would be the same for all alternatives, it does not affect the screening and would be applied to the final analysis for the Recommended Plan only.

7.5 Environmental Considerations for Final Screening

Environmental impacts of all of the final alternatives were evaluated to determine if differences in impacts and mitigation costs across the alternatives could impact plan selection. Differences in impacts associated with new work and maintenance dredging, PAs, ODMDSs and Feeder Berm were evaluated, as well as differences in impacts to habitats, wetlands, SAV, threatened and endangered species, EFH, water and sediment quality, air quality, and cultural resources, among others. The results of this comparison are presented in detail in Section 8.0. Based on this analysis, the environmental effects of all action alternatives would be similar. Almost all impacts would be minor and temporary, requiring no compensatory mitigation. However, two deepening and widening alternatives could cause the permanent loss of a small amount of SAV but mitigation costs would be low and would not affect plan selection.

7.6 Final Screening of Alternatives

The final alternatives, which would be evaluated to determine the Recommended Plan, were the alternatives that deepened the channel and/or widened the channel based on the latest forecasts. Therefore, depths of 45, 48, 50, and 52 feet with no widening, as well as widening to 300 and 350 feet, would be carried forward to the final evaluation in Section 8.0. O&M costs for extending the Entrance Channel for the deeper depth alternatives were developed to better estimate project costs of each proposed depth.

7.6.1 Objectives and Constraints

Each of the alternatives was also evaluated to determine whether it met the objectives of the study. The deepening only alternatives meet all the objectives by reducing costs of navigation associated with vessel movement entering and leaving the POB and improving channel dimensions to accommodate current and future offshore rigs into the POB for fabrication, maintenance, and repair.

All alternatives have been developed to minimize impacts to designated critical habitat for Threatened and Endangered species in the study area; minimize impacts to Threatened and Endangered species in the study area; minimize impacts to cultural resources listed or eligible for the National Register of Historic Places (defined as historic properties); develop alternatives within Coastal Barrier Resources Act (CBRA) guidelines which prohibit new Federal expenditures or financial assistance within any CBRA unit with the exception of improvements to existing navigation channels, disposal areas and related improvements; and limit channel traffic to single lane/one way only.

8.0 COMPARISON OF FINAL ARRAY OF ALERNATIVE PLANS AND DECISION CRITERIA

Table 8-1 presents the Final Array of alternatives along with the corresponding dredged material quantities, average annual costs and benefits, net excess benefits and BCRs using the most current price level and interest rate at the time of calculations (FY 2013 - October 2012 and 3.75 percent interest rate).

For the Final Array of alternatives, all of the channel depth alternatives are economically justified at either the current 250-foot or the 300-foot width alternative, but not at the 350-foot width alternative. The deepening alternatives with no widening have the greatest BCRs and net excess benefits compared to those with any widening.

In comparing the deepening only alternatives, the net excess benefits are increasing as the channel depths increase. Interpolation between these depths was used to optimize the plan and possibly identify the NED plan. The Economic Appendix includes details of the benefit analysis and this interpolation for all of the final alternatives; whereas, Table 8-2 presents just those interpolated depths for the no widening alternative.

Table 8-1. Traditional NED Benefit Analysis for Final Array of Alternative Screening
(Cost in 1,000s, FY 2013 price levels, 3.75% Interest Rate)

Alt. No.	Description	Dredging Quantities (cu. yds.)	First Cost	Average Annual O&M	Total Annual Costs[1]	Average Annual Benefits	BCR	Net Excess Benefits
F-1a	Deepen from 42 to 45 feet	3,736,000	89,200.0	856.3	4,932.0	9,717.2	1.97	4,785.2
F-1b	Deepen from 42 to 48 feet	8,274,000	121,340.0	1,084.2	6,670.5	14,204.6	2.13	7,534.1
F-1c	Deepen from42 to 50 feet	11,430,000	162,170.0	1,324.1	8,861.4	17,380.8	1.96	8,519.5
F-1d	Deepen from 42 to 52 feet	14,093,000	193,950.0	1,503.3	10,586.4	19,873.8	1.88	9,287.4
F-2a	Deepen from 42 to 45 feet/widen from 250 to 300 feet	7,703,000	126,090.0	2,240.2	8,067.3	10,843.1	1.34	2,775.9
F-2b	Deepen from 42 to 48 feet/widen from 250 to 300 feet	12,912,000	189,430.0	2,623.9	11,563.2	13,760.4	1.19	2,197.3
F-2c	Deepen from 42 to 50 feet/widen from 250 to 300 feet	16,503,000	230,730.0	2,853.2	13,867.0	17,939.3	1.29	4,072.2
F-2d	Deepen from 42 to 52 feet/widen from 250 to 300 feet	19,758,000	274,220.0	3,100.8	16,342.2	20,440.4	1.25	4,098.1
F-3a	Deepen from 42 to 45 feet/widen from 250 to 350 feet	14,007,000	204,970.0	4,354.3	14,063.9	8,958.2	0.64	-5,105.7
F-3b	Deepen from 42 to 48 feet/widen from 250 to 350 feet	19,315,000	271,090.0	4,889.2	17,979.5	14,140.2	0.79	-3,839.3
F-3c	Deepen from 42 to 50 feet/widen from 250 to 350 feet	22,569,000	310,880.0	5,272.9	20,342.4	16,687.0	0.82	-3,655.4
F-3d	Deepen from 42 to 52 feet/widen from 250 to 350 feet	26,728,000	365,860.0	5,606.1	23,616.5	19,896.1	0.84	-3,720.4

[1] Total Annual Costs is a sum of Average Annual Cost and Average Annual O&M. Average Annual Costs is a sum of First Cost of Construction and Interest During Construction.

Table 8-2. NED Benefit Analysis for Deepening Only Alternatives (Cost in 1,000s, FY2013 price levels, 3.75% Interest Rate)					
Alt. No.	**Description**	**Average Annual Costs**	**Average Annual Benefits**	**BCR**	**Net Excess Benefits**
	Deepen from 42 to 43 feet	3,366.6	3,239.1	1.0	-127.5
	Deepen from 42 to 44 feet	4,148.0	5,795.9	1.4	1,647.8
F-1a	Deepen from 42 to 45 feet	4,932.0	9,717.2	2.0	4,785.2
	Deepen from 42 to 46 feet	5,509.0	11,213.0	2.0	5,704.0
	Deepen from 42 to 47 feet	6,088.5	12,503.7	2.1	6,415.2
F-1b	Deepen from 42 to 48 feet	6,670.5	14,204.6	2.1	7,534.1
	Deepen from 42 to 49 feet	7,761.4	15,792.7	2.0	8,031.4
F-1c	Deepen from 42 to 50 feet	8,861.4	17,380.8	2.0	8,519.5
	Deepen from 42 to 51 feet	9,721.0	18,627.3	2.0	8,906.3
F-1d	Deepen from 42 to 52 feet	10,586.4	19,873.8	1.9	9,287.4

All alternatives in the Final Array were compared based on economic, engineering, environmental, and socioeconomic factors as presented in Table 8-3. PAs do not need to be expanded to accommodate new work material and the 50-year dredged material quantities, and no new PAs are planned. All PA containment dike lifts would be accomplished inside the footprint of the existing containment dikes, and BMPs would be utilized during construction to avoid impacts to water quality which could affect SAVs or mangroves located near some PAs. All structural alternatives would result in the use of hopper dredges in the Gulf of Mexico and all therefore would have the potential to impact threatened and endangered swimming sea turtles. Reasonable and prudent measures, developed to avoid adverse impacts to these species, would be similar for all alternatives. None of the alternatives would result in impacts to terrestrial resources, wetlands or sand/algal flats. No oyster reef is located near the alternative impact areas.

The deepening only alternatives (F-1a through F-1d) would result in minor additional widening of the top of cut within the existing waterway. Benthic communities that may be present in the submerged sediment on the edge of the current channel would be destroyed, but they would rapidly recolonize. SAV beds are located near the Port Isabel Wye in the shallow waters of the Main Channel along the emergent shoreline. None of the deepening only alternatives would result in SAV impacts. Among the action alternatives, the deepening only alternatives result in the fewest environmental impacts and there are no significant differences in impacts among them.

Table 8-1. Comparison of Final Array Alternatives

Alternative Number	No Action (F-4)	F-1a	F-1b	F-1c	F-1d (Recommended Plan)	F-2a	F-2b	F-2c	F-2d	F-3a	F-3b	F-3c	F-3d
Evaluation Criteria	**Future Without-Project (FWOP)**	**Deepen to 45 feet**	**Deepen to 48 feet**	**Deepen to 50 feet**	**Deepen to 52 feet**	**Deepen to 45 feet/ widen to 300 feet**	**Deepen to 48 feet/ widen to 300 feet**	**Deepen to 50 feet/ widen to 300 feet**	**Deepen to 52 feet/ widen to 300 feet**	**Deepen to 45 feet/widen to 350 feet**	**Deepen to 48 feet/widen to 350 feet**	**Deepen to 50 feet/ widen to 350 feet**	**Deepen to 52 feet/ widen to 350 feet**
Construction Dredging Volumes (MCY)	None	3.7	8.3	11.4	14.0	7.7	12.9	16.5	19.8	14.0	19.3	22.6	26.7
Shoaling Rates (cubic yards per year [cy/yr])	1,099,000	1,155,000	1,198,000	1,227,000	1,255,000	1,256,000	1,302,000	1,333,000	1,364,000	1,438,000	1,502,000	1,545,000	1,587,000
Channel Extension Lengths (feet)	None	2,000	3,000	3,400	4,000	2,000	3,000	3,400	4,000	2,000	3,000	3,400	4,000
Net Excess Benefits (October 2013 price level)	($127,500)	$4,785,200	$7,534,100	$8,519,500	$9,287,400	$2,775,900	$2,197,300	$4,072,200	$4,098,100	($5,105,700)	($3,839,300)	($3,655,400)	($3,720,400)
Construction Air Quality (Nitrogen oxide [NO_x] Emissions)	It is anticipated that air contaminants in the project area would increase due to continued operational constraints on the existing system and a possible increase in ship traffic resulting both from growth of existing business and from new business.	Lowest air quality impacts of all action plans, but greater than No Action; fewer impacts than Recommended Plan	Higher impacts than F-1a, but greater than No Action; fewer impacts than Recommended Plan	Slightly higher impacts than F-1b, but greater than No Action; fewer impacts than Recommended Plan	2,567 tons NO_x (total for all years of construction). Higher impacts than No Action, shallower depth alternatives, and Alternatives F-2a and F-2b; lower impacts than Alternatives F-2c and F-2d, and all F-3 Alternatives	Second lowest air quality impacts overall, but greater than No Action; fewer impacts than Recommended Plan	About the same impacts as Recommended Plan and greater than No Action; lower impacts than Alternatives F-2c and F-2d, F-3b, F-3c, and F-3d	Slightly higher impacts than the Recommended Plan and greater than No Action; lower impacts than Alternatives F-2d, F-3b, F-3c, and F-3d	Higher impacts than the Recommended Plan and greater than No Action; lower impacts than Alternatives F-3c, and F-3d	About the same impacts as Recommended Plan and greater than No Action; lower impacts than Alternatives F-2c and F-2d, F-3b, F-3c, and F-3d	Higher impacts than the Recommended Plan and greater than No Action; lower impacts than Alternatives F-2d, F-3c, and F-3d	Higher impacts than the Recommended Plan and greater than No Action; lower impacts than Alternative F-3d	Highest air quality impacts of all action plans, and greater than No Action; nearly double impacts of the Recommended Plan
Upland PAs	7 existing upland confined PAs	Same number and footprint of PAs as No Action; lower dike heights than Recommended Plan.	Same number and footprint of PAs as No Action; lower dike heights than Recommended Plan	Same number and footprint of PAs as No Action; lower dike heights than Recommended Plan	7 existing upland confined PAs; same footprint as No Action	Same number and footprint of PAs as No Action; lower dike heights than Recommended Plan	Same number and footprint of PAs as No Action; lower dike heights than Recommended Plan	Same number and footprint of PAs as No Action; higher dikes than Recommended Plan	Same number and footprint of PAs as No Action; higher dikes than Recommended Plan	Same number and footprint of PAs as No Action and same dike heights as Recommended Plan	Same number and footprint of PAs as No Action; higher dikes than Recommended Plan	Same number and footprint of PAs as No Action; higher dikes than Recommended Plan	Same number and footprint of PAs as No Action; higher dikes than Recommended Plan

