



**U.S. Army Corps
of Engineers**
Galveston District

Houston-Galveston Navigation Channels, Texas Galveston Harbor Channel Extension Project

POST AUTHORIZATION CHANGE REPORT

And

ENVIRONMENTAL ASSESSMENT

DRAFT

**U.S. Army Corps of Engineers
Southwestern Division
Galveston District
March 2013**

EXECUTIVE SUMMARY

The Galveston Harbor and Channel, Texas Project was part of an earlier study for improving the deep-draft navigation channels within the Galveston Bay area authorized by a resolution of the House Committee on Public Works in October, 1967. The Galveston Bay Area Navigation Study (GBANS), Feasibility Report and Environmental Impact Statement (EIS) for improving the Houston and Galveston channels was completed in 1987, and recommended that the Galveston Harbor and Channel be deepened to 50 feet and widened to 450 feet to provide access to deeper water in the Gulf of Mexico. Issues raised during the Washington review of the 1987 GBANS resulted in a decision by the Assistant Secretary of the Army for Civil Works that a reevaluation study would be performed. The *Houston-Galveston Navigation Channels, Texas, Limited Reevaluation Report and Final Supplemental Environmental Impact Statement* (1995 LRR) was completed in November 1995.

The 1995 LRR presented a plan that consisted of deepening and widening the Houston Ship Channel (HSC) and deepening of the Galveston Harbor and Channel in two phases. Phase I consisted of deepening the channels to a depth of 45 feet; Phase II further proposed deepening the channels to 50 feet. Environmental studies were conducted at that time to assess the impacts of a 50-foot channel; however, it was later determined that deepening the channel to 50 feet was not economically justified.

The Water Resources Development Act (WRDA) 1996, Section 101(a)(30), P.L. 104-303, authorized the HSC to be deepened and widened from 40 feet deep by 400 feet wide to 45 feet deep by 530 feet wide. Congress also authorized deepening and widening of the Galveston Harbor and Channel, Texas Project from the Gulf of Mexico from 40 feet deep to 45 feet deep with variable bottom widths ranging from 650 feet to 1,133 feet. This deepening effort stopped at Station 20+000 of the Galveston Harbor exclusive of the last 2,571 feet at the most westward end of the Galveston channel.

Deepening of the Houston portion to 45 feet was completed in 2005. Deepening of the Galveston Channel did not proceed at that time due to the non-Federal sponsor's lack of funds. Once funds were available, the benefits and costs of the Recommended Plan as identified in the 1995 LRR and authorized by WRDA 1996, for the Galveston Channel were updated by the *Houston-Galveston Navigation Channels, Texas, Galveston Channel Project, Final Limited Reevaluation Report*, dated May 31, 2007, (2007 LRR). The deepening of the Galveston Harbor Channel to 45 feet was completed in January 2011, not including the last 2,571 feet which remained at a 40 feet depth.

At the time of the 1996 WRDA authorization, this remaining 2,571 feet had been evaluated for deepening to 45 feet in the 1995 LRR but was determined to be not economically justified at the time since no portside facilities were in place. In the intervening years, conditions changed and beginning in 2006 portside service facilities began operating and utilizing the 40-foot channel.

This Post Authorization Change Report (PACR) presents the evaluation of deepening this remaining segment up to 45 feet in order to update the results of the 1995 LRR. The change would involve extending the 45 feet deep Galveston Harbor Channel the remaining 2,571 feet to reach the end of the limits of the authorized and currently maintained 40-foot channel. A recommendation by the Chief of Engineers and congressional authorization to amend the 1996 WRDA authorization would be required for implementation of a proposed channel improvement project beyond the authorized 40 feet depth.

The results of the economic analysis show that there is an economically rational justification to deepen the Galveston Harbor Channel to 45 feet through the reaches that are presently authorized to 40 feet. The average annual cost is \$589,100 for a 45-foot channel at the current interest rate of 3.750 percent.

The benefit-cost ratio (BCR) was determined by comparing average annual benefits to the corresponding average annual costs. The 45-foot channel has the highest net benefit results and an expected BCR value of 1.4 at the current interest rate of 3.750 percent. The estimated cost of the project is approximately \$13 million. The overall Houston-Galveston Navigation Channels, Texas project (HGNC), to which the extension would potentially be added, is currently estimated at \$823 million. A separate report is currently being prepared to address the HGNC 902 Limit.

Environmental Impacts are expected to be negligible because construction will occur within the existing project footprint, and an existing placement area will be used.

This project is in support of two of the four goals for U.S. Army Corps of Engineers (USACE) contained in the latest (as of 1 March 2013) USACE Campaign Plan. This plan is available on the internet at the following address:

<http://www.usace.army.mil/about/campaignplan/Pages/Home.aspx>. Specifically, this project supports Goal 2 (Transform Civil Works) and Goal 4 (Prepare for Tomorrow).

Houston-Galveston Navigation Channels, Texas
Galveston Harbor Channel Extension Project Post Authorization Change Report

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**Houston-Galveston Navigation Channels, Texas
Galveston Harbor Channel Extension Project
Post Authorization Change Report**

1.0 INTRODUCTION

1.1 Purpose of Report

The *Houston-Galveston Navigation Channels, Texas, Limited Reevaluation Report and Final Supplemental Environmental Impact Statement* (1995 LRR) was completed in November 1995. Subsequent to its completion the Water Resources Development Act (WRDA) 1996, Section 101(a)(30), P.L. 104-303, authorized the deepening and widening of the Houston Ship Channel (HSC) from 40 feet deep by 400 feet wide to 45 feet deep by 530 feet wide. Congress also authorized deepening and widening of the Galveston Harbor and Channel, Texas Project from the Gulf of Mexico to Station 20+000 of the Galveston Harbor to a depth of 45 feet, with variable bottom widths ranging from 650 feet to 1,133 feet. This deepening effort stopped at Station 20+000 of the Galveston Harbor Channel exclusive of the last 2,571 feet at the most westward end of the Galveston channel. As such, the last 2,571 feet of the Galveston Harbor Channel remains under the previously authorized Galveston Harbor and Channel, Texas Project and is only authorized to 40 feet deep.

This Post Authorization Change Report (PACR) presents an evaluation of deepening the remaining segment of the Galveston Harbor Channel up to 45 feet. The change would involve extending the 45-foot deep Galveston Harbor Channel the remaining 2,571 feet to reach the end of the limits of the authorized and currently maintained 40-foot deep channel

An Environmental Assessment (EA) has been prepared to document the proposed changes in accordance with the National Environmental Policy Act (NEPA).

1.2 Project Area Description

The project area includes the eastern end of Galveston Island and Pelican Island. Galveston Island is a low-lying barrier island two miles off the Texas coast and approximately 50 miles southeast of Houston, Texas. Galveston Island was formed as an offshore bar at the beginning of the present sea-level stand and grew through the accretion of sand from littoral drift. Pelican Island, a natural sand-spit, has been expanded substantially over the years through the placement of dredged material from maintaining the Galveston Harbor and Texas City Channels; a practice

which has continued to the present. The Galveston Harbor Channel is a very active shipping lane providing deep-draft vessel access to the Port of Galveston, an important Texas deepwater port. This channel, inclusive of the portion that will be deepened, is lined with various wharfs, docks and commercial and industrial facilities associated with Port of Galveston operations and other Port users. Texas City, an important Gulf port city and producer of refined petroleum products, is located approximately seven miles from the project area.

The Galveston community has a diversified income base; however, jobs are predominantly dependent upon tourism, the Port of Galveston, commercial fishing, the University of Texas Medical Branch, and the American National Insurance Company.

1.3 History of Project

Galveston Bay, the largest inland bay on the Texas coast, is an important commercial and recreational fishing resource and provides access to the deep-water ports of Houston, Texas City, and Galveston. The Houston and Galveston Channels traverse the Galveston Bay area. This area is located along the northeastern Texas coastline as shown on Figure 1.

The Galveston Harbor and Channel, Texas, Project was part of an earlier study for improving the deep-draft navigation channels within the Galveston Bay area authorized by a resolution of the House Committee on Public Works in October, 1967. This resolution authorized a review of previous reports on the HSC, Galveston Harbor Channel, and the Texas City Channel. The channels at this time were 40 feet in depth.

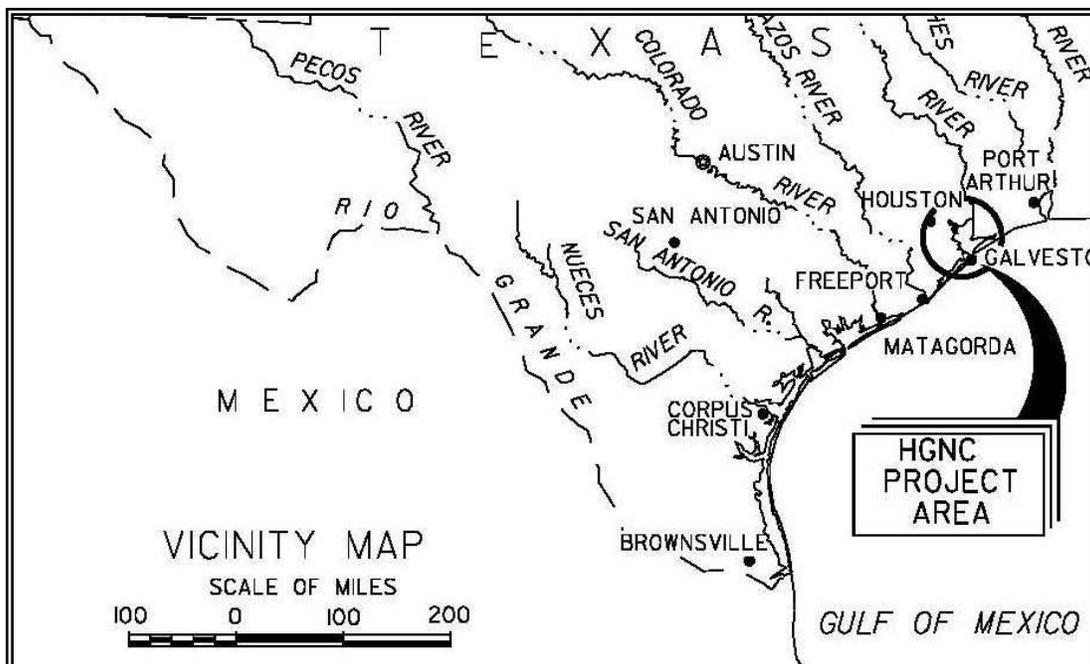


Figure 1 - Houston-Galveston Navigation Channels Project Location on Texas Coastline

The Galveston Bay Area Navigation Study (GBANS), Feasibility Report and Environmental Impact Statement (EIS) for improving the Houston and Galveston channels was completed in 1987, and recommended that the Galveston Harbor and Channel be deepened to 50 feet and widened to 450 feet to provide access to deeper water in the Gulf of Mexico. Issues raised during the Washington review of the 1987 GBANS resulted in a decision by the Assistant Secretary of the Army for Civil Works that a reevaluation study would be performed.

A new LRR was completed in November 1995 and made recommendations for project implementation. The Port of Houston Authority (PHA) and the City of Galveston are the non-Federal sponsors of the Houston-Galveston Navigation Channels, Texas Project (HGNC). By letter dated May 24, 2006, the non-Federal sponsorship for the City of Galveston's portions of project responsibilities was transferred to the Board of Trustees of the Galveston Wharves (Port of Galveston, (POG)).

The 1995 LRR presented a plan that consisted of deepening and widening the HSC and deepening of the Galveston Harbor and Channel in two phases. Phase I consisted of deepening the channels to a depth of 45 feet; Phase II further proposed deepening the channels to 50 feet. Environmental studies were conducted at that time to assess the impacts of a 50-foot channel; however, it was later determined that deepening the channel to 50 feet was not economically justified.

The WRDA 1996, Section 101(a)(30), P.L. 104-303, authorized the HSC to be deepened and widened from 40 feet deep by 400 feet wide to 45 feet deep by 530 feet wide. Congress also authorized deepening and widening of the Galveston Harbor and Channel, Texas Project from the Gulf of Mexico to Station 20+000 of the Galveston Harbor to a depth of 45 feet, with variable bottom widths ranging from 650 feet to 1,133 feet.. This deepening effort stopped at Station 20+000 of the Galveston Harbor exclusive of the last 2,571 feet at the most westward end of the Galveston channel.

Deepening of the Houston portion to 45 feet was completed in 2005. Deepening of the Galveston Channel did not proceed at that time due to the non-Federal sponsor's lack of funds. Once funds were available, the benefits and costs of the Recommended Plan as identified in the 1995 LRR and authorized by WRDA 1996, were updated by the *Houston-Galveston Navigation Channels, Texas, Galveston Channel Project, Final Limited Reevaluation Report*, dated May 31, 2007, (2007 LRR). The deepening of the Galveston Harbor Channel to 45 feet was completed in January 2011, not including the last 2,571 feet which remained at a 40 feet depth.

The HGNC is divided into four main reaches referred to as the Offshore Reach, the Bay Reach, the Bayou Reach, and the Galveston Channel Reach (See Figures 2 and 3). For a more detailed drawing refer to the 11 by 17-inch drawing (C-0) in the Engineering Appendix.

Additionally barge lanes were authorized in 2001 as an addition to the original HGNC project. Referencing the Figure 3 station numbers that designate the different reaches for the HGNC, barge lanes were constructed in the Bay Reach on the west side of the channel looking upstream from Station 138+366.81 to Station 3+700. Barge lanes were constructed on the east side looking upstream from Station 138+366.81 to the Bayou Reach Station 6+00. The barge lanes were constructed to a depth of 12 feet.

1.4 Authorization

Table 1 provides dates and descriptions of authorized project features for the HGNC Project.