Alternative Number	No Action (F-4)	F-1a	F-1b	F-1c	F-1d (Recommended Plan)	F-2a	F-2b	F-2c	F-2d	F-3a	F-3b	F-3c	F-3d
Evaluation Criteria	**Future Without-Project (FWOP)**	**Deepen to 45 feet**	**Deepen to 48 feet**	**Deepen to 50 feet**	**Deepen to 52 feet**	**Deepen to 45 feet/ widen to 300 feet**	**Deepen to 48 feet/ widen to 300 feet**	**Deepen to 50 feet/ widen to 300 feet**	**Deepen to 52 feet/ widen to 300 feet**	**Deepen to 45 feet/widen to 350 feet**	**Deepen to 48 feet/widen to 350 feet**	**Deepen to 50 feet/ widen to 350 feet**	**Deepen to 52 feet/ widen to 350 feet**
ODMDS	1 existing New Work ODMDS	Reopen existing new work ODMDS; lower mounding than Recommended Plan	Reopen existing new work ODMDS; lower mounding than Recommended Plan	Reopen existing new work ODMDS; lower mounding than Recommended Plan	Reopen existing ODMDS, dispersive with unlimited capacity; modeling indicates mounding of new work will not exceed 14.3 feet	Reopen existing new work ODMDS; lower mounding than Recommended Plan	Reopen existing new work ODMDS; lower mounding than Recommended Plan	Reopen existing new work ODMDS; slightly higher mounding than Recommended Plan	Might require resizing of existing ODMDS; mounding height would be higher than Recommended Plan	Reopen existing ODMDS, dispersive with unlimited capacity; same mounding height as Recommended Plan	Might require resizing of existing ODMDS; mounding height would be higher than Recommended Plan	Might require resizing of existing ODMDS; mounding height would be much higher than Recommended Plan	Might require resizing of existing ODMDS; mounding height would be much higher than Recommended Plan
Vegetation/SAV	Ongoing maintenance dredging would not result in impacts to vegetation or SAV	No terrestrial vegetation impacts and no impacts to SAV	No terrestrial vegetation impacts and no impacts to SAV	No terrestrial vegetation impacts and no impacts to SAV	Construction and maintenance dredging would not result in impacts to terrestrial vegetation or SAV	No terrestrial vegetation impacts and no impacts to SAV	No terrestrial vegetation impacts and no impacts to SAV	No terrestrial vegetation impacts and no impacts to SAV	No terrestrial vegetation impacts and no impacts to SAV	No terrestrial vegetation impacts and no impacts to SAV	No terrestrial vegetation impacts and no impacts to SAV	Construction would permanently impact approximately 1 acre of SAV along the edges of the Main Channel; no terrestrial vegetation impacts	Construction would permanently impact approximately 1 acre of SAV along the edges of the Main Channel; no terrestrial vegetation impacts
Terrestrial Wildlife Habitat	Ongoing maintenance dredging and placement would cause no impacts to terrestrial wildlife habitats	No impacts to wildlife habitats; all impacts avoided	No impacts to wildlife habitats; all impacts avoided	No impacts to wildlife habitats; all impacts avoided	All impacts would be avoided by restricting construction activities to the existing PA footprints and existing access roads	No impacts to wildlife habitats; all impacts avoided	No impacts to wildlife habitats; all impacts avoided	No impacts to wildlife habitats; all impacts avoided	No impacts to wildlife habitats; all impacts avoided	No impacts to wildlife habitats; all impacts avoided	No impacts to wildlife habitats; all impacts avoided	No impacts to wildlife habitats; all impacts avoided	No impacts to wildlife habitats; all impacts avoided
Wetlands	Ongoing maintenance dredging and placement would not result in new impacts to wetlands.	No impacts to wetlands; all impacts avoided	No impacts to wetlands; all impacts avoided	No impacts to wetlands; all impacts avoided	All impacts would be avoided by restricting construction activities to the existing PA footprints and existing access roads	No impacts to wetlands; all impacts avoided	No impacts to wetlands; all impacts avoided	No impacts to wetlands; all impacts avoided	No impacts to wetlands; all impacts avoided	No impacts to wetlands; all impacts avoided	No impacts to wetlands; all impacts avoided	No impacts to wetlands; all impacts avoided	No impacts to wetlands; all impacts avoided

Alternative Number	No Action (F-4)	F-1a	F-1b	F-1c	F-1d (Recommended Plan)	F-2a	F-2b	F-2c	F-2d	F-3a	F-3b	F-3c	F-3d
Evaluation Criteria	**Future Without-Project (FWOP)**	**Deepen to 45 feet**	**Deepen to 48 feet**	**Deepen to 50 feet**	**Deepen to 52 feet**	**Deepen to 45 feet/ widen to 300 feet**	**Deepen to 48 feet/ widen to 300 feet**	**Deepen to 50 feet/ widen to 300 feet**	**Deepen to 52 feet/ widen to 300 feet**	**Deepen to 45 feet/widen to 350 feet**	**Deepen to 48 feet/widen to 350 feet**	**Deepen to 50 feet/ widen to 350 feet**	**Deepen to 52 feet/ widen to 350 feet**
Aquatic Habitat	Temporary water column turbidity associated with maintenance dredging and placement would continue	Lowest aquatic habitat impacts of all action plans; impacts similar to No Action; fewer impacts than Recommended Plan	Higher impacts than F-1a, but greater than No Action; fewer impacts than Recommended Plan	Slightly higher impacts than F-1b, but greater than No Action; fewer impacts than Recommended Plan	Impacts greater than No Action; short-term, temporary impacts to benthic organisms and increased turbidity are expected, although no significant impacts would be anticipated	Impacts greater than No Action; water bottom impacts slightly greater than deepening only alternatives ; turbid conditions slightly less than all alternatives with exception of F-1a	Impacts greater than No Action; water bottom impacts slightly greater than deepening only alternatives ; turbid conditions about the same as Recommended Plan	Impacts greater than No Action; water bottom impacts slightly greater than deepening only alternatives ; turbid conditions about the same as Recommended Plan	Impacts greater than No Action; water bottom impacts slightly greater than deepening only alternatives ; turbid conditions greater than the Recommended Plan	Impacts greater than No Action; water bottom impacts and turbid conditions about the same as Recommended Plan but greater than other deepening only alternatives	Impacts greater than No Action; water bottom impacts and turbid conditions greater than deepening only and deepening plus widening to 300-foot alternatives	Impacts greater than No Action; water bottom impacts and turbid conditions greater than deepening only and deepening plus widening to 300-foot alternatives	Impacts greater than No Action; largest water bottom and turbidity impacts of all alternatives
Essential Fish Habitat (EFH)	Ongoing maintenance dredging and placement would not result in new impacts to EFH	Lowest EFH impacts of all action plans; impacts similar to No Action; fewer impacts than Recommended Plan	Higher impacts than F-1a, but greater than No Action; fewer impacts than Recommended Plan	Slightly higher impacts than F-1b, but greater than No Action; fewer impacts than Recommended Plan	Turbidity would be temporary; localized impact during dredging and placement; benthic organisms would be affected until natural recovery occurs; no significant impacts anticipated	Impacts greater than No Action; EFH impacts slightly greater than deepening only alternatives ; turbid conditions slightly less than all alternatives with exception of F-1a	Impacts greater than No Action; EFH impacts slightly greater than deepening only alternatives ; turbid conditions about the same as Recommended Plan	Impacts greater than No Action; EFH impacts slightly greater than deepening only alternatives ; turbid conditions about the same as Recommended Plan	Impacts greater than No Action; EFH impacts slightly greater than deepening only alternatives ; turbid conditions about the same as Recommended Plan	Impacts greater than No Action; EFH impacts and turbid conditions about the same as Recommended Plan but greater than other deepening only alternatives	Impacts greater than No Action; EFH impacts and turbid conditions greater than deepening only and deepening plus widening to 300-foot alternatives	Impacts greater than No Action; EFH impacts and turbid conditions greater than deepening only and deepening plus widening to 300-foot alternatives	Impacts greater than No Action; largest EFH and turbidity impacts of all alternatives
Threatened and Endangered Species	Ongoing maintenance dredging of the Entrance and Jetty Channels may adversely impact sea turtles	Lowest sea turtle impacts of all action plans, but greater than No Action; fewer impacts than Recommended Plan	Higher sea turtle impacts than F-1a, but greater than No Action; fewer impacts than Recommended Plan	Slightly higher impacts than F-1b, but greater than No Action; fewer impacts than Recommended Plan	Construction and maintenance dredging of the Entrance and Jetty Channels may adversely impact sea turtles; no other T&E species adversely affected	Second sea turtle impacts overall, but greater than No Action; fewer impacts than Recommended Plan	About the same impacts as Recommended Plan and greater than No Action; lower impacts than Alternatives F-2c and F-2d, F-3b, F-3c, and F-3d	Slightly higher impacts than the Recommended Plan and greater than No Action; lower impacts than Alternatives F-2d, F-3b, F-3c, and F-3d	Higher impacts than the Recommended Plan and greater than No Action; lower impacts than Alternatives F-3c, and F-3d	About the same impacts as Recommended Plan and greater than No Action; lower impacts than Alternatives F-2c and F-2d, F-3b, F-3c, and F-3d	Higher impacts than the Recommended Plan and greater than No Action; lower impacts than Alternatives F-2d, F-3c, and F-3d	Higher impacts than the Recommended Plan and greater than No Action; lower impacts than Alternative F-3d	Highest sea turtle impacts of all action plans, and greater than No Action

Alternative Number	No Action (F-4)	F-1a	F-1b	F-1c	F-1d (Recommended Plan)	F-2a	F-2b	F-2c	F-2d	F-3a	F-3b	F-3c	F-3d
Evaluation Criteria	**Future Without-Project (FWOP)**	**Deepen to 45 feet**	**Deepen to 48 feet**	**Deepen to 50 feet**	**Deepen to 52 feet**	**Deepen to 45 feet/ widen to 300 feet**	**Deepen to 48 feet/ widen to 300 feet**	**Deepen to 50 feet/ widen to 300 feet**	**Deepen to 52 feet/ widen to 300 feet**	**Deepen to 45 feet/widen to 350 feet**	**Deepen to 48 feet/widen to 350 feet**	**Deepen to 50 feet/ widen to 350 feet**	**Deepen to 52 feet/ widen to 350 feet**
Water and Sediment Quality	Maintenance dredging and placement activities would result in no new impacts. Testing indicates no contaminants of concern would be expected in channel sediments	Lowest temporary turbidity impacts of all action plans; no sediment contaminant concerns	Higher turbidity impacts than F-1a, but greater than No Action; no sediment contaminant concerns	Slightly higher turbidity impacts than F-1b, but greater than No Action; no sediment contaminant concerns	Construction dredging and placement activities would result in temporary increases in turbidity; testing indicates no contaminants of concern would be expected in channel sediments	Impacts greater than No Action; temporary turbidity slightly less than all alternatives with exception of F-1a; no sediment contaminant concerns	Impacts greater than No Action; turbidity conditions about the same as Recommended Plan; no sediment contaminant concerns	Impacts greater than No Action; turbidity conditions about the same as Recommended Plan; no sediment contaminant concerns	Impacts greater than No Action; turbidity conditions about the same as Recommended Plan; no sediment contaminant concerns	Impacts greater than No Action; turbidity about the same as Recommended Plan but greater than other deepening only alternatives; no sediment contaminant concerns	Impacts greater than No Action; turbidity greater than deepening only and deepening plus widening to 300-foot alternatives; no sediment contaminant concerns	Impacts greater than No Action; turbidity greater than deepening only and deepening plus widening to 300-foot alternatives; no sediment contaminant concerns	Impacts greater than No Action; largest turbidity impacts of all alternatives; no sediment contaminant concerns
Hazardous, Toxic, and Radioactive Waste (HTRW)	No change from past practices in land use and the occurrence of HTRW sites would be expected	No HTRW impacts identified	No HTRW impacts identified	No HTRW impacts identified	Construction and placement activities would not impact any known HTRW sites	No HTRW impacts identified	No HTRW impacts identified	No HTRW impacts identified	No HTRW impacts identified	No HTRW impacts identified	No HTRW impacts identified	No HTRW impacts identified	No HTRW impacts identified
Energy and Mineral Resources	Maintenance of the existing project would have no impact on pipelines and mineral resources	No pipeline or mineral resource impacts	No pipeline or mineral resource impacts	No pipeline or mineral resource impacts	Construction and maintenance of the Recommended Plan would have no impact on pipelines and mineral resources	No pipeline or mineral resource impacts	No pipeline or mineral resource impacts	No pipeline or mineral resource impacts	No pipeline or mineral resource impacts	No pipeline or mineral resource impacts	No pipeline or mineral resource impacts	No pipeline or mineral resource impacts	No pipeline or mineral resource impacts
Cultural Resources	Maintenance of the existing project would have no impact on cultural resources	No cultural resource impacts	No cultural resource impacts	No cultural resource impacts	Construction and maintenance of the Recommended Plan would have no impact on cultural resources	No cultural resource impacts	No cultural resource impacts	No cultural resource impacts	No cultural resource impacts	No cultural resource impacts	No cultural resource impacts	No cultural resource impacts	No cultural resource impacts

Alternative Number	No Action (F-4)	F-1a	F-1b	F-1c	F-1d (Recommended Plan)	F-2a	F-2b	F-2c	F-2d	F-3a	F-3b	F-3c	F-3d
Evaluation Criteria	**Future Without-Project (FWOP)**	**Deepen to 45 feet**	**Deepen to 48 feet**	**Deepen to 50 feet**	**Deepen to 52 feet**	**Deepen to 45 feet/ widen to 300 feet**	**Deepen to 48 feet/ widen to 300 feet**	**Deepen to 50 feet/ widen to 300 feet**	**Deepen to 52 feet/ widen to 300 feet**	**Deepen to 45 feet/widen to 350 feet**	**Deepen to 48 feet/widen to 350 feet**	**Deepen to 50 feet/ widen to 350 feet**	**Deepen to 52 feet/ widen to 350 feet**
Socioeconomics	Socioeconomic conditions resulting from existing port activities and commerce would be expected to continue	Lowest economic benefits of all action alternatives, but greater than No Action	Slightly more economic benefits than Alternative F-1a, but less than the Recommended Plan	Slightly more economic benefits than Alternative F-1b, but less than the Recommended Plan	Economic impacts on the region would increase as a result of the channel improvements, resulting in an increase in the number of jobs	Fewer economic benefits than the Recommended Plan but greater than the No Action	Fewer economic benefits than the Recommended Plan but greater than the No Action	Fewer economic benefits than the Recommended Plan but greater than the No Action	Fewer economic benefits than the Recommended Plan but greater than the No Action	Fewer economic benefits than the Recommended Plan but greater than the No Action	Fewer economic benefits than the Recommended Plan but greater than the No Action	Fewer economic benefits than the Recommended Plan but greater than the No Action	Fewer economic benefits than the Recommended Plan but greater than the No Action
Environmental Justice (EJ)	Maintenance of existing project would not impact minority or low-income populations	No impacts to EJ segments of the population	No impacts to EJ segments of the population	No impacts to EJ segments of the population	Construction and maintenance of the Recommended Plan would not impact minority or low-income populations	No impacts to EJ segments of the population	No impacts to EJ segments of the population	No impacts to EJ segments of the population	No impacts to EJ segments of the population	No impacts to EJ segments of the population	No impacts to EJ segments of the population	No impacts to EJ segments of the population	No impacts to EJ segments of the population
Environmental and Safety Risks to Children	Maintenance of existing project would not cause environmental or safety risks to children	No environmental or safety risks to children	No environmental or safety risks to children	No environmental or safety risks to children	Construction and maintenance of the Recommended Plan would not cause environmental or safety risks to children	No environmental or safety risks to children	No environmental or safety risks to children	No environmental or safety risks to children	No environmental or safety risks to children	No environmental or safety risks to children	No environmental or safety risks to children	No environmental or safety risks to children	No environmental or safety risks to children

The alternatives with widths of 300 and 350 feet would extend the top-of-cut for the deepening another 25 or 50 feet toward both shores, respectively. Based upon current survey information, aerial photographs, and field inspections, the 50-foot widening alternatives for all depths (F-2A through F-2d) and the 100-foot widening alternatives for the two shallower depths (F-3a and F-3b) would not impact SAV beds, but the 350-foot width for the 50- and 52-foot deep (F-3c and F-3d) alternatives could impact approximately 1 acre of SAV beds on the north side of the channel. Mitigation costs for the impacts of Alternatives F-3c and F-3d were not estimated, as they would be minimal in comparison to project construction costs.

Each plan was formulated in consideration of the four criteria in the P&G: completeness, effectiveness, efficiency, and acceptability as presented in Table 8-4. With the exception of Alternative F-4, the No-Action Alternative, each alternative in the Final Array is considered acceptable. While all of the alternatives which improve the channel would improve navigation efficiency while avoiding and minimizing environmental impacts to the greatest extent possible during the 50-year period of analysis, the plan with the greatest net excess benefits is considered the most complete, efficient, and effective plan. Therefore, Alternative F1-d, the 52-foot deep channel with no additional widening, is the plan that best meets the four P&G criteria. It is also the environmentally preferable alternative because it is the most efficient alternative in terms of minimizing damages to the biological and physical environment while providing the maximum economic benefit for the general welfare of the Nation.

9.0 PLAN SELECTION

Alternative F1-d (deepening the channel to 52 feet MLLW) is the Recommended Plan. This alternative was evaluated and determined to be economically justified, environmentally acceptable, and complete. The costs including interest during construction (IDC), NED AAEQ benefits, and BCR for the Recommended Plan is presented in Table 9-1.

9.1 NED Benefits

NED Benefits were calculated in HarborSym and were based on reductions in transportation costs generated for more efficient vessel transportation and less restrictions on transit of larger oil drilling rigs. The proposed channel improvements are in response to the need for deeper access by allowing the existing fleet to load more fully and for the introduction of larger vessels, including oil drilling rigs.

Table 8-4. Comparison of P&G Evaluation Criteria

Alternative Number	No Action (F-4)	F-1a	F-1b	F-1c	F-1d (Recommended Plan)	F-2a	F-2b	F-2c	F-2d	F-3a	F-3b	F-3c	F-3d
Criteria	**Future Without-Project (FWOP)**	**Deepen to 45 feet**	**Deepen to 48 feet**	**Deepen to 50 feet**	**Deepen to 52 feet**	**Deepen to 45 feet/ widen to 300 feet**	**Deepen to 48 feet/ widen to 300 feet**	**Deepen to 50 feet/ widen to 300 feet**	**Deepen to 52 feet/ widen to 300 feet**	**Deepen to 45 feet/widen to 350 feet**	**Deepen to 48 feet/widen to 350 feet**	**Deepen to 50 feet/ widen to 350 feet**	**Deepen to 52 feet/ widen to 350 feet**
Acceptability (meets all laws, regulations and guidance)	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
Completeness (provides and accounts for all necessary investments or other actions to ensure the realization of the planning objective)	No Action is an incomplete solution to all planning objective	Plan is an incomplete solution; it provides some improvement in navigation efficiency over No Action but does not maximize transportation benefits when compared to other alternatives	Plan is an incomplete solution; it provides some improvement in navigation efficiency over No Action but does not maximize transportation benefits when compared to other alternatives	Plan is an incomplete solution; it provides some improvement in navigation efficiency over No Action but does not maximize transportation benefits when compared to other alternatives	Plan is more complete than lesser plans and has the highest net excess benefits of alternatives evaluated; but may not maximize transportation benefits are still rising and deeper plans were not evaluated.	Plan is an incomplete solution; it provides some improvement in navigation efficiency over No Action but does not maximize transportation benefits when compared to other alternatives	Plan is an incomplete solution; it provides some improvement in navigation efficiency over No Action but does not maximize transportation benefits when compared to other alternatives	Plan is an incomplete solution; it provides some improvement in navigation efficiency over No Action but does not maximize transportation benefits when compared to other alternatives	Plan is an more complete solution; it provides some improvement in navigation efficiency over No Action but does not maximize transportation benefits when compared to other alternatives, including the Recommended Plan	Plan is an incomplete solution; it provides some improvement in navigation efficiency over No Action but does not maximize transportation benefits when compared to other alternatives	Plan is an incomplete solution; it provides some improvement in navigation efficiency over No Action but does not maximize transportation benefits when compared to other alternatives	Plan is an incomplete solution; it provides some improvement in navigation efficiency over No Action but does not maximize transportation benefits when compared to other alternatives	Plan is an incomplete solution; it provides some improvement in navigation efficiency over No Action but does not maximize transportation benefits when compared to other alternatives including the Recommended Plan
Efficiency (extent to which an alternative plan is the most cost effective means of achieving the objective)	No Action does not address the planning objective	Less costly than Recommended Plan but does not address objective as effectively; net excess benefits are not maximized and are less than the Recommended Plan	Less costly than Recommended Plan but does not address objective as effectively; net excess benefits are not maximized and are less than the Recommended Plan	Less costly than Recommended Plan but does not address objective as effectively; net excess benefits are not maximized and are less than the Recommended Plan	Cost-effective; achieves objective; net excess benefits may not be maximized but are greatest of alternatives evaluated; Sponsor indicated this plan is LPP	Less costly than Recommended Plan but does not address objective as effectively; net excess benefits are not maximized and are less than the Recommended Plan	More costly than Recommended Plan but does not address objective as effectively; net excess benefits are not maximized and are less than the Recommended Plan	More costly than Recommended Plan but does not address objective as effectively; net excess benefits are not maximized and are less than the Recommended Plan	More costly than Recommended Plan but does not address objective as effectively; net excess benefits are not maximized and are less than the Recommended Plan	More costly than Recommended Plan but does not address objective as effectively; net excess benefits are not maximized and are less than the Recommended Plan	More costly than Recommended Plan but does not address objective as effectively; net excess benefits are not maximized and are less than the Recommended Plan	More costly than Recommended Plan but does not address objective as effectively; net excess benefits are not maximized and are less than the Recommended Plan	More costly than Recommended Plan but does not address objective as effectively; net excess benefits are not maximized and are less than the Recommended Plan
Effectiveness (extent to which the alternative plans contribute to achieve the planning objective)	Ineffective for improving navigational efficiencies	Not as effective as Recommended Plan for improving navigation efficiency	Not as effective as Recommended Plan for improving navigation efficiency	Not as effective as Recommended Plan for improving navigation efficiency	Most effective plan for improving navigation efficiency when compared to alternatives evaluated; Sponsor has indicated this plan is the LPP	Not as effective as Recommended Plan for improving navigation efficiency	Not as effective as Recommended Plan for improving navigation efficiency	Not as effective as Recommended Plan for improving navigation efficiency	Effective for improving navigation efficiency	Not as effective as Recommended Plan for improving navigation efficiency	Not as effective as Recommended Plan for improving navigation efficiency	Not as effective as Recommended Plan for improving navigation efficiency	Effective for improving navigation efficiency

Table 9-1. Economic Summary for Plan Selection (FY2013 price levels, 3.75% interest)	
First Cost of Construction	$193,950.0
IDC	$ 9,824.0
Total Investment	$203,774.0
Total AAEQ Cost	$ 10,586.4
AAEQ Benefits	$ 19,873.8
Net Excess Benefits	$ 9,287.4
BCR	1.9

It is not known if Alternative F1-d is the NED plan which maximizes the net excess benefits because the net excess benefits were still increasing with deeper channel dimensions and a deeper alternative was not included in the Final Array of alternatives. However, Alternative F1-d was the most cost effective of the Final Array of alternatives considered and the deepest channel dimension that the non-Federal sponsor would support at this time. Therefore, Alternative F1-d, deepening the channel to 52 feet with no widening, is considered the Recommended Plan.