Table 1: Authorized Project Features for HGNC Project

Date	Project and Work Authorized	Documents
October 12, 1996	The project for navigation and environmental restoration, Houston-Galveston Navigation Channels, Texas: Report of the Chief of Engineers, dated May 9, 1996, at a total cost of \$298,334,000, with an estimated Federal cost of \$197,237,000 and an estimated non-Federal cost of \$101,097,000, and an average annual cost of \$786,000 for future environmental restoration over the 50-year life of the project, with an estimated annual Federal cost of \$590,000 and an estimated annual non-Federal cost of \$196,000. The removal of pipelines and other obstructions that are necessary for the project shall be accomplished at non-Federal expense. Non-Federal interests shall receive credit toward cash contributions required during construction and subsequent to construction for design and construction management work that is performed by non-Federal interests and that the Secretary determines is necessary to implement the project.	Water Resources Development Act 1996, Section 101(a)(30), P.L. 104-303
October 27, 2000	That the Secretary of the Army, acting through the Chief of Engineers, is directed to design and construct barge lanes at the Houston-Galveston Navigation Channels, Texas, project immediately adjacent to either side of the Houston Ship Channel, from Bolivar Roads to Morgan Point, to a depth of 12 feet with prior years' Construction, General carry-over funds.	Energy and Water Development Appropriations Act, 2001, P.L. 106-377, Section 1(a)(2) Appendix B - H.R. 5483, 106 th Congress

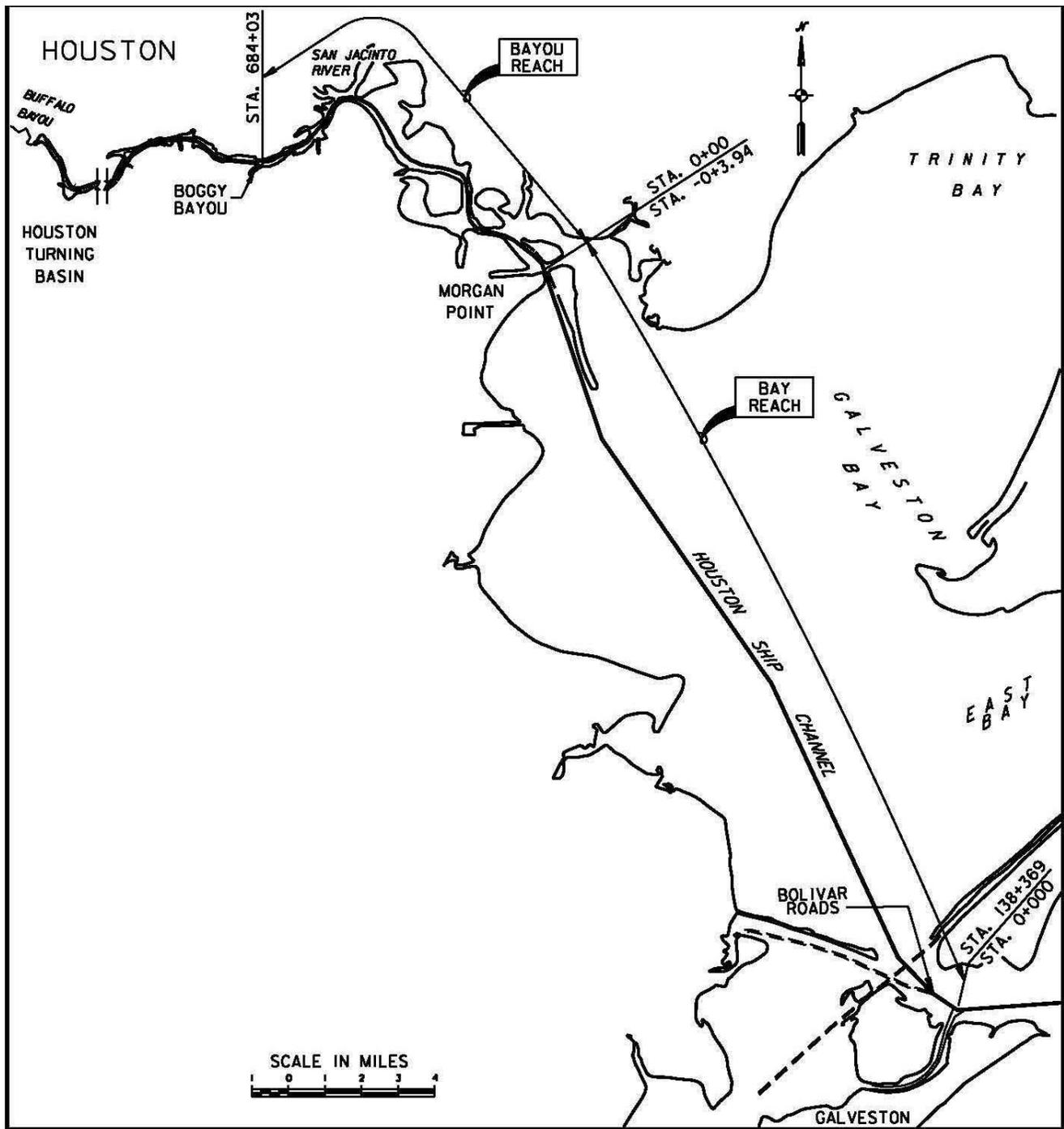


Figure 2 – Map of Houston Portion of HGNC Reach Designations

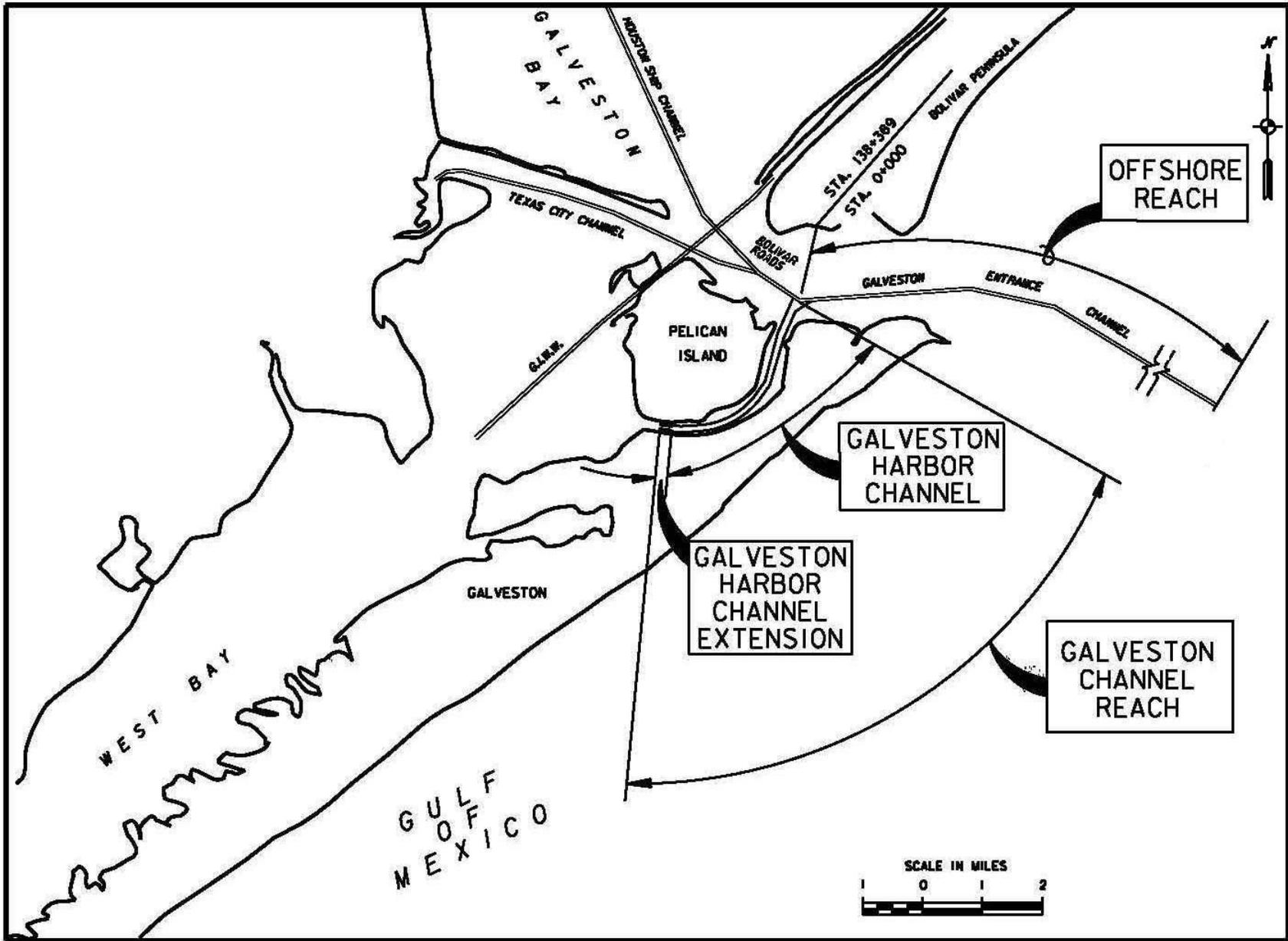


Figure 3 – Map of Galveston Portion of HGNC Reach Designations

1.5 Description of Authorized Project

Additional information pertaining to the Station numbers, depths, bottom widths and channel lengths for the HGNC channel reaches is presented in Table 2. The term “Station” refers to a horizontal distance in feet measured along the centerline of the channel and is used to indicate the relative location of a particular portion of the channel.

Table 2 - Approximate Channel Segments for the HGNC Reaches

Reach	Channel Segments and Station Numbers for Each Reach of the HGNC Project	Depth (Feet below MLT)	Bottom Width (feet)	Channel Length (feet)	Channel Length (miles)
Galveston Harbor and Channel portion of the HGNC Project					
Offshore Reach (Galveston Entrance Channel)	Extended Entrance 55+840 to 76+000	47	800	20,160	3.8
	Entrance 30+515 to 55+840	47	800	25,325	4.8
	Outer Bar 21+753 to 30+515	47	800	8,763	1.7
	Inner Bar 4+490 to 21+753	45	800	17,262	3.3
	Bolivar Roads 0+000 to 4+490	45	800	4,490	0.8
Galveston Channel Reach (Galveston Channel)	Galveston Harbor Channel (from Bolivar Roads to Pier 9)† 0+000 to 8+000	45	Varies 650–1,133	8,000	3.9
	Galveston Harbor Channel (from Pier 9 to Pier 38) 8+000 to 20+000	45		12,000	2.3
	Galveston Harbor Channel (from Pier 38 to 43 rd Street)†† 20+000 to 22+571	40	1,085	2,571	0.5
Houston Ship Channel portion of the HGNC Project					
Bay Reach	Bolivar Roads to Morgans Point Bay Station -0+3.94 to 138+369†††	45	530	138,373	26
Bayou Reach	Morgans Point to Boggy Bayou Bayou Station 0+00 to 684+03.	45	530	68,600	13
Approximate Length of Channel authorized to be deepened under the HGNC Project				305,544†	60

† The newly constructed 45-foot Galveston Harbor Channel terminal end functions as a turning basin as it encompasses the entire width and length of the channel which is 1,075 feet wide by approximately 4,700 feet in length.

†† The section of Galveston Harbor Channel referred to in this document as the Galveston Harbor Channel Extension was not included in the 1995 LRR project/HGNC Project and is not reflected in channel length total.

††† Bay Station -0+3.94 is the same location as Bayou Station 0+00; Bay Station 138+369 is the same location as Offshore Station 0+000.

Dredged material from the Offshore and Bolivar Roads area (see Figure 3) was designated to be deposited in the Gulf, within a beneficial use berm and in an Ocean Dredged Material Disposal Site (ODMDS). Material from the Galveston Channel Reach and the Bayou Reach of the HSC was authorized for placement in upland, fully confined placement areas (PAs). Material from the Bay Reach was designated to be used beneficially for the environmental restoration plan described below.

The environmental restoration portion of the authorized HGNC consists of the initial construction of tidal marsh habitat and a colonial waterbird nesting island through the beneficial use of new work dredged material, and incremental development (deferred construction) of additional marsh habitat through the beneficial use of maintenance materials dredged from Galveston Bay. The HSC portion of the HGNC involved environmental restoration and navigation; whereas, the Galveston portion of the HGNC only involved navigation. Figure 4 shows the location of the environmental restoration features for the HSC portion of the HGNC.

Responsibility for the Offshore Reach is shared by both of the current non-Federal Sponsors of the HGNC. The Bay and Bayou Reaches are the responsibility of the PHA, and the Galveston Channel Reach is the responsibility of the POG.

Army regulations and U.S. Army Corps of Engineers (USACE) Headquarters guidance on tidal datum, provided in Engineering Technical Letter (ETL) 1110-2-349 *REQUIREMENTS AND PROCEDURES FOR REFERENCING COASTAL NAVIGATION PROJECTS TO MEAN LOWER LOW WATER DATUM*, dated April 1, 1993, and Engineer Manual (EM) 1110-2-1003, 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 of 1988 (NAVD 88). The predominate reasons for conversion to MLLW is the need for consistency throughout the ports of the U.S., to enhance the continuity of National Oceanic and Atmospheric Administration (NOAA) and U.S. Coast Guard (USCG) navigation charts and to avoid misconceptions within the shipping and dredging industries with regard to channel depths.

Galveston District (District) is in the process of complying with the above referenced guidance on referencing tidal datums using MLLW. Conversion will be completed at a later date in accordance with the District's action plan to convert all projects within the District to MLLW. Vertical survey measurements at tide gauges and benchmarks are currently being used to estimate the relative difference between MLT and MLLW datums along the Federal channels.

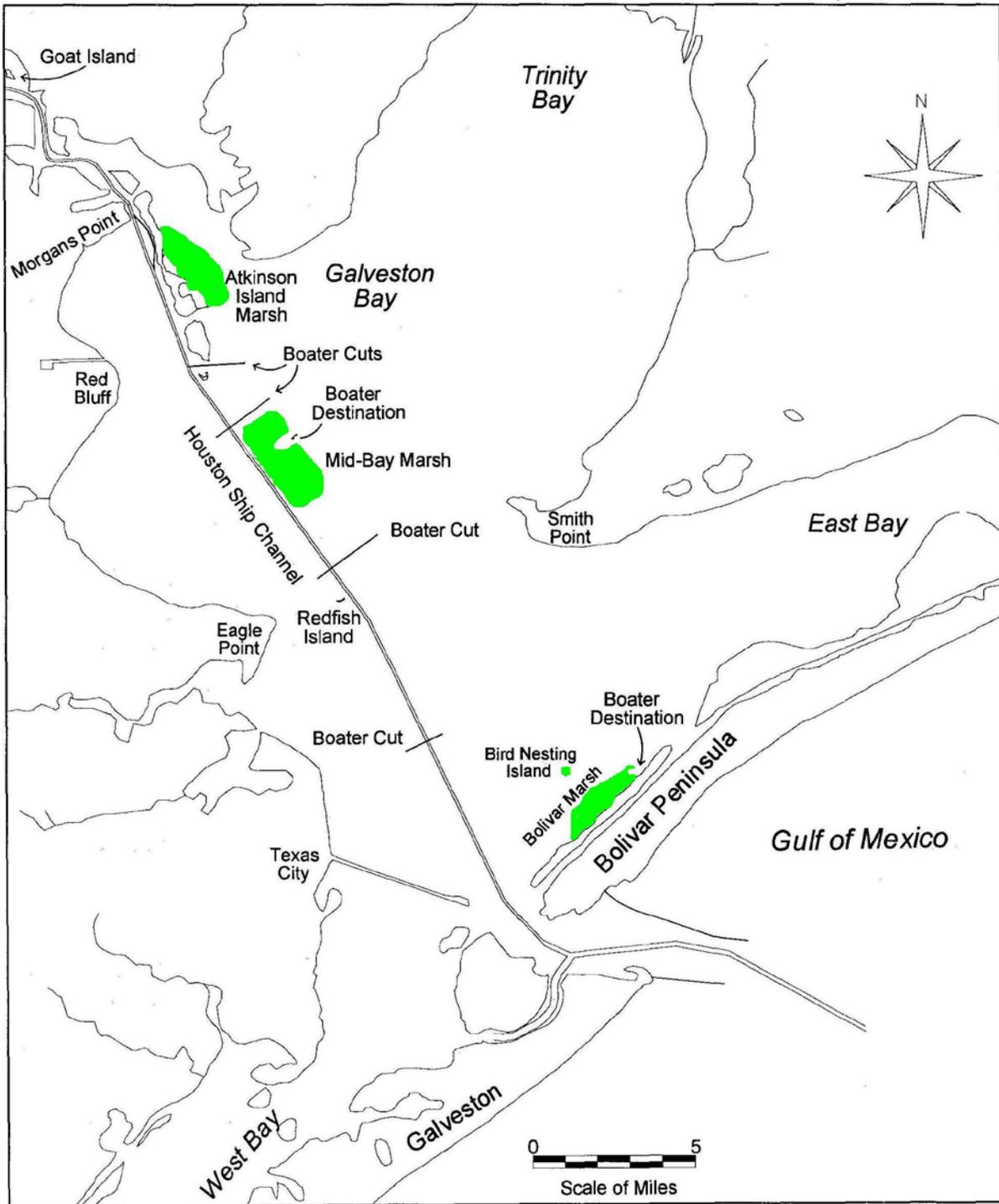


Figure 4 – Environmental Restoration Features for the HSC portion of the HGNC

The objective is to maintain an effective water depth for each of the proposed channel modifications while correctly referencing resulting water surface level in MLLW. A very simplified synopsis of the four phases the District will perform to comply with the above reference guidance with estimated cost and estimated duration is as follows:

- Phase 1: Use active and inactive Texas Coastal Ocean Observation Network (TCOON) gages to determine calibration/conversion values between MLLW (approximately \$300,000 and one year).
- Phase 2: Establish new gages if needed to better define the MLLW and MLLW relationships in the coastal region (approximately \$1,311,000 and 18 months).
- Phase 3: Install new or reconfigure existing staff gages to reflect MLLW datum (approximately \$300,000-500,000 labor and 18 months).
- Phase 4: Update technical materials and communicate conversion impacts to internal/external stakeholders (no cost/duration cited).

Activities associated with Phases 1 and 2 have been initiated via contract. Because of the data collection requirements, these tasks are scheduled to be completed by 3rd Quarter fiscal year (FY) 13.

Additional References for consultation during PED may include the following post-2003 guidance pertaining to tidal datum:

1. ER 1110-2-8160, "Policies for Referencing Project Elevation Grades to Nationwide Vertical Datums", dated March 1, 2009;
2. Engineer Circular (EC) 1110-2-6070, "Guidance for a Comprehensive Evaluation of Vertical Datums on Flood Control, Shore Protection, Hurricane Protection, and Navigation Projects", dated July 1, 2009;
3. EM 1110-1-1005, "Engineering and Design – Control and Topographic Surveying", Appendix B-6. Implementation Actions, dated January 1, 2007; and
4. EM 1110-2-6056, "Standards and Procedures for Referencing Project Evaluation Grades to Nationwide Vertical Datums", dated December 31, 2010.

1.6 Funding Since Authorization

The HGNC began receiving funds in FY 1998 and has received Construction General (CG) Federal Funds each year since. These totals are detailed by FY in Table 3.

Table 3 - Funding since Authorization (as of: 9/30/2012)

Houston-Galveston Navigation Channels - Construction General Federal Funding (In Thousands)												
Fiscal Year (FY)	Corps Capability	OMB Budget	Appropriated	Emergency Supplemental	ARRA	Rescission	Savings & Slippage	5% Holdback	Allocated	Total Reprogramming	Total Allocated	Cumulative Total
1998	\$23,900	\$15,000	\$20,000	\$0	\$0	\$0	\$0	\$0	\$20,000	\$0	\$20,000	\$20,000
1999	\$60,000	\$5,220	\$49,000	\$0	\$0	\$0	(\$3,436)	\$0	\$45,564	(\$1,362)	\$44,202	\$64,202
2000	\$67,400	\$60,000	\$60,000	\$0	\$0	\$0	(\$8,545)	\$0	\$51,455	(\$13,451)	\$38,004	\$102,206
2001	\$55,100	\$53,492	\$53,492	\$0	\$0	\$0	(\$8,559)	\$0	\$44,933	(\$23,205)	\$21,728	\$123,934
2002	\$46,800	\$28,785	\$33,785	\$0	\$0	\$0	(\$5,400)	\$0	\$28,385	\$0	\$28,385	\$152,319
2003	\$54,000	\$19,478	\$36,000	\$0	\$0	(\$203)	(\$6,443)	\$0	\$29,354	\$18,200	\$47,554	\$199,873
2004	\$35,500	\$18,726	\$35,500	\$0	\$0	(\$180)	(\$7,886)	\$0	\$27,434	\$20,306	\$47,740	\$247,613
2005	\$29,000	\$18,000	\$22,000	\$0	\$0	(\$158)	(\$2,297)	\$0	\$19,545	\$7,500	\$27,045	\$274,658
2006	\$47,000	\$24,800	\$26,000	\$4,217	\$0	(\$260)	\$0	\$0	\$29,957	\$0	\$29,957	\$304,615
2007	\$71,280	\$43,076	\$43,076	\$0	\$0	\$0	\$0	\$0	\$43,076	\$0	\$43,076	\$347,691
2008	\$33,450	\$16,320	\$15,730	\$0	\$0	\$0	\$0	\$0	\$15,730	\$0	\$15,730	\$363,421
2009	\$21,700	\$21,700	\$21,244	\$8,000	\$86,164	\$0	\$0	\$0	\$115,408	\$0	\$115,408	\$478,829
2010	\$42,400	\$500	\$242	\$0	\$0	\$0	\$0	\$0	\$242	(\$10,573)	(\$10,331)	\$468,498
2011	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	(\$2,422)	(\$2,422)	\$466,076
2012	\$0	\$600	\$600	\$0	\$0	\$0	(\$12)	\$0	\$588	(\$461)	\$127	\$466,203
TOTAL			\$416,669	\$12,217	\$86,164	(\$801)	(\$42,578)	\$0	\$471,671	(\$5,468)	\$466,203	

Table 4 shows the total expenditures for the HGNC as of September 30, 2012 as \$619,515,523. Table 3 funding reflects Federal dollars only; whereas, Table 4 expenditures reflect both Federal and non-Federal costs.

Table 4 – Houston-Galveston Navigation Channels – Expenditure Recap

End of FY	Federal Construction Cost	Non-Federal Construction Cost	Yearly Construction Cost	Cumulative Construction Cost
Sep-98	\$21,710,187	\$995,955	\$22,706,142	\$22,706,142
Sep-99	\$32,002,467	\$9,651,362	\$41,653,829	\$64,359,971
Sep-00	\$67,341,990	\$26,939,013	\$94,281,003	\$158,640,974
Sep-01	\$21,446,315	\$6,592,594	\$28,038,909	\$186,679,883
Sep-02	\$27,360,567	\$8,387,114	\$35,747,681	\$222,427,564
Sep-03	\$48,528,490	\$16,949,168	\$65,477,658	\$287,905,222
Sep-04	\$48,147,545	\$16,240,443	\$64,387,988	\$352,293,210
Sep-05	\$26,989,716	\$6,585,888	\$33,575,604	\$385,868,814
Sep-06	\$4,493,460	\$715,875	\$5,209,335	\$391,078,149
Sep-07	\$19,285,935	\$5,988,987	\$25,274,922	\$416,353,071
Sep-08	\$23,741,037	\$6,856,033	\$30,597,070	\$446,950,141
Sep-09	\$20,032,546	\$6,301,542	\$26,334,088	\$473,284,229
Sep-10	\$33,853,983	\$11,088,261	\$44,942,244	\$518,226,473
Sep-11	\$36,837,013	\$12,311,513	\$49,148,526	\$567,374,999
Sep-12	\$38,772,187	\$13,368,337	\$52,140,524	\$619,515,523
	\$470,543,438	\$148,972,085	\$619,515,523	

Source: Galveston District Annual Report – Table A worksheet

1.7 Authorized Project Cost Information

Table 5 provides a comparison of 1) the estimated cost for the project as authorized by Congress; 2) the project last presented to Congress in which barge lanes were authorized for construction under the HSC portion of the project; 3) the authorized project updated to October 2012 price level. These last costs were developed by price leveling the costs from the certified Total Project Cost Summary (TPCS), dated 23 July 2012 (see Appendix B) to October 2012 price levels.

The \$11,707,000 shown under the “Galveston Channel - Navigation” portion of Table 5 is the estimated cost of the Tentatively Recommended Plan identified later in this report.

Section 101 (30) of WRDA 96 authorized the project at a total cost of \$298,334,000 (\$197,237,000 Federal and \$101,097,000 non-Federal) based on the approved LRR dated November 1995. The future environmental restoration over the 50-year period of analysis was also authorized at an average annual cost amount which is calculated to be \$10,047,000, bringing the total authorized cost to \$308,381,000. The Energy and Water Development Appropriations Act, 2001, as enacted by Section 1(a)(2) of P.L. 106-377, authorized Barge Lanes to be constructed; however, the act did not increase the authorized project cost.

As shown in Table 4 above, total HGNC expenditures are approximately \$620 million to date. The current 902 cost limit for the HGNC is estimated to be \$537,340,000. A separate report is currently being prepared to address the HGNC 902 Limit and request congressional reauthorization for the HGNC. The aforementioned Tentatively Recommended Plan (which will be discussed later in this report) would also require new authorization and that cost could conceivably be added to the authorized cost of the HGNC project.

The most current cost estimate dated February 9, 2012, for HGNC estimates the Constant Dollar Cost (does not include inflation) at October 2012 price levels as \$798,695,000 (Table 5); higher than the current 902 limit for HGNC. This figure is inclusive of the barge lanes authorized for construction under the Energy and Water Development Appropriation Act of 2001 (Section 1(a)(2)). The Total Project Cost of \$822,900,000, is the Constant Dollar Cost fully funded with escalation to the estimated 2030 mid-point of construction.