The Final Screening determined that Net Excess Benefits would be $9.3 million. The project would be economically justified with a BCR of 1.9.

9.2 Categorical Exemption

For a navigation project if a plan with lesser benefits is preferred by the sponsor due to financial constraints, guidance allows for a categorical exemption to be granted and this lesser plan to be selected as the Recommended Plan. The USACE guidance requires that the NED plan be recommended unless there are believed to be overriding reasons favoring the selection of another alternative. Planning guidance (ER 1105-2-100) states that if the non-Federal sponsor identifies a financial constraint due to limited resources, and if net benefits are increasing as the constraint is reached, a categorical exemption may be granted and the constrained plan recommended. Categorical exemptions for plans that are lesser projects than the NED plan are cost shared on the same basis as the NED and become a federally supportable plan.

Prior to completion of the economic analysis for the study, and without model results and benefit comparisons, the non-Federal sponsor assumed 50 feet would be the optimum channel depth based on traffic and available non-Federal funding. Therefore, the depth of 50 feet was chosen by the sponsor believing it would satisfy the needs of their users and remain within their future proposed budgets. After total Tentatively Selected Plan alternative analysis was completed, the economic analysis revealed that the net excess benefits continued to increase at 52 feet with a cost significantly less than originally anticipated by the non-Federal sponsor. Rather than have a Locally Preferred Plan to remain at 50 Feet and result in fewer benefits, the non-Federal sponsor agreed that acceptance of this deeper 52 Feet channel improvement through categorical exemptions was in the best interest of the Port and National economic development.

In this study's selection of the Recommended Plan, the sponsor has indicated a preference of the 52-foot alternative due to cost restraints. This plan is a justified plan in an array of alternatives in which it is not known if the NED benefits have been maximized. Had alternatives deeper than 52 feet been evaluated and net excess benefits decreased, it would have indicated that the 52-foot alternative was the NED plan. However, because no evaluation deeper than 52 feet was performed, the 52-foot alternative was not identified as the NED plan. This alternative still meets the policies for the high-priority outputs and has greater benefits than the smaller scale plans (Table 8-3). Since the 52-foot plan is the sponsor's preference due to financial constraints and fits all of the criteria regarding categorical exemptions for navigation projects, this plan has been identified as the Recommended Plan. The economic analysis indicates that the NED is 52 feet deep or deeper; therefore, cost sharing would be the same as if it was the identified NED plan.

9.3 Least Cost Disposal Alternative

Placement options were evaluated to determine the best disposal alternative for all material, both new work and O&M. These alternatives considered possible beneficial use of dredged material, as well as traditional PAs.

9.3.1 Beneficial Use Opportunities

Section 2037 of WRDA 2007 amended Section 204 of WRDA 92 dealing with regional sediment management. Section 204 states that a regional sediment management plan shall be developed by the Secretary of the Army for sediment obtained through the construction, operation, or maintenance of an authorized Federal water resources project. The purposes of using sediment for the construction, repair, modification, or rehabilitation of Federal water resource projects are to reduce storm damage to property; to protect, restore, and create aquatic and ecologically related habitats, including wetlands; and to transport and place suitable sediment.

During the Feasibility study, a conceptual sediment budget was developed (HDR, 2008) and the beneficial use of the dredged material was investigated. New work construction would yield primarily clay sediments, which are suitable for dike construction or marsh restoration. New work material from the Main Channel would be stockpiled within the existing PAs and used for future incremental dike raisings. No marshes in need of clay material for restoration were identified near the project area. New work material from the Entrance and Jetty Channels would be placed at the New Work ODMDS; sediments to be dredged would be overwhelmingly clay and would not be suitable for placement at the nearshore Feeder Berm, which was designed to receive sandy sediments.

The potential for beneficial use of maintenance material from the new project was also investigated. Shoaled sediments from the majority of the Main Channel (Stations 11+000 to 89+500) are expected to be primarily clay and silt. No marsh areas that would benefit from these sediment types have been identified near the project area. Maintenance dredging of the eastern end of the Main Channel (Stations 0+000 to 11+000), and the entire Jetty and Entrance Channels are expected to be primarily sand with some silt, suitable for use in the nearshore Feeder Berm. Sandy material deposited in this nearshore berm is redeposited by cross-shore and longshore currents on the shoreline of South Padre Island, decreasing shoreline erosion. Sandy materials could also be used to nourish eroding beaches fronting the City of South Padre Island; however, beach placement is not a least-cost plan. The incremental difference between the cost of normal placement into the Feeder Berm and the cost to pump material directly onto the beach must be provided by a non-Federal sponsor. In the past, the City of South Padre Island has participated in paying the incremental cost to place the material directly onto the beach at South Padre Island. This incremental cost has been about $2 to 3 million per dredging cycle.

9.3.2 Screening for Least Cost Plan

Based on the possible beneficial use options identified above, several alternative placement plans were considered for the material from Station -17+000 to 11+000. This reach includes the Entrance Channel Extension, Entrance Channel, Jetty Channel, and a portion of the Main Channel. This reach is primarily sandy material which would be suitable for placement in the Feeder Berm, the current least cost disposal plan for maintenance material. Another option for this material would be placement into the Maintenance ODMDS which is located directly adjacent to the channel extension. However, the Maintenance ODMDS has been designated for material only from the Entrance and Jetty Channel. This designation prevents material from Station 0+000 to 11+000 (part of the Main Channel) to be placed in the Maintenance ODMDS. Placement of the material from Station 0+000 to 11+000 is limited to the Feeder Berm because of the lack of capacity in the nearby upland PAs.

Additional advance maintenance (AM) was considered to allow channel dredging cycles to be combined in order to save mobilization and demobilization costs that occur with each dredging contract. Currently 2 feet of AM is included in the channel improvement design for this reach.

AM greater than the 2 feet would result in stability issues for the channel, so this option was disregarded from further consideration.

Table 9-2 presents that quantifiable costs and dredging cycles for the two remaining placement options: Placement Plan 1 (Maintenance ODMDS and Feeder Berm) and Placement Plan 2 (Feeder Berm).

Use of Placement Plan 2 rather than Placement Plan 1 provides an economically and environmentally balanced, sustainable solution for life cycle sediment management for the BIH project. While life-cycle maintenance dredging costs for Placement Plan 1 are essentially equivalent to Placement Plan 2, environmental benefits of Placement Plan 2 make it the optimal sediment management solution.

Table 9-2. Alternative Placement Plans

Stationing	Placement Location	Dredging Cycle (years)	Average Annual Costs
Placement Plan 1			
Sta. -17+000 to 0+000	Maintenance ODMDS	1.5	$6,246,000
Sta. 0+000 to 11+000	Feeder Berm	4.5	
Placement Plan 2			
Sta. -17+000 to 0+000	Feeder Berm	1.5	$6,387,000
Sta. 0+000 to 11+000	Feeder Berm	4.5	

Environmental benefits are achieved by regularly placing material trapped by the channel extension back into the littoral system through the use of the Feeder Berm. The material is then available for cross-shore and longshore sediment transport to the beaches of South Padre Island. This improves environmental stewardship, while improving relationships with area stakeholders on South Padre Island, where shoreline erosion has averaged 18 feet per year. Placing material into the Maintenance ODMDS removes the material from the littoral system and keeps it from nourishing the shoreline.

In addition, the Feeder Berm option (Placement Plan 2) has the potential to reduce life cycle costs because sediments from the Entrance and Jetty Channels are placed further upcurrent from the channel than the Maintenance ODMDS option (Placement Plan 1). The current Entrance Channel terminates at the southwest corner of the Maintenance ODMDS, with the majority of this ODMDS offshore of the current channel limits. For the Recommended Plan, the Entrance Channel Extension would extend the channel along the Maintenance ODMDS' southern limit.

The Maintenance ODMDS site is dispersive in nature; material is generally moved away from the site by the Gulf current within a few weeks to months. While the current flows from south to north most of the time, storms and seasonal reversals sometimes result in the current moving from north to south. If maintenance materials are present at the ODMDS site when the current reverses, they could move back into the channel. The historic dredging records used to establish this study's channel shoaling rates include the current practice of Feeder Berm use for placement of all of the material from the Jetty and Entrance Channels. The Maintenance ODMDS has not been used in more than a decade. Therefore, any increase in shoaling due to the periodic reverse in current flows from north to south has not been accounted for using the recent historic records. Use of the Maintenance ODMDS with the future channel alignment could potentially increase channel shoaling and maintenance costs.

Because of uncertainties described above and the fact that these average annual costs for the two placement plans are nearly identical, these plans' costs are considered equivalent. Therefore, Placement Plan 2, the Feeder Berm option, is the preferred solution because it is the least cost, environmentally preferable plan.

Brazos Island Harbor, Texas Channel Improvement Project

Appendix M
Dredged Material Management Plan

APPENDIX M

DREDGED MATERIAL MANAGEMENT PLAN (DMMP)

Brazos Island Harbor, Texas Channel Improvement Study

FINAL INTEGRATED FEASIBILITY REPORT AND ENVIRONMENTAL ASSESSMENT

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Brazos Island Harbor, Texas
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1.0 INTRODUCTION

1.1 PURPOSE OF REPORT

The Brazos Island Harbor (BIH) project, also known as the Brownsville Ship Channel (BSC), is an existing deep-draft navigation project located on the lower Texas coast. The channel uses the natural Brazos-Santiago Pass to connect the Gulf with the inland portion of the BSC terminating at the Port of Brownsville (POB). A feasibility-level planning study is being completed to determine whether channel improvements to the existing Brazos Island Harbor (BIH) project are feasible and in the Federal interest.

The goal of this Dredged Material Management Plan (DMMP) is to develop a placement plan that will accommodate the 50-year placement of dredged material associated with the BIH channel improvements, taking into consideration cost and environmental concerns.

The purpose of this document is to 1) describe the existing conditions of dredged material placement at BIH; and 2) describe and document the selection of a DMMP. This DMMP will be included as an appendix to the Final Integrated Feasibility Report and Environmental Assessment (FIFR-EA). The DMMP covers placement of dredged material over the 50-year period of analysis from 2021 to 2071 studied in the FIFR-EA.