Table 5 – Changes in Total Project First Cost (\$000)

Construction Item	HGNC Features of Recommended Plan (Oct 1995 price level)	Project last presented to Congress (Additional Authorization ¹)	Current Project Cost Estimate for HGNC (Oct 2012 Price level)	Tentatively Recommended Plan (Oct 2012 Price level)
Houston Ship Channel (HSC) –Navigation and Environmental Restoration				
Navigation:				
Federal – Deep-Draft 75%	\$140,796		\$265,213	
Non-Federal – Deep-Draft 25%	\$46,932		\$88,404	
Federal – Shallow Draft 90%			\$3,387	
Non-Federal – Shallow Draft 10%			\$376	
U.S. Coast Guard	\$2,443		\$6,671	
Lands & Damages	\$648		\$1,221	
Relocations	\$48		\$72	
Levees & Spillways:				
Federal - Levees 75%	\$7,440		\$3,238	
Non-Federal - Levees 25%	\$2,480		\$1,079	
Berthing	\$5,537		\$11,989	
TOTAL Navigation	\$206,324		\$381,650	
Restoration:				
Federal 75%	\$35,308		\$119,239	
Non-Federal 25%	\$11,769		\$39,746	
TOTAL Restoration	\$47,077		\$158,985	
TOTAL Houston Ship Channel	\$253,401		\$540,635	
Deferred Environmental Restoration for HSC				
Federal 75%	\$75,250		\$125,325	
Non-Federal 25%	\$25,083		\$41,775	
TOTAL Deferred Environmental Restoration	\$100,333		\$167,100	
Barge Lanes - Navigation				
Federal 90%		\$30,779	\$6,402	
Non-Federal 10% (Cash contribution)		\$3,420	\$711	
TOTAL Barge Lanes		\$34,199	\$7,113	
Entrance Channel - Navigation				
Federal – Deep Draft 75%	\$21,578		\$30,689	
Non-Federal – Deep Draft 25%	\$7,193		\$10,230	
U.S. Coast Guard	\$210		\$487	
TOTAL Entrance Channel	\$28,981		\$41,406	
Galveston Channel - Navigation				
Federal – Deep Draft 75%	\$10,541		\$25,986	\$8,459
Non-Federal – Deep Draft 25%	\$3,515		\$8,662	\$2,820
e	\$1,882			
Federal 75%			\$5,811	
Non-Federal 25%			\$1,937	
U.S. Coast Guard	\$14		\$45	
Lands & Damages				
Pipeline Removals (100% Non-Federal)				\$428
TOTAL Galveston Channel	\$15,952		\$42,441	\$11,707
TOTAL Houston-Galveston Navigation Channels	\$398,667	\$34,199	\$798,695	\$11,707

¹The Barge Lanes were an additional authorization; however, there was not an increase to the authorized cost.

Several changes have previously been made to the HGNC project scope since authorization. The project has also received FY 06 and FY 09 Supplemental CG funds for repairs to PAs due to impacts associated with Hurricanes Rita and Ike. Additional project components have also been previously constructed including Red Fish Reef and San Jacinto Erosion Protection Projects.

Each navigation channel has a different Sponsor. The costs for the environmental restoration project are specific to the HSC portion of the HGNC and are shared differently than the costs for the navigation project. Total Project Costs for the HGNC are detailed in Table 6 with corresponding cost share ratios for Federal to non-Federal shown in parenthesis after the description of the purpose (e.g. Deep-Draft (75/25)). The HSC portion and the Galveston Ship Channel (GSC) portion of the HGNC are shown separately in the table.

Environmental restoration for the HGNC is cost shared 75/25. The HGNC was authorized previous to WRDA 1996, in which Section 210(a) established 65/35 cost sharing for environmental protection and restoration. Per WRDA 1996, Section 210(b), the amendments made by Section 210(a) apply only to projects authorized after the date of the enactment of WRDA 1996, therefore, the HGNC cost share for environmental restoration has remained 75/25.

Table 6 - Cost Allocation Table
Total Project Costs by Project Purpose (Authorized Project)
(Fully Funded Estimate 1-Oct 12 Price Level)

Item	Federal Costs	Non-Federal Costs	Total Cost
Ratios below provide percentage of Federal/non-Federal (N-F) cost share			
Port of Houston Authority Items:			
LERRDS	\$0	\$1,293,000	\$1,293,000
General Navigation Features:			
Deep-Draft (75/25 ¹)			
Houston Ship Channel	\$268,451,000	\$89,483,000	\$357,934,000
Entrance Channel	\$30,689,000	\$10,230,000	\$40,919,000
Shallow Draft (90/10 ¹)			
Boater's Cuts	\$3,387,000	\$376,000	\$3,763,000
Barge Lanes	\$6,402,000	\$711,000	\$7,113,000
Environmental Restoration (75/25¹)	\$119,239,000	\$39,746,000	\$158,985,000
Deferred Environmental Restoration (75/25¹)	\$143,487,000	\$47,826,000	\$191,304,000
Port of Galveston Items:			
General Navigation Features: (75/25¹)	\$31,797,000	\$10,599,000	\$42,396,000
Coast Guard: (100%)			
Houston Ship Channel	\$6,671,000		\$6,671,000
Entrance Channel	\$487,000		\$487,000
Galveston Channel	\$45,000		\$45,000
Associated Costs for Berthing (100% N-F)		\$11,989,000	\$11,989,000
Project Total	\$610,647,000	\$212,253,000	\$822,900,000
¹ Cash Contribution			

2.0 PROBLEMS AND OPPORTUNITIES

2.1 Problems

The remaining 2,571 feet of authorized channel in the Galveston Channel Reach is only 40 feet deep, and the local sponsor and facilities at the far end of the Galveston Channel Reach are not able to take full advantage of the 45 feet depth of the remainder of the channel.

The economy of the United States has become increasingly dependent on waterborne transportation for a wide range of manufactured goods and raw material. The 40-foot authorized channel serves Piers 39, 40 and 41, which have historically handled general cargo, and two additional docks that handle liquid sulphur and bulk dry commodities, like barite and cement among other things. While container vessels have not historically been light-loaded, deep-draft vessels carrying bulk dry commodities that are transiting the 40-foot portion of the Galveston Harbor Channel must arrive and depart light-loaded. The vessels carrying bulk commodities in the 45-foot portion are light-loaded in order to utilize facility docks handling cement, barite ore, bio-diesel, and coal, located along the far western end of the 40-foot channel segment.

2.2 Opportunities

There is an opportunity to realize navigation benefits due to the recent addition of portside service facilities utilizing the existing 40-foot channel. This translates to an opportunity to seek the additional authorization needed to extend the limits of the currently authorized 45-foot channel which stops 2,571 feet short of these relatively new facilities.

Deepening the remainder of the channel will allow the facilities at the end of the channel to transport larger volumes of goods with each movement via more fully loaded vessels or deeper draft vessels. This improves productivity by moving cargo faster, safer, and more efficiently with less energy expended and producing less pollution.

3.0 PLAN FORMULATION

3.1 Federal Objective

The Federal Objective of water and related land resources project planning is to contribute to national economic development (NED) consistent with protecting the Nation's environment, pursuant to national environmental statutes, applicable executive orders, and other Federal planning requirements. NED objectives stress increasing the net values of the national output of goods and services and improving economic efficiency on a national level. The plan that reasonably maximizes net benefits is the NED plan.

Federal objectives are designed to assure systematic interdisciplinary planning, assessment, and evaluation of plans addressing natural, cultural, and environmental concerns, which will be responsive to Federal laws and regulations. The following six Federal objectives were included in the consideration and development of alternatives:

(1) *NED*. For all project purposes except ecosystem restoration, the alternative plan that reasonably maximizes net economic benefits consistent with protecting the Nation's environment, the NED plan, shall be selected. The ASA(CW) may grant an exception when there are overriding reasons for selecting another plan based upon other Federal, State, local, and international concerns. The tentatively recommended plan is the NED plan.

(2) *National Ecosystem Restoration (NER)*. For ecosystem restoration projects, a plan that reasonably maximizes ecosystem restoration benefits compared to costs, consistent with the Federal objective, shall be selected. The selected plan must be shown to be cost effective and justified to achieve the desired level of output. This plan shall be identified as the NER plan. Beneficial use was considered in the development of alternatives; however, due to cost and engineering considerations, was eliminated during the final screening of alternatives.

(3) *Combined NED/NER*. Projects, which produce both NED and NER benefits, will result in a "best" recommended plan so that no alternative plan or scale has a higher excess of NED benefits plus NER benefits over total project first costs. This plan shall attempt to maximize the sum of net NED and NER benefits and to offer the best balance between two Federal objectives. Recommendations for multipurpose projects will be based on a combination of NED benefit-cost analysis and NER benefits analysis, including cost effectiveness and incremental cost analysis.

(4) *Effects on Environmental Quality (EQ)*. The EQ account identifies the nonmonetary effects on significant natural and cultural resources (ER 1105-2-100). Environmental considerations associated with these actions include those related to dredging and disposal of dredged material.

(5) *Regional Economic Development (RED)*. The RED account identifies changes in the distribution of regional economic activity. Evaluations of regional effects are to be carried out using nationally consistent projection of income, employment, output, and population (ER 1105-2-100). Federal objectives would allow for a small increase in damages in some areas so long as reduction in damages in other areas is significantly decreased. In the consideration of deep-draft liquid sulphur activities, while sulphur volumes have been quite stable over the last decade or more, there are depth constraints in the Sparkman Channel, leading to the primary destination port in Tampa Bay, Florida. It was determined that should the Sparkman Channel in Tampa Bay, Florida be deepened, that savings attributable to deeper channels at both ends of the sulphur route could result in benefits in Tampa.

(6) *Other Social Effects (OSE)*. The OSE account identifies the plan effects from perspectives that are relevant to the planning process, but are not reflected in the NED/NER, EQ, and RED accounts (ER 1105-2-100). Structural and nonstructural alternatives must reflect close coordination with interested Federal and State agencies and the affected public. The effects of these measures on the environment must be carefully identified and compared with technical, economic, and social considerations and evaluated in light of public input. The proposed project would not have a disproportionate adverse impact on minority or low-income population groups within the project area.

3.2 Planning Objectives

The planning objectives and constraints reflect the reasons for conducting the planning effort. The objectives provide the result that is desired from a project while the constraints tell us what to avoid during the formulation of our plans. The following planning objectives were used in formulation and evaluation of alternative plans:

- Increase deep-draft navigation efficiency for Galveston Harbor Channel over the 50-year period of analysis; and
- Identify an environmentally acceptable project; and
- Maximize benefits over cost for the period of analysis.

3.3 Planning Constraints

Unlike planning objectives which represent the desired positive changes, planning constraints represent restrictions that should not be violated. The following constraints apply to this PACR:

- The study process and plans must comply with Federal and State laws and policies;
- Fish and wildlife habitat affected by a project should be minimized as much as possible and preserved, if possible; and
- Alternative plans that resolve problems in one area should not create or amplify problems in other areas.
- Project depths in excess of 45 feet would not provide additional navigation efficiency benefits as vessels must traverse the adjacent 45-foot authorized channel to reach the study area.

3.4 Plan Formulation Process

The planning objectives and constraints form the basis for subsequent plan formulation, alternative screening and the identification of the Tentatively Recommended Plan. The expected Future Without-Project Condition (synonymous to the “No-Action Plan”) was developed for comparison with other alternatives. Additionally, structural and non-structural alternatives were developed. For the structural plans, a variety of channel depths and dredged material placement alternatives were developed, evaluated and screened.

3.5 Future Without-Project Condition (FWOP)

The without-project condition describes the condition expected to happen in the project area in the future should the no-action alternative be selected. Alternatives are compared to the same without-project condition. For discussion concerning vessel draft distribution see the economic analysis section on Fleet Characteristics.

The No-Action Alternative is the continued maintenance of the existing 40 feet deep by 1,085-foot wide channel segment extending a distance of 2,571 feet between Station 20+000 and Station 22+571 (Figure 5). Maintenance dredging of this section is typically performed every four years to maintain project depth. During each four year maintenance cycle approximately 648,000 cubic yards of material are dredged and placed in the existing, designated upland confined Pelican Island PA. Under the No-Action Alternative deeper draft vessels seeking access to the bulk cargo facilities at the far west end of the channel would continue to be constrained by channel depth and would continue current non-structural practice of light-loading Panamax vessels to access and depart the bulk cargo facilities.

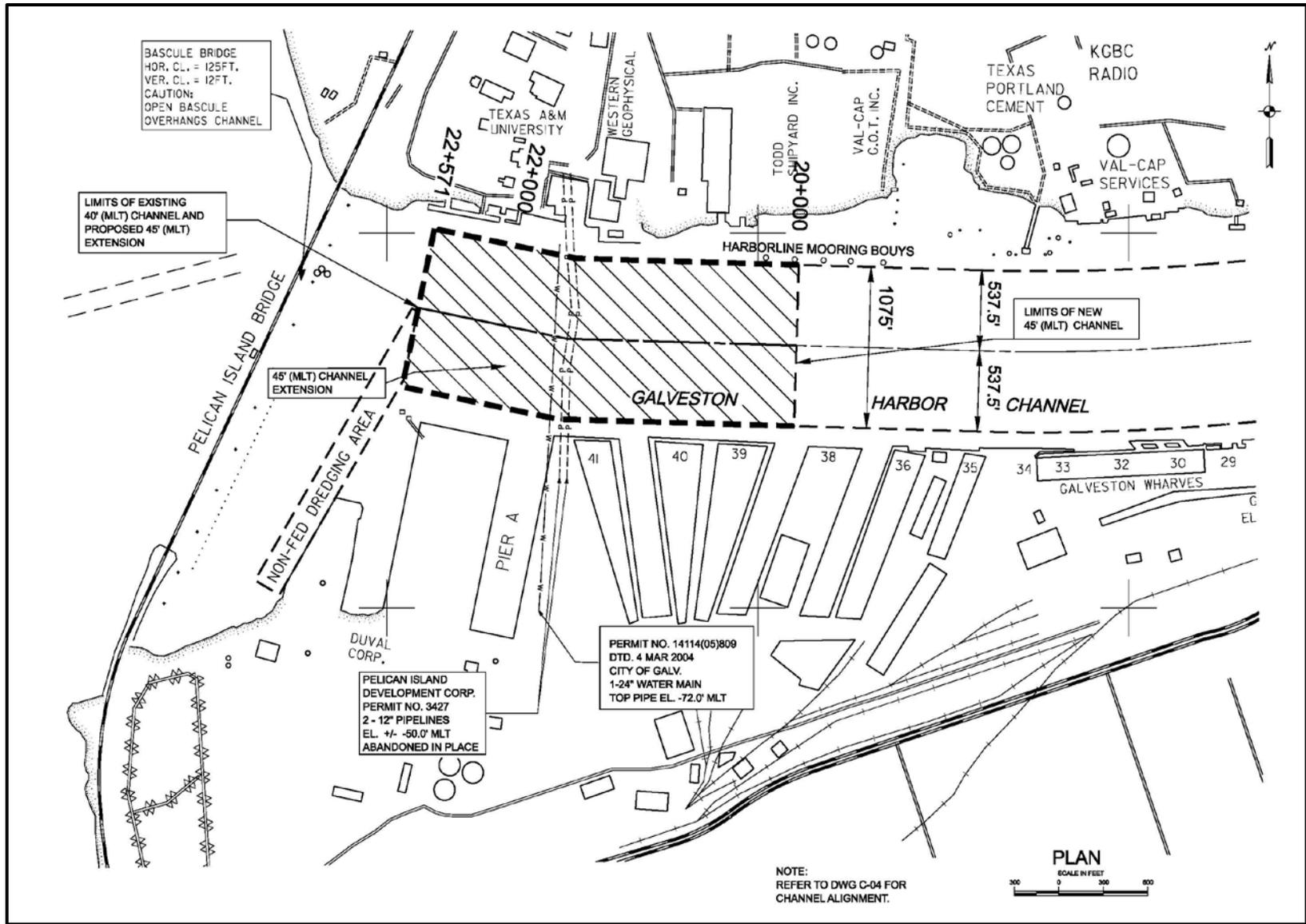


Figure 5 – Location of Proposed Extension within Galveston Harbor Channel

3.6 Structural Alternatives

The following Structural Alternatives were considered:

1. 42 feet Deep Channel;
2. 43 feet Deep Channel;
3. 44 feet Deep Channel; and
4. 45 feet Deep Channel.