1.2 PROJECT AREA DESCRIPTION

The project area, shown in Figure 1, includes the BSC channel and property directly adjacent to the channel, including the POB and upland placement areas (PAs), as well as offshore PAs and a nearshore Feeder Berm. Nearly all of the property adjacent to the land-locked portion of the channel is owned by the POB. The Port infrastructure includes railroad and highway systems allowing access to the Port facilities. The existing BSC navigation channel is 19.4 miles in length. The Entrance and Jetty Channels extend east to west for approximately 2.4 miles, from the open Gulf of Mexico, through the jetties to the Laguna Madre. The flared North and South Jetties flank Brazos Santiago Pass, which connects the Gulf with the Lower Laguna Madre. The Main Channel extends 17 miles westward from the Laguna Madre to the Turning Basin, which is located on the eastern outskirts of the city of Brownsville.

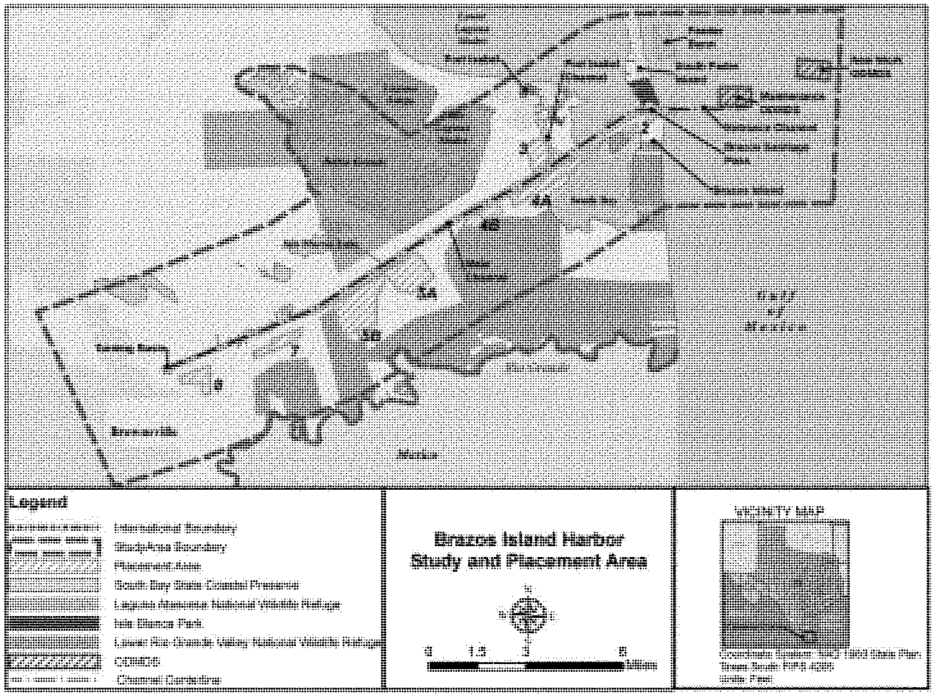

Figure 1 – Study Area Map

There are ten PAs available for the placement of dredged material from the proposed BIH Project— two existing Ocean Dredged Material Disposal Sites (ODMDSs; separate sites for new work and maintenance), which can be used for the Entrance and Jetty Channels, seven upland PAs for containment of material from the Main Channel, and one nearshore Feeder Berm that can be used for beach-quality sediments from the Entrance and Jetty Channels, and a portion of the Main Channel. The ODMDSs and Feeder Berm are all dispersive and by their nature have unlimited capacity.

1.3 SCOPE OF STUDY

Navigation is a priority mission of the U.S. Army Corps of Engineers (USACE) and effective accomplishment of this mission requires dredging to achieve navigable channel dimensions sufficient to meet the needs of waterborne transportation. In this effort, USACE is committed to environmentally sound dredging and placement or management of dredged materials as defined by applicable laws and policies. This can best be achieved through the development of a long-term management strategy for dredged material as delineated in a DMMP. It is the policy of USACE that all DMMPs include an assessment of potential beneficial use (BU) of dredged material for environmental purposes including fish and wildlife habitat creation and restoration and/or hurricane and storm damage reduction.

Dredged material management planning for all Federal harbor projects is conducted by USACE to ensure that maintenance dredging activities are performed in an environmentally acceptable manner, use sound engineering techniques, are economically justified, and ensure that long-term placement facilities are available. Ultimately, the DMMP identifies specific measures necessary to manage the volume of material likely to be dredged within the BIH project over the 50-year period of analysis included in the feasibility study.

1.4 AUTHORIZATION AND DEVELOPMENT HISTORY

1.4.1 Authorization Documents

This DMMP study is being conducted for inclusion in the FIFR-EA pursuant of the latest study authority.

The Congress authorized USACE to conduct a study of BIH, Texas, to determine whether the project should be modified in any way, particularly with a view to widening and deepening the existing channels, pursuant to a resolution of the Committee on Public Works, U.S. House of Representatives dated May 5, 1966.

1.4.2 Development History

Since 1880 with the first Federal involvement in navigation improvements, the BIH has evolved from a shallow-draft navigation channel with a depth of only 10 feet to a deep-draft navigation channel with its current 42-foot depth (Figure 2). The Rivers and Harbors Acts (RHAs) of 1880 and 1881 provided for deepening of the natural channel through the Brazos Santiago Pass to 10 feet, widening the channel through the pass to 70 feet, and the construction of two parallel jetties at the pass. Construction of the South Jetty was started in 1882 and continued until 1884, when operations were suspended due to a lack of funds.

The RHA of 1919 provided authorization to deepen the channel to 18 feet with a 400-foot width through the pass. Under this authorization, two short stone jetties were constructed and some channel dredging was performed. As authorized in the RHA of 1930, jetties at the Brazos Santiago Pass were constructed in 1935 in conjunction with the construction of a navigation channel to Port Isabel. More channel improvements were completed in 1936 when the Main

Channel to the Brownsville Turning Basin was dug through the Rio Grande deltaic plain to provide a navigation channel and turning basin for the City of Brownsville. After these channel improvements, the small fishing community of Port Isabel, located on the mainland overlooking the Laguna Madre and Brazos Santiago Pass, began to grow and industrial facilities were constructed along the western end of the Main Channel, near the Turning Basin and the City of Brownsville.

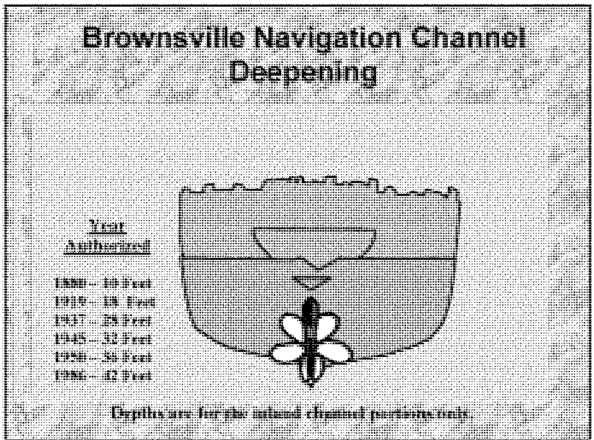

Figure 2: History of Channel Deepening

Several improvements to the waterway were authorized by the RHA of 1960. Most of the project improvements were constructed:

- Widening 1.3 miles of the Brownsville Turning Basin Extension from 300 feet to 500 feet in 1964;
- Construction of a third basin to the Brownsville Fishing Harbor in 1968;
- Widening the upper 3-mile reach of the BIH from 200 to 300 feet in 1980; and
- Deepening a locally dredged extension of the Brownsville Turning Basin from its 32-foot depth to 36 feet in 1980.

The construction of a 1,000-foot extension to the North Jetty, which was authorized by the RHA of 1960, was deauthorized under Section 1001 of the Water Resource Development Act (WRDA) of 1986; however, the current project dimensions were authorized under Section 201, Public Law 99-662. Some of the authorized improvements (e.g. recreational facilities, jetty walkways and comfort stations, and dust control measures) were not implemented. The authorized increase of the turning basin by 1,000 feet, also included in the RHA of 1960, was modified to a 1,200-foot width based on subsequent engineering analyses. Construction of the WRDA 1986 channel improvements was completed in 1996.

1.5 CHANNEL ALIGNMENT

The BIH provides for –42-foot deep mean lower low water (MLLW) navigation on the inland portion of the channel and a 44-foot depth in the offshore Entrance and Jetty Channels. The BIH is essentially a straight waterway with no bridges or other obstructions for the entire 19.4-mile length of the waterway and is operated for single-lane, one-way traffic only. The existing waterway consists of the Entrance Channel, Jetty Channel, Main Channel, Turning Basin Extension, and Turning Basin.

1.6 DATUM

1.6.1 Vertical Datum

Army regulations and USACE Headquarters guidance on tidal datum, provided in Engineering Technical Letter 1110-2-349 Requirements and Procedures for Referencing Coastal Navigation Projects to Mean Lower Low Water Datum, dated April 1, 1993, and Engineering Manual (EM) 1110-2-1003, dated April 1, 2002, stress the necessity of converting local datum, such as Mean Low Tide (MLT) to MLLW. EM 1110-2-1003 further states that MLLW should be tied to the North American Vertical Datum (NAVD) 88. The predominant reason for conversion to MLLW is the need for consistency within the shipping and dredging industries with regard to channel depths.

Historically, USACE–Galveston used the MLT datum for its navigation channels. As noted in the regulations and guidance above, this datum was recently converted to MLLW for consistency with other USACE Districts. MLLW datum was used for all quantity calculations during plan formulation. For the BIH conversion, on average, the MLT/MLLW difference is +0.31 foot. Because this difference was so small and it would have little to no effect on dredging quantities, the study addresses MLT as equal to MLLW for conversion from historic dredging records and drawings. Therefore, –42 feet MLT is considered equal to –42 feet MLLW. The elevations of the PAs are referenced to NAVD 88.

1.6.2 Horizontal Datum

Horizontal coordinates will be based on North American Datum of 1983 (NAD 83), Texas State Plane Coordinates, South Central Zone.

2.0 EXISTING AND FUTURE WITHOUT PROJECT CONDITIONS

2.1 DESCRIPTION OF EXISTING CONDITIONS

USACE is responsible for maintaining BIH channel to its authorized dimensions to ensure navigability of the waterway (Table 1). There are nine PAs available for the placement of dredged material from the existing BIH Project—one site that can be used for the offshore section of the channel, seven upland confined sites for containment of material from the landlocked reach of the channel (PAs 2, 4A, 4B, 5A, 5B, 7, and 8), and a nearshore Feeder Berm. A separate ODMDS site was designated for the placement of offshore new work material when the existing 42-foot channel was constructed during the mid-1990s. This New Work ODMDS has been inactive since that time, but it would be reactivated for construction of the Recommended Plan. The ODMDS and Feeder Berm are dispersive in nature and therefore have unlimited capacity. The Maintenance ODMDS is utilized for maintenance material deemed not suitable for beach or nearshore placement and is located approximately 2.5 nautical miles from shore. The nearshore Feeder Berm site is used for the close placement of beach quality sediment to augment the South Padre Island nearshore profile.

2.1.1 Authorized PAs for the Existing BIH Channel

The nine PAs utilized for current maintenance needs are described below. Figure 1 above presents the location of the seven upland confined PA sites and two ODMDS sites, as well as the Feeder Berm.