Net benefits are still rising at 45 feet; however, as addressed under the Section 3.3 Planning Constraints, project depths in excess of 45 feet would not provide additional navigation efficiency benefits as vessels must traverse the adjacent 45-foot authorized channel to reach the study area. Therefore, depths below 45 feet have not been considered for the extension.

Construction of the 42-, 43-, 44-, and 45-foot channel alternatives would involve dredging the bottom width of the existing channel only. The existing channel width in the extension is 1,085 feet whereas the new bottom width will be 1,075 feet as shown in the Figure 6 typical cross section in Section 5.0 Selected Plan. New work materials as identified in the Engineering Appendix, Section 6.2 consist primarily of stiff to hard high plasticity clays. Project design elements (e.g., channel width, side slopes, advanced maintenance and allowable over-depth), annual maintenance quantities and impacts for all channel deepening alternatives being considered are essentially the same, but the initial new work dredged quantities (inclusive of advance maintenance and allowable overdepth) generated from the construction of each of the alternatives would vary (Table 7).

Table 7 – Initial Dredged Quantities for Channel Alternatives

Channel Alternative	Total Estimated ¹New Work Volume (cubic yards)	New Work Federal Channel Dredge Volume (cubic yards)	²Third-Party Facilities (cubic yards)
42 feet Deep Channel Project	255,100	200,400	54,700
43 feet Deep Channel Project	373,233	304,867	68,367
44 feet Deep Channel Project	491,367	409,333	82,033
45 feet Deep Channel Project	609,500	513,800	95,700

¹New work volume includes quantities for advance maintenance and allowable overdepth.

²The Third-Party Facilities dredged volume is not dredged from the Federal Channel; it is dredging of the Third-Party berth. This is necessary for the Third-Party Facility to benefit from the deepening of the Federal Channel to 45 feet. This work is considered an associated cost used in the BCR and is also considered in the placement area capacity analysis.

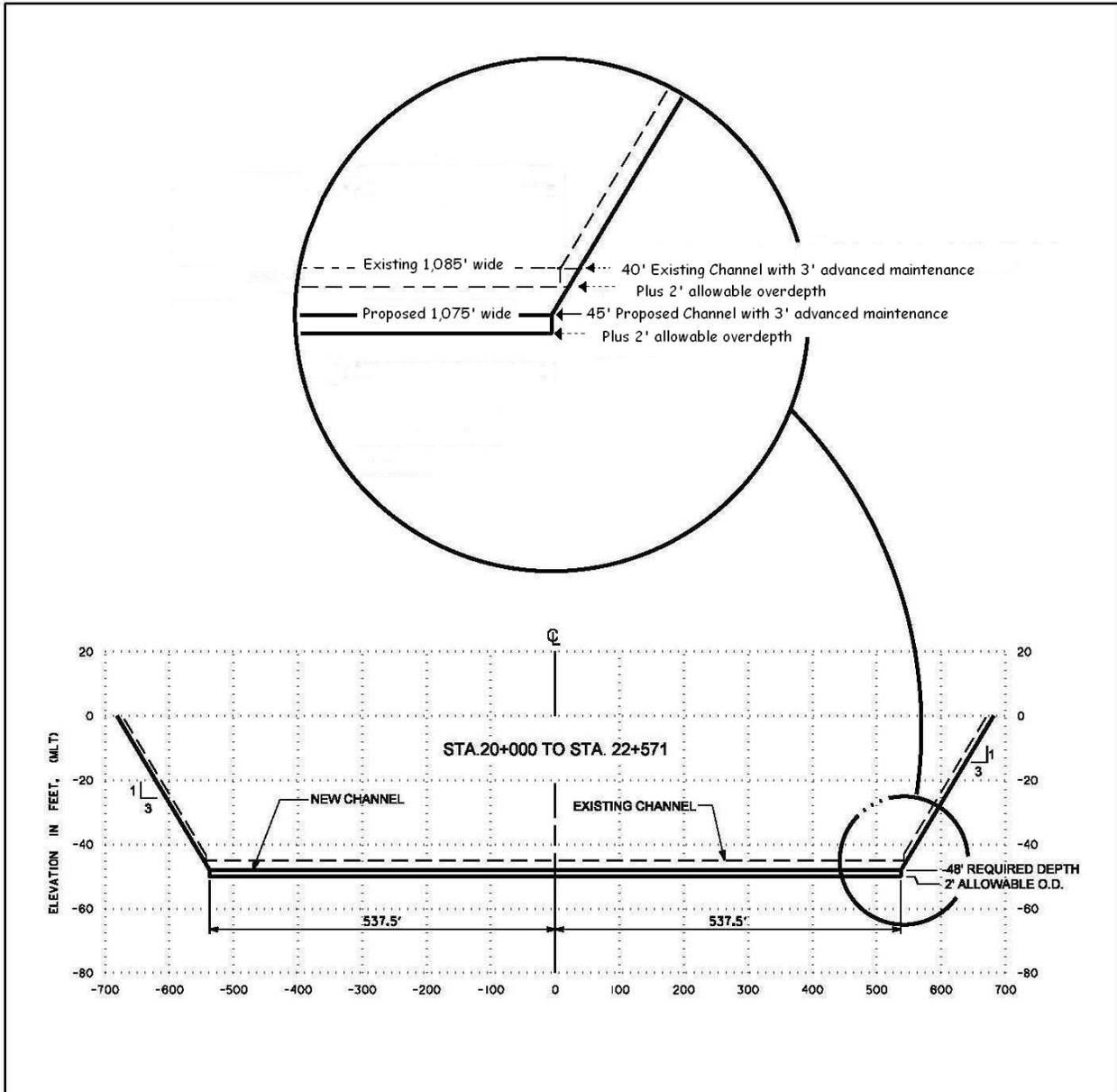


Figure 6 – Typical Cross Section of Proposed Extension within Galveston Harbor Channel

For all channel project alternatives considered, deepening of the channel and future maintenance would be performed using a hydraulic pipeline dredge with channel dimensions matching the new 45-foot project authorized by WRDA 1996. Shoaling rates at the project location were determined to be stable and to be the same as the FWOP and not impacted by any of the proposed channel depths, based upon a long history of maintenance dredging at the site and engineering analysis. Estimated maintenance dredging for each of the proposed channel alternatives would remain at 648,000 cubic yards per dredging cycle or every four years, representing no increase over current maintenance dredging quantities for the existing 40-foot channel.

A hydraulic pipeline dredge would be used to minimize turbidity during initial dredging. Initial dredging would temporarily increase water column turbidity during dredging activities for any of the proposed channel deepening alternatives; however, these are considered minor and are comparable in type and magnitude to those experienced during routine maintenance dredging that occurs for the existing channel template. Typical cut depth of maintenance material would be identical to the new work.

3.7. Dredged Material Placement Alternatives

Several dredged material placement alternatives were considered, including the existing upland confined PA (i.e., Pelican Island PA), a new upland confined PA on Pelican Island, and a new beneficial use site (marsh) located off the west end of Pelican Island (Figure 7). The Engineering Appendix includes more detailed information on the following placement options, including existing soils data and foundation conditions.

3.7.1 Pelican Island PA

The first PA consists of placing new work material into the upland, confined, Pelican Island PA and using the material for raising and repairing levees. Maintenance material from this extension would continue to be placed in the Pelican Island PA. Pelican Island PA is located on the northernmost portion of Pelican Island and north of the Galveston Harbor Channel. The PA is approximately 1,100 acres in size and is currently divided into a three cell disposal system.

3.7.2 New Upland PA on Pelican Island

An 81.76-acre tract, located on the north edge of the Galveston Harbor Channel was explored for consideration as a new dredged material upland confined PA. This placement alternative was dropped from consideration due to the high cost to develop the site compared to the relatively small placement capacity of the completed PA.

3.7.3 Beneficial Use of Dredged Material Alternatives

The third dredged material PA considered beneficially using new work material to create marsh on the west side of Pelican Island. Depending on the channel depth alternative considered, between 200,400 and 513,800 cubic yards of new work dredged material would be generated from dredging the channel and used to create an estimated 48 to 103 acres of open water marsh. This does not include any material from the Third-Party Facilities. Maintenance material from this extension would continue to be placed in the Pelican Island PA consistent with current practice.

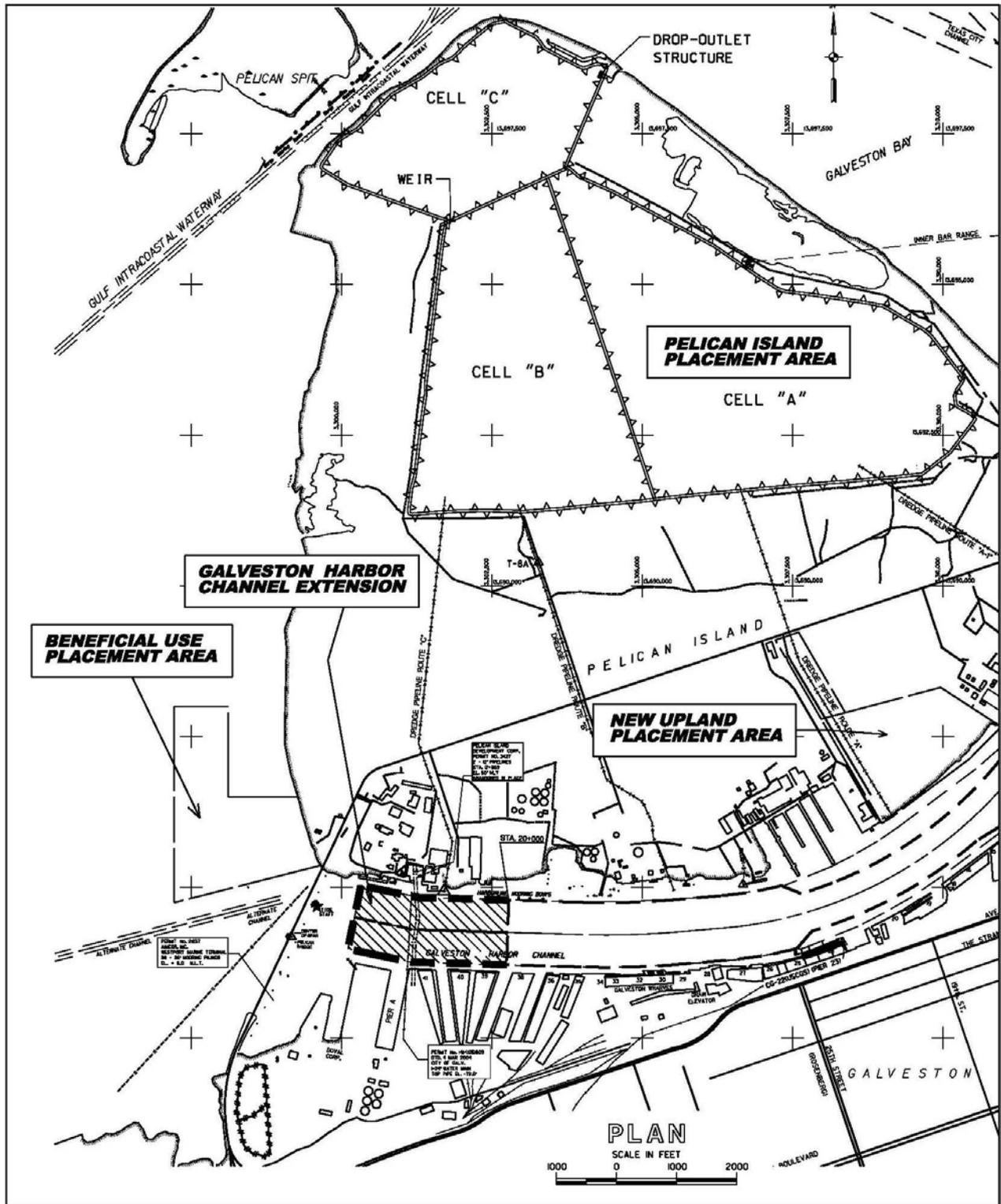


Figure 7 – Dredged Material Placement Alternatives Considered

As discussed in the EA, Section 2, the construction process and design for marsh creation is similar regardless of the beneficial use quantity and corresponding marsh size. Marsh creation would entail mechanically constructing a perimeter levee at an elevation of +7 feet, assuming the average depth to bay bottom along the west side of Pelican Island is around – 4 feet MLT. The perimeter levee would be constructed by excavating borrow material to a depth of –8 feet MLT from bay bottom adjacent to the proposed levee location. The perimeter levee would be armored using a combination of geotextile, blanket stone, and riprap.