<u>Offshore PAs</u>

Maintenance ODMDS

This offshore PA occupies 352 acres of open water with no containment dikes. It is reserved for maintenance materials dredged from the existing Jetty Channel and Entrance Channel (Station 0+000 to Station -13+000) by hopper dredge. The Maintenance ODMDS has not been used in recent years because it was preferable to use the material beneficially, if possible. Material from the offshore channels is generally placed in the Feeder Berm or provided for beach nourishment on South Padre Island under cost-sharing agreements with the General Land Office and the City of South Padre Island. Coordinates of the control points for the Maintenance ODMDS (also known as PA 1), as outlined in the "Brazos Island Harbor Ocean Dredged Materials Disposal Site Designation" report, dated July 1990, are presented in Table 2. As noted in Section 1.6.2 above, the horizontal datum for the ODMDS is referenced to Texas State Plane, NAD(83), Texas South Zone.

Table 1. Dimensions of Existing Brownsville Ship Channel

Channel Reach	Constructed Depth (feet)	Constructed Bottom Width (feet)	Channel Length (miles)
Entrance Channel (Gulf of Mexico to offshore end of jetties)	44	300	1.3
Jetty Channel (Gulf of Mexico to Laguna Madre)	44	300_A	1.1
Main Channel (Laguna Madre to Turning Basin Extension)	42	250_B	15.1
Turning Basin Extension	Transitions from 42 to 36	Transitions from 400 to 325	1.3
Turning Basin	36	Transitions from 325 to 1,200	0.6

Notes:

A. Includes 0.2 mile by 400 feet transition to Main Channel. Remainder of Jetty Channel (0.9 mile) is 300 feet wide.

B. Includes 0.4 mile by 400 feet transition from Jetty Channel and 3.2 mile by 400 feet transition to Turning Basin. Remainder of Main Channel (11.5 miles) is 250 feet wide.

Table 2 Maintenance ODMDS Control Points

Control Point No.	Latitude	Longitude	Northing (Y)	Easting (X)
1	26° 04' 32"	97° 07' 26"	16,555,390.361	1,435,890.262
2	26° 04' 32"	97° 06' 30"	16,555,446.327	1,440,996.513
3	26° 04' 02"	97° 06' 30"	16,552,417.497	1,441,029.918
4	26°° 04' 02"	97° 07' 26"	16,552,361.528	1,435,923.292

Feeder Berm BU Site 1A

Feeder Berm BU Site 1A occupies 313 acres in a near shore open water area with no containment dikes, and is reserved for maintenance dredge materials from the Entrance Channel and Jetty Channel (0+000 to Station -13+000). Material that is not provided for beach placement on South Padre Island is placed at this site by hopper dredge. . The purpose of this PA is to restore material into the littoral current along South Padre island. Coordinates of the control points for Feeder Berm Site 1A, according to the "Underwater Feeder Berm Construction" report, dated 1988, are presented in Table 3.

Table 3 Maintenance Feeder Berm BU Site 1A Control Points

Control Point No.	Latitude	Longitude	Northing (Y)	Easting (X)
1	26° 06' 11"	97° 09' 23"	16,565,270.617	1,425,115.409
2	26° 06' 15"	97° 08' 55"	16,565,701.700	1,427,663.599
3	26° 05' 19"	97° 09' 13"	16,560,461.499	1,428,631.538
4	26° 05' 23"	97° 08' 45"	16,560,030.355	1,426,083.032

Upland Confined PAs

The seven upland confined PAs are described individually in more detail below. Each of these seven existing PAs is provided through a 50-year easement from the non-Federal Sponsor to the U.S. Government. The material is dredged by cutterhead and pumped into the PAs through floating and submerged hydraulic pipelines. This easement was issued on January 26, 1994.

PA 2

PA 2 is located on the south side of the junction of the Jetty Channel and Main Channel and occupies an area approximately 71 acres in size (Figure 1). The site is completely confined with 7,642 linear feet of existing containment dike with an average height of 27 feet along its perimeter. It has been used to confine dredged material from the first section of the Main Channel. The site has not been used recently and the drop-outlet structure is currently non-functioning.

PA 4A

PA 4A occupies an area approximately 469 acres in size along the south side of the Main Channel near the junction with Port Isabel Channel (Figure 1). The site is completely confined with 33,910 linear feet of existing containment dike with an average height varying from 17 to 23 feet along its perimeter. The site was last used for placement of dredged material from the adjacent reach of the Main Channel reach in 2009. The drop-outlet structure is currently silted in and in need of extensive excavation prior to future use.

PA 4B

PA 4B occupies an area approximately 243 acres in size along the south side of the Main Channel. The site is completely confined with 16,338 linear feet of existing containment dike with an average height of 7 feet along the perimeter of the site. The site has not been used for maintenance dredging for several years. The drop-outlet structure is currently non-functioning.

PA 5A

PA 5A occupies an area approximately 704 acres in size along the south side of the Main Channel (Figure 1). The site is completely confined with 21,628 linear feet of existing containment dike with an average height of 6 feet along its perimeter. It is used for placement of maintenance dredged material from the adjacent section of the Main Channel. The drop-outlet structure is currently silted in and in need of extensive excavation prior to future use.

PA 5B

PA 5B occupies an area approximately 1,020 acres in size along the south side of the Main Channel (Figure 1). The site is completely confined with 29,343 linear feet of existing containment dike with an average height of 12 feet along its perimeter. The current drop-outlet structure is functional with maintenance having been performed in 2012 by the non-Federal Sponsor. The site has been used recently for placement of maintenance material from dredging of the adjacent section of the Main Channel.

PA 7

PA 7 occupies an area approximately 257 acres in size along the south side of the Main Channel (Figure 1). The site is completely confined with 20,471 linear feet of existing containment dike with an average height of 20 feet along its perimeter. The site has been used recently for placement of maintenance material from dredging of the adjacent section of the Main Channel. The current drop-outlet structure is functional having been maintained in recent years by the non-Federal Sponsor.

PA 8

PA 8 is located on the south side of the Main Channel near the Turning Basin and occupies an area approximately 288 acres in size (Figure 1). The site is completely confined with 18,024 linear feet of existing containment dike with an average height of 22 feet along its perimeter. The site has been used recently for placement of maintenance material from dredging of the adjacent section of the Turning Basin Extension and Turning Basin. The current drop-outlet structure is functional having been maintained in recent years by the non-Federal Sponsor.

2.1.2 Dredging Quantities

As shown in Table 4, approximately 1.1 million cubic yards (MCY) of shoaled material accumulates annually in the BIH channel. The dredging frequency varies by channel reach with the Entrance and Jetty Channels having the most frequent dredging cycle of 1.5 years.

Table 4 Existing Shoaling Quantities

CHANNEL REACH (Station)	O&M Cycle Frequency (year)	Shoaling (CY/year)
17+000 to 0+000	1.5	351,000
0+000 to 11+000	4.5	154,000
11+000 to 28+000	4	176,000
28+000 to 34+000	4	41,000
34+000 to 50+000	4	118,000
50+000 to 65+000	5	137,000
65+000 to 79+415	6	93,000
79+415 to 89+500	7	33,000
TOTAL SHOALING		1,103,000

Available dredging history data was collected from June 1952 through March 2011 from the USACE dredging histories database. This data provided a basis for estimating existing shoaling rates, and evaluating how previous channel modifications have altered shoaling in the channel. The data gathered was used in calculating average annual shoaling rates by reach. All material that was shoaled was assumed to be removed in these estimates.

2.1.3 Advance Maintenance and Allowable Overdepth

The channel has historically been maintained to various depths of advance maintenance and allowable overdepth below the authorized 42-foot channel template. An additional depth outside the required template is permitted to allow for inaccuracies in the dredging process. District commanders may dredge a maximum of two feet of Allowable Overdepth in coastal regions, and in inland navigation channels (ER 1130-2-520 Navigation and Dredging Operations and Maintenance Policies). This additional dredging allowance is referred to as allowable overdepth. Past dredging of the existing channel has varied between 1' to 2' allowable overdepth.

2.2 FUTURE MAINTENANCE WITHOUT-PROJECT CONDITION

Maintenance dredging activities would continue to be performed as they have been in the past in the future without-project condition (FWOP). Dredging of the Entrance and Jetty Channels would be performed by hopper dredge, with higher shoaling sections dredged as frequently as every 18 months, and other reaches dredged on the average of 4.5 years. The additional allowable overdepth and advance maintenance described in Section 2.1.3 would continue to be used in channel maintenance dredging. From the existing shoaling quantities in Table 4, the total 50-year shoaling is calculated to be 55.0 MCY of material.

Following the practice of recent years, it is assumed that all material from the Entrance and Jetty channels would be placed in the least-cost nearshore Feeder Berm or directly onto South Padre Island beaches under cost-sharing agreements with the Texas General Land Office (GLO) and the City of South Padre Island. The Main Channel reaches would continue to be dredged every 4 to 7 years with a hydraulic pipeline cutterhead, with material being pumped to the existing PAs that line the channel's south bank. No new PAs would be needed to accommodate quantities expected over the 50-year period of analysis. PA dikes would continue to be raised incrementally as additional capacity is needed. On occasion in the past, the BIH channel maintenance has been postponed because of budget considerations, resulting in restricting vessel drafts to those shallower than the authorized depth. However, quantities are calculated for the FWOP with the expectation that the channel would be maintained at authorized depths throughout the period of analysis.

3.0 LEAST COST DISPOSAL ALTERNATIVE

Placement options were evaluated to determine the best disposal alternative for all material, both new work and Operations and Maintenance (O&M). These alternatives considered possible beneficial use of dredged material, as well as traditional PAs.

3.1 BENEFICIAL USE OPPORTUNITIES

Section 2037 of WRDA 2007 amended Section 204 of WRDA 92 dealing with regional sediment management. Section 204 states that a regional sediment management plan shall be developed by the Secretary of the Army for sediment obtained through the construction, operation, or maintenance of an authorized Federal water resources project. The purposes of using sediment for the construction, repair, modification, or rehabilitation of Federal water resource projects are to reduce storm damage to property; to protect, restore, and create aquatic and ecologically related habitats, including wetlands; and to transport and place suitable sediment.

During this feasibility study, a conceptual sediment budget was developed (HDR, 2008) and the beneficial use of the dredged material was investigated. New work construction would yield primarily clay sediments, which are suitable for dike construction or marsh restoration. New work material from the Main Channel would be stockpiled within the existing PAs and used for future incremental dike raisings. No marshes in need of clay material for restoration were identified near the project area. New work material from the Entrance and Jetty Channels would be placed at the New Work ODMDS; sediments to be dredged would be overwhelmingly clay and would not be suitable for placement at the nearshore Feeder Berm, which was designed to receive sandy sediments.

The potential for beneficial use of maintenance material from the new project was also investigated. Shoaled sediments from the majority of the Main Channel (Stations 11+000 to 89+500) are expected to be primarily clay and silt. No marsh areas that would benefit from these sediment types have been identified near the project area. This material would continue to be placed in the existing upland, confined PAs.

Maintenance dredging of the eastern end of the Main Channel (Stations 0+000 to 11+000) and the entire Jetty and Entrance Channels are expected to be primarily sand with some silt, suitable for use in the nearshore Feeder Berm. Sandy material deposited in this nearshore berm is moved by cross-shore and longshore currents toward the shoreline of South Padre Island, decreasing shoreline erosion. Sandy materials could also be used to directly renourish eroding beaches fronting the City of South Padre Island; however, beach placement is not a least-cost plan. The incremental difference between the cost of normal placement into the Feeder Berm and the cost to pump material directly onto the beach must be provided by a non-Federal sponsor. In the past, the City of South Padre Island and the General Land Office have participated in paying the incremental cost to place the material directly onto the beach at South Padre Island. This incremental cost has been about $2 to $3 million per dredging cycle.

3.2 SCREENING FOR LEAST COST PLAN

Based on the possible beneficial use options identified above, several alternative placement plans were considered for maintenance material from Station –17+000 to 11+000. This reach includes the Entrance Channel Extension for the Recommended Plan (-17+000 to -13+000), the Entrance Channel, Jetty Channel, and a portion of the Main Channel. This reach contains primarily sandy material that would be suitable for placement in the Feeder Berm, the current least-cost disposal plan for maintenance material. Another option for this material would be placement into the Maintenance ODMDS, which is located directly adjacent to the channel extension. However, the Maintenance ODMDS has been designated for material only from the Entrance and Jetty Channels. This designation prevents material from Station 0+000 to 11+000 (part of the Main Channel) to be placed in the Maintenance ODMDS. Placement of the material from Station 0+000 to 11+000 is limited to the Feeder Berm because of the lack of capacity in the nearby upland PAs.

Additional advance maintenance (AM) was considered to allow channel dredging cycles to be combined in order to save mobilization and demobilization costs that occur with each dredging contract.

Table 5 presents the quantifiable costs and dredging cycles for the two remaining placement options: Placement Plan 1 (Maintenance ODMDS and Feeder Berm) and Placement Plan 2 (Feeder Berm).

Use of Placement Plan 2 rather than Placement Plan 1 provides an economically and environmentally balanced, sustainable solution for life cycle sediment management for the BIH Recommended Plan. While life-cycle maintenance dredging costs for Placement Plan 1 are essentially equivalent to Placement Plan 2, environmental benefits of Placement Plan 2 make it the optimal sediment management solution.

Environmental benefits are achieved by regularly placing material trapped by the channel extension back into the littoral system through the use of the Feeder Berm. The material is then available for cross-shore and longshore sediment transport to South Padre Island. This improves environmental stewardship, while improving relationships with area stakeholders on South Padre Island, where shoreline erosion has averaged 18 feet per year. Placing material into the Maintenance ODMDS removes the material from the littoral system and keeps it from nourishing the littoral system.

Table 5 Alternative Placement Plans

Stationing	**Placement Location**	**Dredging Cycle (years)**	**Average Annual Costs**
Placement Plan 1			
Sta. −17+000 to 0+000	Maintenance ODMDS	1.5	$6,246,000
Sta. 0+000 to 11+000	Feeder Berm	4.5	
Placement Plan 2			
Sta. −17+000 to 0+000	Feeder Berm	1.5	$6,387,000
Sta. 0+000 to 11+000	Feeder Berm	4.5	

In addition, the Feeder Berm option (Placement Plan 2) has the potential to reduce life cycle costs because sediments from the Entrance and Jetty Channels are placed farther upcurrent from the channel than the Maintenance ODMDS option (Placement Plan 1). The current Entrance Channel terminates at the southwest corner of the Maintenance ODMDS, with the majority of this ODMDS offshore of the current channel limits. For the Recommended Plan, the Entrance Channel Extension would extend the channel along the Maintenance ODMDS's southern limit. The Maintenance ODMDS site is dispersive in nature; material is generally moved away from the site by the Gulf current within a few weeks to months. While the current flows from south to north most of the time, storms and seasonal reversals sometimes result in the current moving from north to south. If maintenance materials are present at the ODMDS site when the current reverses, they could move back into the channel. The historic dredging records used to establish this study's channel shoaling rates include the current practice of Feeder Berm use for placement of all of the material from the Jetty and Entrance Channels. The Maintenance ODMDS has not been used in more than a decade. Therefore, any increase in shoaling due to the periodic reverse in current flows from north to south has not been accounted for using the recent historic records. Use of the Maintenance ODMDS with the future channel alignment could potentially increase channel shoaling and maintenance costs.

Because of uncertainties described above and the fact that these average annual costs for the two placement plans are nearly identical, these plans' costs are considered equivalent. Therefore, Placement Plan 2, the Feeder Berm option, is the preferred solution because it is the least-cost, environmentally preferable plan from Station –17+000 to 11+000.

Maintenance material from the remainder of the Main Channel (11+000 through 89+500) would be hydraulically pumped to the nearest upland, confined PAs, which line the south side of the channel. As discussed above, no opportunities for beneficial use have been identified for this portion of the channel. Use of the adjacent PAs represents the least-cost placement plan for the remainder of the project area.

4.0 DESCRIPTION OF THE DREDGED MATERIAL MANAGEMENT PLAN FOR THE RECOMMENDED PLAN

4.1 NEW WORK PLACEMENT

For the Recommended Plan, the new work material from channel deepening would be distributed among the existing New Work ODMDS (Figure 3) and upland confined PAs as shown in Table 6. Dredging of the Entrance Channel Extension (-18+000 to -13+000), the Entrance Channel and the Jetty Channel would be accomplished by hopper dredge. Dredging of the Main Channel through the Turning Basin (11+000 to 89+500) would be performed by cutterhead dredges. District policy recommends 2-foot allowable overdepth in reaches where large dredges operate. Table 7 presents the allowable overdepth by channel reach for the Recommended Plan.

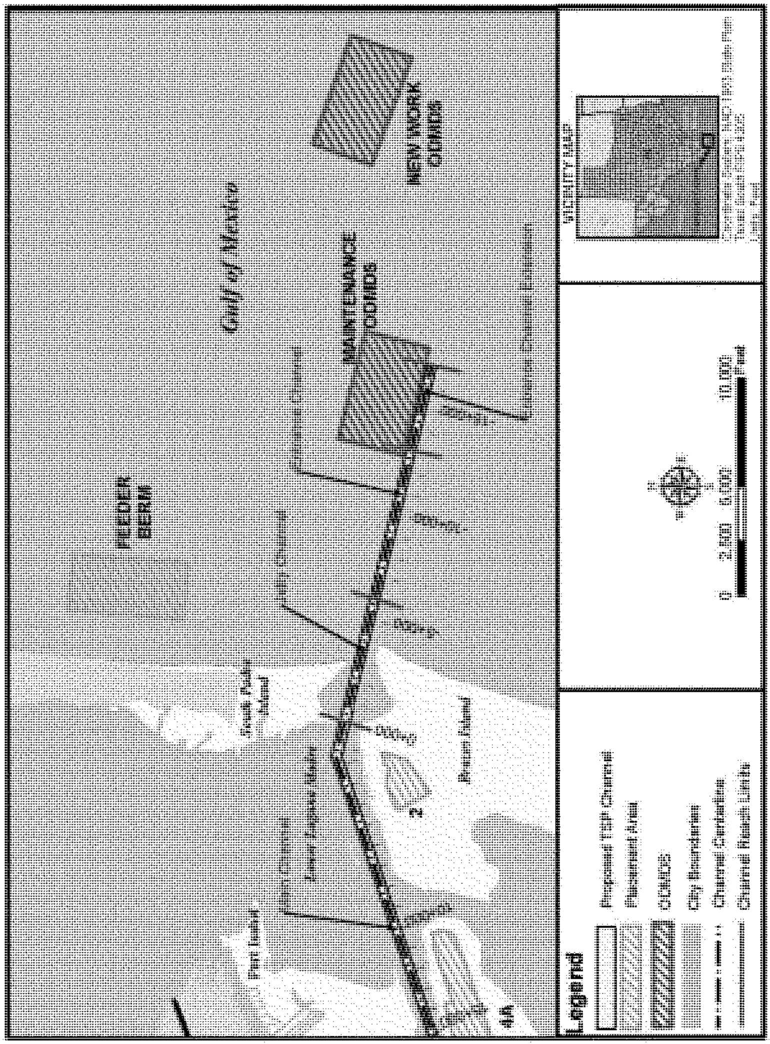

Figure 3 Recommended Plan - Entrance Channel Extension to Main Channel

Table 6 Brazos Island Harbor Recommended Plan –
New Work Quantities & Placement Area Dike Elevations After Construction

Channel Stations		Type of Dredge	PA Location	Current PA Size (acres)	Deepening Dredge Quantity (MCY)	Existing PA Dike Elevation in Feet (NAVD88*)	New Work Dike Elevation in Feet (NAVD88)
-17+000	0+000	Hopper	New Work ODMDS	350	2.1		
0+00 0	7+000	Pipeline	2	71	0.9	27	36
7+000	25+000	Pipeline	4B	243	2.7	7	19
25+000	50+000	Pipeline	5A	704	3.6	6	12
50+000	70+000	Pipeline	5B	1020	2.6	12	15
70+000	82+000	Pipeline	7	257	1.8	20	26
82+000	89+500	Pipeline	8	288	0.4	22	25
				Total CY	14.1		

*NAVD = North American Vertical Datum

Table 7 Allowable Overdepth

Reach	Allowable Overdepth (ft)
Brownsville Entrance Channel (Sta. -17+000 to Sta. 6+000)	2
Brownsville Jetty Channel (Sta. -6+000 to Sta. 0+000)	2
Brownsville Main Channel (Sta. 0+00-Sta.79+415)	1
Brownsville Turning Basin Extension Channel (Sta. 79+415-Sta. 86+215)	1
Brownsville Turning Basin (Sta. 86+215-Sta. 89+500)	1

The Port of Brownsville is responsible for dredging their docks for the channel improvements. This dredging of port facilities is expected to be completed during the deepening of the channel at the same time as the adjacent channel improvement and is relatively small compared to the dredging of the Main Channel.

4.2.1 New Work ODMDS

All of the material from Station -17+000 to 0+000 would be placed at the existing New Work ODMDS (U.S. Environmental Protection Agency [EPA], 1991). This site is located in a dispersive offshore environment and has unlimited capacity. It is located approximately 4 miles from shore in 60 to 70 feet of water. The 350-acre site is large enough to contain all new work material that would be placed there during construction. A Site Management and Monitoring Plan (SMMP) will need to be developed in consultation with, and approved by, EPA before dredged materials can be placed at the site. A new format for SMMP's is currently under development with EPA Region 6. An SMMP for the Recommended Plan will be developed during the Pre-Construction, Engineering Design phase of this project.

Coordinates of the control points for the New Work ODMDS, as outlined in the "Brazos Island Harbor 42-Foot Project, Texas Ocean Dredged Material Disposal Site Designation" report, dated November 1991, are presented in Table 8.

Table 8 New Work ODMDS Control Points

Control Point No.	Latitude	Longitude	Northing (Y)	Easting (X)
1	26° 05' 16"	97° 05' 04"	16,559,975.766	1,448,788.403
2	26° 05' 10"	97° 04' 06"	16,559,429.626	1,454,083.306
3	26° 04' 42"	97° 04' 09"	16,556,599.632	1,453,841.842
4	26° 04' 47"	97° 05' 07"	16,557,044.843	1,448,547.713

Upland PAs

New work material from the Main Channel (Stations 0+000 through 84+200) would be pumped from cutterhead dredges through a combination of fully submerged and floating hydraulic pipelines into existing upland confined PAs owned and managed by the BND (PAs 2, 4B, 5A, 5B, 7, and 8). PA 4A would not be used for new work placement. In addition, new work material may be placed in PA 3, a PA managed by the San Benito Navigation District and generally used for Port Isabel Channel material. The clay new work material would be stockpiled and used to raise the PA 3 dikes for later, unrelated maintenance dredging of the Port Isabel Channel. Specific quantities going to PA 3 are unknown at this time; should PA 3 be utilized, quantities going to PA 2 and/or 4B would be reduced. PA 3 is completely confined by earthen dikes, and is nearing capacity at its current levee height. The area contains no wetland or environmentally sensitive habitat. The non-Federal sponsor's dredging of the dock facilities is expected to be placed in PA 5A and/or PA 8.