The new work material from the construction of the channel deepening project would be pumped into the marsh site, and amphibious equipment would be used to guide the dredge discharge for fairly even placement across the site. As a follow up measure, 5 feet deep circulation channels would be constructed inside the marsh cell. Excavated material from construction of the circulation channels would be placed in the eastern area of marsh near the Pelican Island shoreline. Outlet structures would also be put into place. More detailed information on the Beneficial Use Alternative is available in Section 2.9 Beneficial Use of Dredged Material in the Engineering Appendix. Conceptual Drawing B-02, showing the beneficial use alternative, is also available in that appendix.

3.8 Non-Structural Alternatives

Light-loading of vessels is the only viable non-structural alternative, but is already in use as the without-project condition. Each alternative also assumes some amount of light-loading continues to occur.

4.0 EVALUATION OF CHANNEL AND PLACEMENT ALTERNATIVES

4.1 Screening of Alternatives

The following screening criteria were used in the development and evaluation of possible project alternatives. The Tentatively Recommended Plan should:

- Increase deep-draft navigation efficiency for Galveston Harbor Channel over the 50-year period of analysis; and
- Identify an environmentally acceptable project; and
- Maximize benefits over costs for the period of analysis.

Each alternative¹ was evaluated with respect to the aforementioned criteria (Table 8).

Table 8 - Alternatives Screening Matrix

Channel Alternative¹	Screening Criteria	Increase deep-draft navigation efficiency	Be environmentally acceptable	Maximize Net Benefits
No-Action Alternative (40 feet Deep Channel)			✓	
42 feet Deep Channel Alternative		✓	✓	
43 feet Deep Channel Alternative		✓	✓	
44 feet Deep Channel Alternative		✓	✓	
45 feet Deep Channel Alternative (Tentatively Recommended Plan)		✓	✓	✓

¹The channel width for all alternatives, including the No-Action Alternative, is the existing authorized width of 1,085 feet associated with the currently authorized -40 feet MLT depth of this channel segment.

The No-Action Alternative is considered environmentally acceptable since it would continue to involve only minor temporary impacts to bay bottom experienced during routine maintenance activities. However, deeper draft vessels attempting ingress and egress to the bulk cargo facilities at the far west end of the channel would continue to be constrained by existing channel depth, and would continue current practices of light-loading to access and depart the bulk cargo facilities.

4.2 Increasing Navigation Efficiency

Navigation efficiency is based upon transportation cost savings which produces economic benefits. As detailed in the economic appendix and summarized in Table 9, each alternative produces a transportation cost savings.

Table 9 – Transportation Cost Savings per Ton

Channel Depth	40 feet	41 feet	42 feet	43 feet	44 feet	45 feet
Cost per Ton	\$15.26	\$13.81	\$13.35	\$12.92	\$12.51	\$12.13
Savings per Ton	--	\$1.45	\$1.91	\$2.34	\$2.75	\$3.13

All proposed channel deepening alternatives increased navigation efficiency since deeper channels allow larger volumes of goods to be transported with each vessel movement, as light-loaded vessels can be more fully loaded or smaller vessels are replaced with larger deeper-drafting vessels. As shown in the bottom line, the savings per ton increases from \$1.45 for a 41-foot channel to \$3.13 for a 45-foot channel (Appendix A – Economic Analysis).

Costs, including dredging, placement, relocations, and Operations and Maintenance (O&M) costs for the 50-year period of analysis were estimated from all of the alternatives and compared to the project benefits. Three pipelines are located within the project footprint, none of which require relocation; however, two of the three identified pipelines are inactive and need to be removed and disposed of for all of the alternatives considered. The cost to remove the two inactive pipelines is a non-Federal project cost estimated to be \$428,400. Pipeline costs were included in all alternatives. The third pipeline is located at -72 feet MLT and will not be affected. Based on information provided by locally involved industries along the extension, a one time \$1,439,340 in associated costs (incurred by the third-party portside facilities) for their facilities modifications is included in all alternatives greater than 42 feet. Modifications to their facilities for depths up to 42 feet would not be necessary.

The end user located provided preliminary engineering data for modification of their existing portside facility for a future 45-foot berth depth. The existing waterfront facility includes a tied-back sheet pile bulkhead extending below elevation -42 feet MLT with multiple breasting dolphins spaced along the bulkhead. Berth deepening plans include leaving the existing soil slope to elevation -42 feet MLT in front (berth side) of the sheet pile bulkhead to maintain bulkhead stability. The berth would be dredged inside that slope toe to the required depth to take advantage of increased channel depth. The facility would either install dolphins at the toe of the revised berth template, or use spacer (or camel) barges in conjunction with existing dolphins to space deep draft ocean going vessels away from the bulkhead. In the future, the facility may construct a platform in front of the existing bulkhead or place a weight relieving platform behind

the bulkhead to allow surcharge loads closer to the breasting line. The remaining portside facilities will deepen their berths as necessary should they plan to take advantage of the deepened channel.

The benefit-cost analysis reflects these associated costs. Table 10 displays a summary of the economic analysis and includes benefit-cost ratios (BCRs) and net excess benefits compared to the cost of the proposed project modifications. Only the 45 feet deep channel alternative would accommodate fully-loaded deep-draft vessels traversing the adjacent 45-foot authorized channel ingress and egress of the Port's bulk terminal facilities located at the end of the channel thus maximizing project benefits as shown in Table 10. For discussion concerning underkeel clearance see the economic analysis section on Fleet Characteristics.

Table 10 – Summary of Economic Analysis – Galveston Harbor Channel Extension BCR

Galveston Channel Extension PACR Summary of Economic Analysis												
	42-foot			43-foot			44-foot			45-foot		
	Low	Median	High	Low	Median	High	Low	Median	High	Low	Median	High
Avg Annual Benefits												
Containers	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Sulphur	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Bulk Terminal	\$380,000	\$491,000	\$647,000	\$466,000	\$602,061	\$794,000	\$547,000	\$706,000	\$931,000	\$623,000	\$804,000	\$1,061,000
Total AAB	\$380,000	\$491,000	\$647,000	\$466,000	\$602,061	\$794,000	\$547,000	\$706,000	\$931,000	\$623,000	\$804,000	\$1,061,000
Costs												
Project First Cost		\$7,614,300			\$9,665,180			\$11,410,060			\$13,154,940	
Interest During Construction		\$35,766			\$45,400			\$53,596			\$61,792	
Sub-Total Project Costs		\$7,650,066			\$9,710,580			\$11,463,656			\$13,216,732	
Avg Annual Cost (AAC)		\$341,000			\$432,800			\$511,000			\$589,100	
Incremental O&M		\$0			\$0			\$0			\$0	
Total AAC		\$341,000			\$432,800			\$511,000			\$589,100	
Benefit-Cost Ratio (AAB/AAC)	1.1	1.4	1.9	1.1	1.4	1.8	1.1	1.4	1.8	1.1	1.4	1.8
Net Excess Benefits (AAB-AAC)	\$39,000	\$150,000	\$306,000	\$33,200	\$169,261	\$361,200	\$36,000	\$195,000	\$420,000	\$33,900	\$214,900	\$471,900
Critical Inputs & Assumptions:												
Discount Rate	3.750%											
Period of Analysis, years	50			The costs for the Non-Federal interests to deepen the berths were included as associated costs.								
Design Vessel Draft, feet	46			An additional \$300,000 in associated costs for construction of a weight relieving platform behind Texas International Terminals' bulkhead are included in the 43, 44, and 45 foot draft alternatives.								
Bulk Tonnage, Barite and Cement												
Draft-Constrained Tonnage, 2008, s.t.	192,000			Typically, historical trends would be extrapolated, but there is little history here, so bulk tonnage is based on 2008. Bulk commodity shipments have historically been light-loaded.								
Annual Growth Rate Scenarios				Future growth is expected to be driven by Barite imports, which in turn are driven by drill rig activity. The low growth rate is based on no growth. The median growth rate is based on a compound annual growth rate from 1998-2008 as well as AEO estimates. The high growth rate is assumed to be twice of the median rate.								
Low	0.0%											
Median	1.1%											
High	2.2%											
Sulphur, Avg Annual Tonnage '98-08	1,888,000			Trendline for Galv Sulphur shipments is flat, with some annual variability.								
Sulphur Growth Rate	0%											
Tampa Channel Deepening	Project Year			Sulphur vessel draft is constrained by depth at receiving dock in Tampa. Vessel is limited to 35' draft (with 1' underkeel in 36' channel). If that specific Tampa channel is deepened beyond 40', benefits begin to accrue to sulphur shipments.								
Low	25			Three assumptions were examined for year of deepening.								
Median	12											
High	5			While a share of Tampa deepening costs should be included here, if all sulphur benefits are to be included, due to the probability of Tampa deepening the Sparkman Channel, no benefits or Tampa costs are included.								
Containers	No historical evidence of draft-constrained container vessels in GSC. Would need market study or similar analysis that examines origin-destination of likely commodities. Would also need to examine capacity limits of available dockspace/upland storage. Identify associated costs for uplands and loading/unloading.											

4.3 Environmental Acceptability

Impacts resulting from any of the proposed channel deepening alternatives would involve only minor temporary impacts to bay bottom comparable in type and magnitude to those experienced during routine maintenance that occurs under the FWOP to maintain the existing channel template. Therefore, all proposed channel alternatives are considered environmentally acceptable and no mitigation would be required for any of the alternatives.

Upon examination of project costs and benefits, it was determined that it would be more cost effective to pump the material to Pelican Island PA than to construct an open water marsh, unless USACE could feasibly cost share marsh creation with the local sponsor or other interested entity. Because pumping to Pelican Island PA is the least cost option, beneficial use of the material will not be pursued unless cost sharing is feasible. Economic summary data for the channel alternatives with material beneficially used is included in Table 11. Potential marsh construction costs and cost sharing information for USACE and the local sponsor or other interested entity are found in Table 12.

Table 11 - Summary of Economic Analysis--Galveston Harbor Channel Extension BCR Calculations with Beneficial Use Sites

Galveston Channel Extension PACR												
Summary of Economic Analysis												
	42-foot			43-foot			44-foot			45-foot		
	Low	Median	High	Low	Median	High	Low	Median	High	Low	Median	High
Avg Annual Benefits												
Containers	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Sulphur	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Bulk Terminal	\$380,000	\$491,000	\$647,000	\$466,000	\$602,061	\$794,000	\$547,000	\$706,000	\$931,000	\$623,000	\$804,000	\$1,061,000
Total AAB	\$380,000	\$491,000	\$647,000	\$466,000	\$602,061	\$794,000	\$547,000	\$706,000	\$931,000	\$623,000	\$804,000	\$1,061,000
Costs												
Project First Cost		\$11,373,223			\$14,039,816			\$17,640,466			\$20,973,677	
Interest During Construction		\$143,207			\$176,783			\$222,121			\$264,092	
Sub-Total Project Costs		\$11,516,430			\$14,216,599			\$17,862,587			\$21,237,769	
Avg Annual Cost (AAC)		\$513,300			\$633,700			\$796,200			\$946,700	
Incremental O&M		\$0			\$0			\$0			\$0	
Total AAC		\$513,300			\$633,700			\$796,200			\$946,700	
Benefit-Cost Ratio (AAB/AAC)	0.7	1.0	1.3	0.7	1.0	1.3	0.7	0.9	1.2	0.7	0.8	1.1
Net Excess Benefits (AAB-AAC)	(\$133,300)	(\$22,300)	\$133,700	(\$167,700)	(\$31,639)	\$160,300	(\$249,200)	(\$90,200)	\$134,800	(\$323,700)	(\$142,700)	\$114,300
Critical Inputs & Assumptions:												
Discount Rate	3.750%											
Period of Analysis, years	50			The costs for the Non-Federal interests to deepen the berths were included as associated costs.								
Design Vessel Draft, feet	46			An additional \$300,000 in associated costs for construction of a weight relieving platform behind Texas International Terminals' bulkhead are included in the 43, 44, and 45 foot draft alternatives.								
Bulk Tonnage, Barite and Cement												
Draft-Constrained Tonnage, 2007, s.t.	192,000			Typically, historical trends would be extrapolated, but there is little history here, so bulk tonnage is based on 2008. Bulk commodity shipments have historically been light-loaded.								
Annual Growth Rate Scenarios	Future growth is expected to be driven by Barite imports, which in turn are driven by drill rig activity. The low growth rate is based on no growth. The median growth rate is based on a compound annual growth rate from 1998-2008 as well as AEO estimates. The high growth rate is assumed to be twice of the median rate.											
Low	0.0%											
Median	1.1%											
High	2.2%											
Sulphur, Avg Annual Tonnage '98-08	1,888,000			Trendline for Galv Sulphur shipments is flat, with some annual variability.								
Sulphur Growth Rate	0%											
Tampa Channel Deepening	Project Year			Sulphur vessel draft is constrained by depth at receiving dock in Tampa. Vessel is limited to 35' draft (with 1' underkeel in 36' channel). If that specific Tampa channel is deepened beyond 40', benefits begin to accrue to sulphur shipments.								
Low	25			Three assumptions were examined for year of deepening.								
Median	12											
High	5			While a share of Tampa deepening costs should be included here, if all sulphur benefits are to be included, due to the probability of Tampa deepening the Sparkman Channel, no benefits or Tampa costs are included.								
Containers	No historical evidence of draft-constrained container vessels in GSC. Would need market study or similar analysis that examines origin-destination of likely commodities. Would also need to examine capacity limits of available dockspace/upland storage. Identify associated costs for uplands and loading/unloading.											

Table 12: Galveston Harbor Channel Extension Alternatives, Associated Quantities, Placement, & Costs

		CHANNEL ALTERNATIVES				
		1	2	3	4	5
		No-Action (Continued Maintenance of 40-foot deep channel)	42-foot deep channel	43-foot deep channel	44-foot deep channel	45-foot deep channel (Tentatively Recommended Plan)
New Work Material (cy)		NA	200,400	304,400	409,333	513,800
^a Maintenance Material (cy) 4yr cycle		648,000	648,000	648,000	648,000	648,000
Corresponding Placement Alternative	Upland Confined Placement Area	Pelican Island	Pelican Island	Pelican Island	Pelican Island	Pelican Island
	Marsh Acres – Beneficial Use	NA	48 acres	66 acres	86 acres	103 acres
Average Annual Benefits	Channel Deepening w/ Upland Confined Placement	NA	\$491,000	\$602,061	\$706,000	\$804,000
	Channel Deepening w/ Beneficial Use	NA	\$491,000	\$602,061	\$706,000	\$804,000
Average Annual Costs	Channel Deepening w/ Upland Confined Placement	NA	\$341,000	\$432,800	\$511,000	\$589,100
	Channel Deepening w/ Beneficial Use	NA	\$513,300	\$633,700	\$796,200	\$946,700
Net Excess Benefits	Channel Deepening w/ Upland Confined Placement	NA	\$150,000	\$169,261	\$195,000	\$214,900
	Channel Deepening w/ Beneficial Use	NA	(\$22,300)	(\$31,639)	(\$90,200)	(\$142,700)
^b Additional Cost in Millions the Cost Share Partner would have to provide for Beneficial Use Alternatives.		NA	\$3.8	\$4.3	\$6.2	\$7.8

^aBased on the existing and future shoaling rates at the project location, estimated maintenance dredging for each of the No-Action and proposed channel alternatives would be the same quantity of 648,000 cy every 4 years. Maintenance material from this extension would continue to be placed in the Pelican Island PA consistent with current practice.

^bThe Additional Amount (Millions) the Cost Share Partner would be required to pay for Beneficial Use Plan is determined by taking the Project 1st Cost for Beneficial Use minus the Project 1st Cost of the Tentatively Recommended Plan (see Table 10 and Table 11 - Summary of Economic Analysis).

4.4 Identification of Tentatively Recommended Plan

The 45-foot channel with the utilization of the existing Pelican Island PA reasonably maximizes economic benefits with the planning objectives and constraints, and is environmentally acceptable; as such it is the Tentatively Recommended Plan.

This alternative was evaluated in further detail and refined in Section 5, Selected Plan. In addition, its relationship to the overall HGNC project is described.

5.0 SELECTED PLAN

The identification of the Tentatively Recommended Plan from the various alternatives was based upon economic and environmental factors. The environmental consequences are fully described in Section 4 of the EA. Impacts resulting from any of the proposed deepening alternatives were considered comparable in type and magnitude to those experienced during routine maintenance of the existing channel.

5.1 Project Description

The proposed channel improvements consist of deepening a segment of the existing 40 feet deep by 1,085 feet wide channel to 45 feet, for a distance of 2,571 feet. The deepening will originate near POG Pier-38 at Station 20+000, continue westward towards Pelican Island Bridge and end at Station 22+571. Station 20+000 demarcates the farthest extent of the authorized 45-foot Galveston Harbor Channel. Construction of the project will require the removal of two inactive pipelines. The project limits for the newly constructed 45-foot Galveston Harbor Channel and the Galveston Harbor Channel Extension study area are shown in Figure 5.

Advanced maintenance and allowable over-depth will remain at the current requirement of 3 feet and 2 feet, respectively, such that the maximum channel depth following periodic maintenance would not exceed 50 feet.

The existing 40-foot channel template that was authorized under the Galveston Harbor and Channel, Texas Project has a base width of 1,085 feet. The 45-foot channel bottom width would be 1,075 feet, 10 feet less in width than existing bottom width. Side slopes will be constructed at 1V:3H (1 foot vertical and 3 foot horizontal) as shown in Figure 6. Side slopes will be maintained at 1V:2H.

The Galveston Harbor Channel Extension deepening effort would generate a total of 513,800 cubic yards of new work material (includes advance maintenance and allowable overdepth). No ocean placement would be performed for new work dredged material placement. Engineering Appendix, Section 6.2 identifies new work materials that would be dredged to deepen the channel as consisting primarily of stiff to hard high-plasticity clays. This material would be placed in the upland confined Pelican Island PA (Figure 8), located north of the Galveston Harbor Channel on the northernmost end of Pelican Island. The PA is approximately 1,100 acres in size and is currently divided into a three cell system. For an in-depth description of the Pelican Island PA see Engineering Appendix, Section 6.2.2. The current estimated dredged material capacity in the Pelican Island PA is 40 million cubic yards (MCYs) and is based on an ultimate levee height of + 50 feet MLT as discussed in the 1995 LRR. The required PA capacity for dredged maintenance material after shrinkage, for the remainder of the 50-year period of analysis, is 29.64 MCY, leaving about 10.36 MCY of available capacity. The total new work volume anticipated for placement in the PA from construction of the channel extension, 726,900 CY (581,520 CY after shrinkage), includes 513,800 CY of estimate new work from construction of the extension, 95,700 CY of new work from third-party facilities, plus 102,400 CY of non-pay dredging for the extension and 15,000 CY of non-pay dredging for the third-party facilities. See the Engineering Appendix, Section 2.8 for definitions of the various dredging volumes included in the total new work volume. No incremental increase in shoaling within the Federal channel is anticipated as a result of this project; therefore, Pelican Island PA has more than sufficient remaining capacity to accommodate the new work volume generated by this channel extension.

The dredging cycle of the channel would be defined by the average number of years between the O&M dredging operations for a historical period. Each channel or reach may or may not have its own dredging frequency. The District's Dredging Histories Database, a DOS-based computer program, was utilized to establish the existing shoaling rate and dredging frequency for the newly constructed 45-foot Galveston Harbor Channel. Referencing the 2007 LRR, Engineering Appendix document, an analysis of 24 years of dredging history identified six maintenance dredging cycles with an estimated shoaling rate of 1,425,500 cubic yards per year for the complete 22,571-foot long channel. The newly constructed 45-foot deep channel shoaling rate will be assumed to remain the same as the existing channel; therefore, a linear interpolation of the channel dredging data produces a shoaling rate of approximately 162,000 cubic yards per year for the proposed extension. The dredging frequency will remain the same (four years) as the existing 45-foot channel (Engineering Appendix, Section 2.6).

According to the 1995 LRR, previous estimates made near or prior to 1995 indicate that the make-up of dredged maintenance material from the channel has consisted in the past of approximately 80 percent fine grained materials and approximately 20 percent coarse grained or sandy materials. Only 7,776,000 cubic yards of maintenance material (12 maintenance cycles) is expected over the 50-year period of analysis, the same as is required for the 40-foot channel. No additional maintenance dredged material over and above the historic dredging volumes for the 40-foot channel is anticipated as a result of deepening the channel to 45 feet. All maintenance material would be placed in the existing upland confined Pelican Island PA, consistent with current practices.

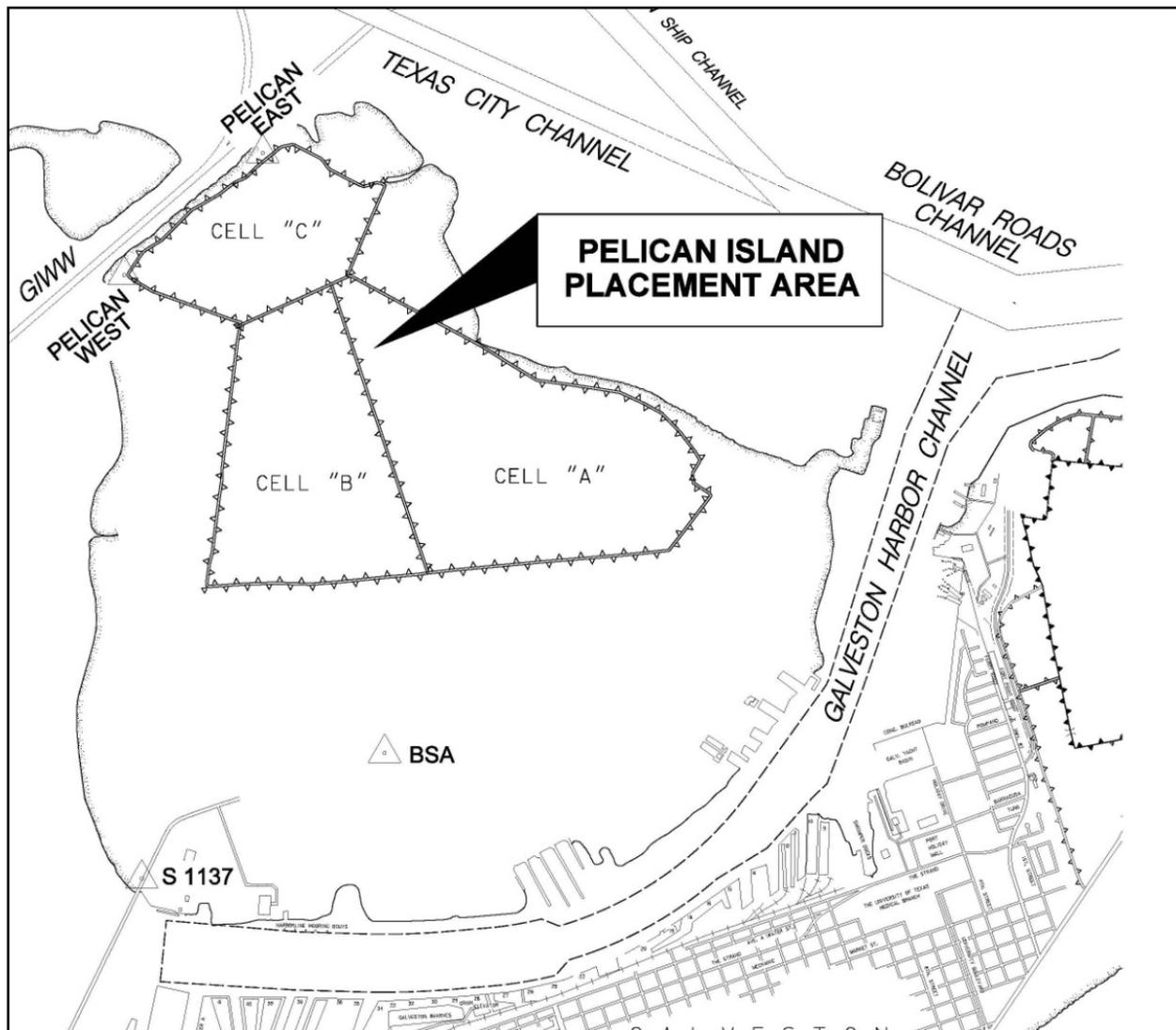


Figure 8 – Pelican Island PA

A hydraulic pipeline dredge would be used to minimize turbidity during initial dredging. Initial dredging would temporarily increase water column turbidity during dredging activities for any of the proposed channel deepening alternatives; however, these are considered minor and are comparable in type and magnitude to those experienced during routine maintenance dredging that occurs for the existing channel template. Typical cut depth of maintenance material would be identical to the new work. For O&M dredging, standard operating procedures employ a pipeline dredge.

Past NEPA documentation and coordination for the adjacent 45-foot channel identified impacts to bay bottom (benthic habitat) as minor and temporary and required no mitigation. Deepening the extension involves deepening only 2,571 linear feet of channel to match the bottom depth of the recently constructed 45-foot channel. No oyster reef is present in the extension and as such, no mitigation would be required for any of the proposed deepening alternatives. For more detailed information see the EA.

5.2 Changes in Project Purpose

There is no proposed change in project purpose. The HGNC is a multipurpose project. The two project purposes are to provide navigation improvements to the ports of Houston and Galveston, and to provide environmental restoration for the HSC portion of the HGNC through the beneficial uses of dredged material. Restoration objectives are to use cost-effective engineering measures to help restore significant resources in the Galveston Bay system that may have been degraded by previous navigation improvements.

5.3 Changes in Scope of Authorized Project

The percent change in scope when comparing the approximate 305,544 feet of channel length authorized under the HGNC and the approximate 2,571 feet of Galveston Harbor Channel Extension proposed for deepening shows a percent increase of 0.84 percent over the 1996 authorization.

A relatively small volume of new work material, about 513,800 cubic yards, would be dredged to deepen the Galveston Harbor Channel Extension to 45 feet. The total quantity of additional dredged material from the extension is small, compared with the 71,275,000 cubic yards required for deepening the rest of the Galveston Channel Reach. Therefore, the new work material from the extension would be placed into the existing Pelican Island PA identified for the Galveston portion of the HGNC and no new PAs would be necessary.

This is considered a benefit to the project as this new work material is highly suitable for construction and would be used to raise levees in the future as presented in the 1995 LRR 50-Year Maintenance Plan and as described in Section 6.2.2 of the Engineering Appendix for this PACR. The existing PA has sufficient future capacity for the 45-foot project maintenance, and the relatively small amount of additional material from construction and maintenance of the extension. The existing channel utilizes a 3-foot advanced maintenance depth and 2-foot allowable over-depth. The extension would continue to allow the same advanced maintenance and allowable over-depth after it is deepened (Appendix B - Engineering Appendix).