None of the existing PAs would need to be expanded, and no new PAs would be needed. Construction to raise the containment dikes to heights needed to accommodate new work quantities would be done within the footprints of the existing PAs. The resulting elevations of the PA dikes for the new work placement activities are also shown in Table 6. They would range from a total elevation of 12 feet NAVD88 around PA 5A to a total elevation of 36 feet around PA 2. Armoring of the exterior toe of the PA 4A and 4B dikes on the side facing the channel would be necessary from Station 22+000 to 33+800. PA 4A is an existing PA that would not be used for new work material during this project; however, this site would be utilized for maintenance material during the 50-year period of analysis. A new dike would be constructed to protect a large loma on the south side of PA 4B from impacts associated with dredged material placement; all other lomas in the project area are already protected by similar dikes. As recommended by 2013 USFWS Coordination Act Report, the new dike would be constructed a minimum of 30 feet from the toe of the existing loma.

4.2 MAINTENANCE MATERIAL PLACEMENT

Maintenance dredging would generally be conducted by hopper and cutterhead dredges, with material being distributed among a nearshore Feeder Berm or the existing Maintenance ODMDS (Figure 3), and upland confined PAs as shown in Table 9. Advance maintenance would be a constant 2 feet for the entire length of the channel. Maintenance quantities are expected to increase approximately 14.3 percent over the FWOP condition. The project's maintenance dredging quantities increase by approximately 6.7 MCY over the 50-year period of analysis. Maintenance dredging would utilize the same PAs as those identified for the FWOP condition, with the exception of PA 2, and the duration and frequency of dredging events would be within the range occurring under current conditions.

The Port is also responsible for the cost of maintaining their facilities. It is expected that these facilities will be dredged at the same time as the adjacent reach of channel, if needed. The Port would pay the incremental costs of the facilities dredging, and for construction of placement area capacity (dike raising) for placement area of maintenance materials. The landlocked reaches of the channel where the Port facilities are located do not have high rates of shoaling. Additionally, the banks of these facilities are basically hardened (sheet piling, etc.) and there is very little erosion and most likely, even less shoaling is expected within the dock area. Overall, the quantity of material to be removed at the Port facilities is negligible when compared to the maintenance dredging of the main channel and can easily be included within the PAs without any additional dike raises being needed to accommodate the dock material. This maintenance dredging of port facilities is expected to be completed at the same time as maintenance of the adjacent channel reaches. Non-Federal quantities that could be deposited in the Federal project PA(s) were estimated to be 13.3 MCY of maintenance material over the 50-year period of analysis (Table 9).

Table 9 Brazos Island Harbor Recommended Plan – Operations & Maintenance Quantities and Placement Area Dike Elevations

Channel Stations		Shoaling Rate (cy/yr)	PA	Size (acres)	Dredge Cycle (years)	Number of Cycles in 50 years	Quantity per Cycle (cy/Cycle)	Total O&M Quantity in 50 years (MCY) (rounded)		Total Dike Elevation in 50 years (feet NAVD88)
–17+000	0+000	470,630	Nearshore Feeder Berm Site 1A	320	1.5	33	706,000	23.3		N/A
0+000	11+000	161,595			4.5	11	727,000	8.0		N/A
11+000	28+000	183,995	4A	469	4	12	736,000	8.8		35
28+000	34+000	43,047	4B	243	4	12	172,000	2.1		24
34+000	50+000	123,527	5A	704	4	12	494,000	5.9		17
50+000	65+000	143,577	5B	1,020	5	10	718,000	7.2		19
Non-Federal Permit Dredging					5	10	831,000		6.7	
65+000	79+000	98,637	7	257	6	8	586,000	4.7		38
Non-Federal Permit Dredging					6	8	415,000		3.3	
79+000	89+500	30,377	8	288	7	7	241,000	1.7		28
Non-Federal Permit Dredging					6	8	831,000		3.3	
				Total Federal Channel O&M Dredging Volume				61.7		
				Non-Federal Permit Dredging Volume					13.3	
				Total Dredging Volume				75.0		

Dredging of the Entrance and Jetty Channels and the first 11,000 feet of the Main Channel (–17+000 to 11+000) would generally be performed by a hopper dredge, and material would be placed in the nearshore Feeder Berm Site 1A). Sediment removed by maintenance dredging would therefore be regularly placed back into the littoral system, available for cross-shore and longshore sediment transport to South Padre Island. Monitoring of material placed at the Feeder Berm has demonstrated that it moves toward the beach and disperses, with the major movement being in the alongshore direction. If for some reason the Feeder Berm cannot be used, maintenance material from the Entrance and Jetty Channels (Station –17+000 to 0+000) could be placed in the Maintenance ODMDS. The ODMDS and Feeder Berm are located in dispersive environments and have unlimited capacities.

Maintenance material from the remainder of the Main Channel (Stations 11+000 through 89+500) would be placed in existing PAs 4A, 4B, 5A, 5B, 7, and 8 (Figures 4 and 5). PA 2 would not be used for maintenance work placement. Upland PAs and containment dikes are sized to accommodate total quantities over the 50-year period of analysis. None of the existing PAs would need to be expanded, and no new PAs would be needed.

Construction to raise the containment dikes to heights needed to accommodate the 50-year maintenance quantities would be done within the footprints of the existing PAs using material stockpiled during new work construction. Dikes would be raised incrementally as needed to contain material from each maintenance cycle. An additional 13.3 MCY of material is expected to be placed in the PAs over the 50-year period of analysis from non-Federal dredging to maintain the port facilities. The resulting elevations of the PA dikes for the 50-year Dredged Material Management Plan (DMMP), including the non-Federal dredging quantities, are also shown in Table 9. They range from a total elevation of 17 feet NAVD88 around PA 5A to a total elevation of 38 feet around PA 7.

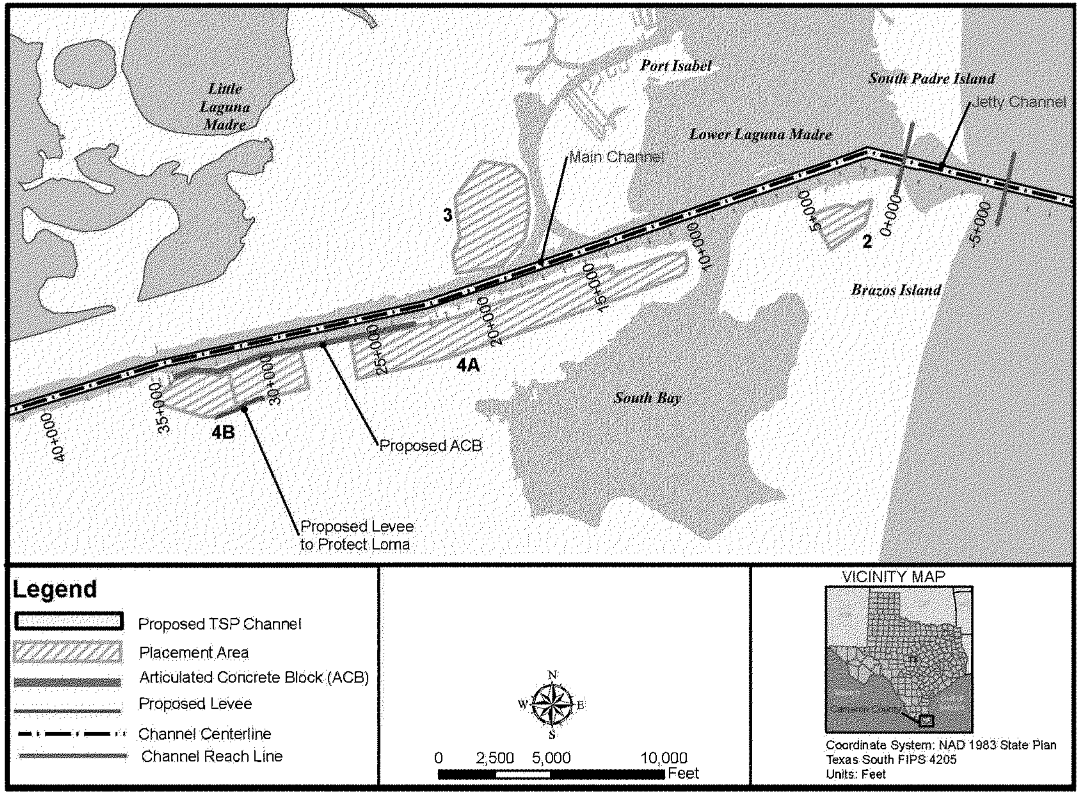

Figure 4 Recommended Plan - Jetty Channel to Main Channel

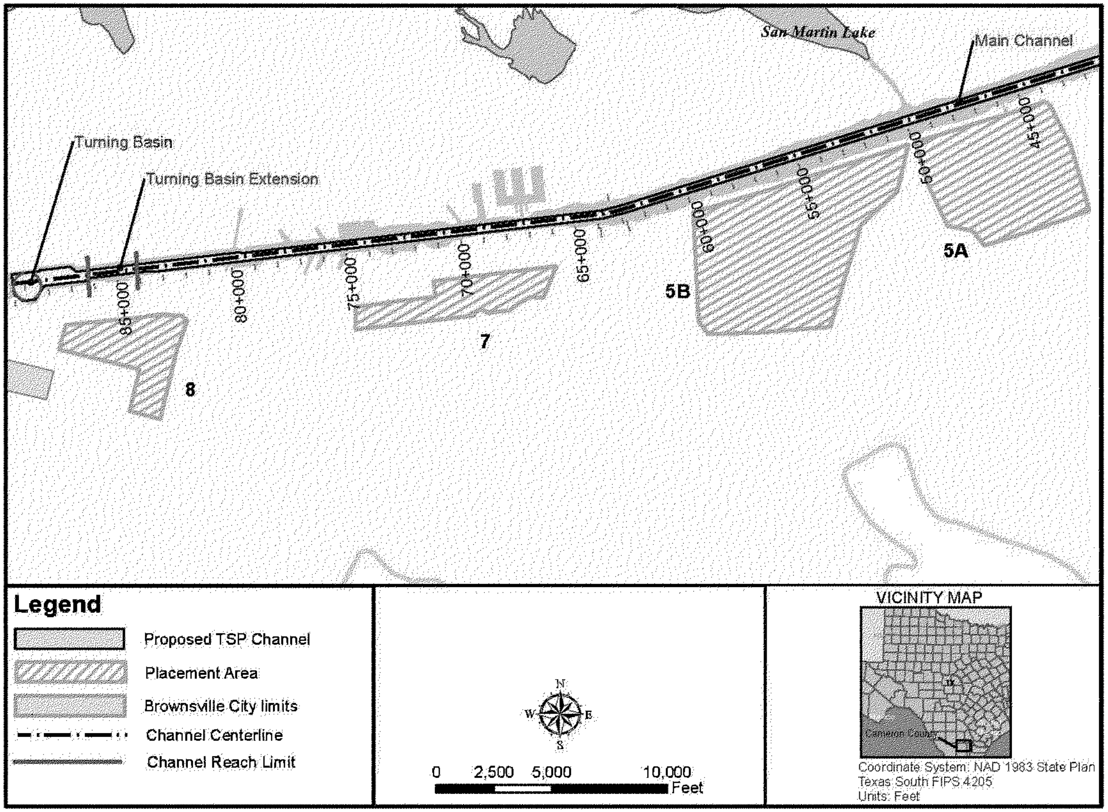

Figure 5 Recommended Plan – Main Channel to Turning Basin