5.4 Changes in Local Cooperation Requirements

Required changes to the Project Cooperation Agreement (PCA) center around the project's authorization, the description of the project, and the projects costs. Additional Congressional authorization to allow for the modification of the existing HGNC would be required in order to deepen the Galveston Harbor Channel Extension. Cost sharing for the HGNC and other local requirements would be the same for the extension as for the main channel. As such, the primary amendments to the PCA would be to include the new authorization, adding the Galveston Harbor Channel Extension as a general navigation feature (GNF) and the adjustment of project costs.

5.5 Changes in Location of Project

The Galveston Harbor Channel Extension project would involve deepening a portion of the Galveston Harbor Channel that is currently authorized and maintained at 40 feet deep. However, because the segment was not in the 1995 LRR and subsequent authorization under WRDA 96, this would be considered a change of location (extension) of the Project.

The change in location of the project is directly adjacent to the HGNC project. All dredged material resulting from the deepening would be placed in the existing Pelican Island PA. No additional land acquisition is required.

5.6 Design Changes

The proposed channel center alignment extends westward from Station 20+000 to the end of the existing 40-foot channel at Station 22+571. This portion of channel would be constructed to match the design of the adjacent newly constructed 45-foot channel with channel side slopes at 1V:3H, and bottom width of 1,075 feet.

5.7 Changes in Total Project First Costs

The costs from the certified TPCS dated July, 23 2012 (see Appendix B) were updated to October 2012 price levels. The Total Project Cost (October 2012 price levels) for this PACR estimates the project first cost (constant dollar cost) of the Galveston Harbor Channel Extension Project at \$11,707,409. The fully funded (total project cost) project estimate, including contingencies and escalation to midpoint of construction (FY14, 1st quarter), is \$12,243,060. The study expenditures are not included in that figure. The overall project costs for the HGNC is \$822,900,000, including inflation and contingency with October 1, 2012, price levels. This increase reflects an approximate 1.5 percent project cost increase for the HGNC.

New authorization is required for this PACR. The project first cost (1 October 2012 price level) of \$11,707,409 for the approximately half mile long project would serve as the basis for any future 902 limit calculations if authorized as a separable element. However, if the extension is authorized as part of the HGNC reauthorization, the extension cost would be added to the overall HGNC project as part of the separate 902 Limit Report currently being prepared.

5.8 Changes in Project Benefits

The existing HGNC project benefits result from navigation improvements and environmental restoration improvements. Navigation benefits associated with the various deepening and widening alternatives were derived from reductions in vessel transportation costs, reductions in vessel delays, and reductions in vessel casualties. The proposed deepening of the channel from Station 20+000 to 22+571 will provide navigation improvements to the facilities at the end of the channel by providing the additional depth to allow these users to benefit from the adjacent 45-foot channel described in the 1995 LRR and reduce transportation costs realized through the more efficient loading of vessels on a per trip basis. Table 13 shows the Average Annual Benefits for the HGNC 1995 LRR and the recommended project.

Table 13 – Average Annual Benefits

HGNC 1995 LRR Average Annual Benefits (October 1994 prices, 7.75% interest),	Galveston Harbor Channel Extension PACR (only) Average Annual Benefits (October 2012 prices, 3.750% interest)
\$87,232,000	\$804,000

There will be some slight overall increase in the cost of the project due to the one time construction cost of deepening the extension; however, overall there is expected to be a positive change in project benefits with the deepening of the extension.

5.9 Benefit-Cost Ratio

The BCR for the HGNC project and the recommended project is shown in Table 14.

Table 14 – Benefit-Cost Ratio (BCR)

HGNC 1995 LRR (October 1994 prices, 7.75% interest),	HGNC - Galveston Channel Project 2007 LRR; updated economics on Galveston Portion October 2006 prices, 4.875% interest	Galveston Harbor Channel Extension PACR (only) (October 2012 prices, 3.750% interest)	Galveston Harbor Channel Extension PACR (only) (October 2012 prices, 7.0% interest)
BCR: 2.3	BCR: 2.3	BCR: 1.4	BCR: 0.8

The 2007 LRR updated economics for the Galveston Channel Project portion of the HGNC and showed a BCR of 2.3 using October 2006 prices and 4.875 percent interest.

The BCR for the Tentatively Recommended Plan is 1.4. The benefits for the recommended project were calculated for a 50-year period of analysis using FY 2013 Federal Discount rate of 3.750 percent and the deep-draft vessel operating costs contained in the Economic Guidance Memorandum (EGM 11-05). The BCR was also calculated at a value of 0.8 using a 7.0 percent interest rate.

5.10 Cost Apportionment

Initial construction for the project deepening from 40 feet to 45 feet would be apportioned 75 percent Federal and 25 percent non-Federal with POG, the Sponsor for the GSC portion of the HGNC. Project First Costs for the recommended project are detailed in Table 15. Upon completion of construction the local sponsor must provide an additional cash contribution equal to 10 percent of GNF costs. The costs may be paid over a period not exceeding 30 years. The sponsor’s costs for Land, Easements, Rights-Of-Way, and Relocation (LERR) are credited against the additional cash contribution. New aids to navigation are not required for this extension.

Table 15 – Tentatively Recommended Plan - First Costs Allocation
(Price Level October 2012)

Costs Allocated to 45-foot Depth				
	Total Costs	Federal Share (75% of 45-foot Costs)	Non-Federal Share (25% of 45-foot Costs)	***Non-Federal 100% Cost
General Navigation Features				
Lands – Federal	\$0	\$0	\$0	
Navigation	\$9,046,380	\$6,784,785	\$2,261,595	
Engineering and Design	\$1,333,871	\$1,000,403	\$333,468	
Construction Management	\$898,758	\$674,069	\$224,690	
Pipeline Removals	\$428,400			\$428,400
*Total Project First Costs	\$11,707,409	\$8,459,257	\$2,819,752	\$428,400
**Associated Non-Federal Costs (owner cost)				
Third-party Portside Facility (includes \$300,000 weight relieving platform & \$1,139,340 to dredge berths)	\$1,439,340			\$1,439,340
With Associated Non-Federal Costs Added	\$13,146,749	\$8,459,257	\$2,819,752	\$1,867,740

*TPCS includes a 20 percent contingency

**TPCS does not include \$1,439,340 for third-party Portside Facility.

***Non-Federal Project First Costs are the sum of \$2,819,752 and \$428,400 for a total of \$3,248,152.

In reference to cost sharing purposes the recommended plan would be authorized at 45 feet deep and therefore does not meet the definition for a deep-draft project as defined by Section 214 (1) of WRDA 86. Section 101(a)(4) of WRDA 86 states that the non-Federal Sponsor "...shall perform or assure performance of all relocations of utilities necessary to carry out the project, except in the case of a project for a deep-draft harbor and in the case of a project constructed by non-Federal interest under Section 204..." neither exception of which apply in this instance. Consequently, pipeline relocation costs will be borne 100 percent by the non-Federal sponsor (see Real Estate Plan, Appendix D).

5.11 Environmental Considerations in Recommended Changes

A Draft EA has been prepared that addresses the environmental effects of the recommended changes to the Galveston Harbor Channel Extension included in this PACR. Environmental impacts resulting from deepening the 40-foot channel to 45 feet are expected to be negligible because construction will occur within the existing project footprint and an existing PA will be used. For a detailed discussion of the environmental effects of these recommended changes, please refer to Section 4.0 of the Draft EA. Summary points of the environmental effects discussed in the Draft EA are included in the following paragraphs.

The environmental review of the recommended modifications included consideration of impacts to sea level rise, vegetation, wildlife, aquatic resources including Essential Fish Habitat (EFH), threatened and endangered species and proposed piping plover critical habitat, cultural resources, socioeconomic resources, Environmental Justice, Prime and Unique Farmlands, Hazardous, Toxic, and Radioactive Wastes, air, noise, water quality, as well as alternative courses of action and cumulative impacts.

The deepening of Galveston Harbor Channel Extension would have negligible impacts to very low quality bay bottom habitat comparable in type and magnitude to those experienced during routine maintenance that occurs for the existing channel template. No special aquatic sites, including wetlands, would be impacted. Therefore, no mitigation would be required for this project. Only minor, temporary increases in turbidity, noise and navigation traffic are anticipated. However, such effects would not be “new”, but would be among the cyclical recurring impacts that occur during maintenance of the channel. All affected resources are expected to recover to pre-project conditions after the work is completed. The proposed project is expected to contribute beneficially to navigation efficiency and is not expected to contribute negative cumulative impacts to the area.

The proposed project was found to be compliant with the Endangered Species Act, Clean Air Act, Clean Water Act, EFH, the Texas Coastal Management Plan (TCMP) and other relevant laws and executive orders as discussed in Section 7.0 of the Draft EA.

5.12 Public Involvement

Coordination has been limited to the end users of the channel (POG, Texas International Terminals, and the Gulf Sulphur Services). The public will have an opportunity to comment on the project during the 30-day public review of the PACR/EA document. Any comments submitted during that process will be considered and addressed. The Galveston Harbor Channel

Extension Project is very limited in scope, non-controversial, and affects only previously deepened and regularly maintained channel.

6.0 FEDERAL AND NON-FEDERAL RESPONSIBILITIES

By an agreement dated June 21, 2007, the Government and the non-Federal Sponsor agreed to cooperate in the modification of the GSC portion of the Galveston Harbor and Channels, Texas Projects of the HGNC. The proposed work is not within the provisions of the existing agreement, thus modification of the PCA will be necessary. Cost sharing of the \$11,707,409 will be 75 percent Federal and 25 percent non-Federal.

7.0 SUMMARY AND CONCLUSIONS

For the purpose of calculating the Section 902 limit, the total estimated first cost of the project at FY 13 price levels (1 October 2012) is: \$11,707,409, including an estimated Federal share of \$8,459,257; and an estimated non-Federal share of \$3,248,152.

The results of the economic analysis in Appendix A show that there is an economically rational justification to deepen the Galveston Channel to 45 feet through the reach presently authorized to 40 feet. Volume continues to increase at the bulk terminal for minerals used in oil and gas exploration and a significant share (68 percent) of this volume is constrained by the current channel depth.

Construction of the 45-foot channel from Station 20+000 to Station 22+571 would provide the navigable depths to the facilities at the end of the channel and allow these users to benefit from the adjacent 45-foot channel and reduce transportation costs realized through the more efficient loading of vessels on a per trip basis. All basic features of the project remain the same. The addition of the 2,571 feet of deepened channel does not add or delete any project purpose.

The total project first cost for construction of the extension is approximately \$11,707,409. The navigation improvements have an average annual cost of \$589,100 and average annual benefits of \$804,000 and a BCR of 1.4.

These recommendations are made with the provision that Congressional Authorization be obtained and that prior to implementation of the recommended improvements, the Federal Government and the non-Federal sponsor (POG) would modify the PCA.

8.0 RECOMMENDATIONS

It is recommended that the existing project for HGNC, authorized by WRDA 1996 and Energy and Water Development Appropriations Act of 2001, be modified generally as described in this report as the Tentatively Recommended Plan. Such modifications as in the discretion of the Chief of Engineers may be advisable, and subject to cost-sharing and financing arrangements satisfactory to the President and the Congress, to provide deep-draft channel improvements to the Port of Galveston from the extension and continued maintenance of a portion of the Galveston Harbor Channel.

Since this PACR is for new additional authorization and the newly authorized costs would serve as the basis for any future 902 calculation a 902 analysis for this piece is not necessary, as such the 902 limit is the cost of this project.

For the purpose of calculating the Section 902 Limit for the extension the total estimated first cost of the project at October 2012 price levels is (a) \$11,707,409, including an estimated 75 percent Federal share of (b) \$8,459,257, and an estimated 25 percent non-Federal share of (c) \$2,819,752.

- (a) Includes only GNF costs (\$11,279,009) plus LERR value (\$428,400).
- (b) Includes only the Government's percentage share of GNF costs (\$8,459,257).
- (c) Includes only the non-Federal sponsors 100 percent share of GNF costs (i.e., not the extra 10 percent payment amount) (\$2,819,752) plus LERR value (\$428,400).

All of the GNF project costs and associated costs are included in the BCR calculation. Total average annual costs for the project are \$589,100 for construction. There are no additional O&M costs over the existing project. Fully Funded Cost of the project, which includes Project Costs and expected escalation totals, is \$12,243,060.

It is further recommended that this cost ultimately be added to the HGNC project cost as part of the proposed reauthorization of the HGNC currently being addressed under a separate report, which addresses the HGNC 902 Limit.

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

The non-Federal sponsor, prior to implementation, shall agree, through the amendment to the PPA, to perform items of project partnership which may include, if applicable, the following:

- a. Provide 25 percent of the total cost of construction of the GNFs attributable to dredging to 45 feet. Provide 25 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;
- b. Provide, during the first year of construction, any additional funds necessary to pay the full non-Federal share of design costs allocated by the Government to commercial navigation;
- c. Provide all lands, easement, and rights-of-way (LER), including those necessary for the borrowing of material and disposal 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;
- d. 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 LER and relocations, 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 LER, and relocations, including utility relocations, provided by the non-Federal sponsor equals or exceeds 10 percent of the total cost of construction of the GNFs, the non-Federal sponsor shall not be required to make any contribution under this paragraph, nor shall it be entitled to any refund for the value of LER and relocations, including utility relocations, in excess of 10 percent of the total costs of construction of the GNFs;
- e. 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 Government;
- f. Provide 50 percent of the excess cost of operation and maintenance of the project over that cost which the Government determines would be incurred for operation and maintenance if the project had a depth of 45 feet;
- g. Give the 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;

- h. Hold and save the United States free from all damages arising from the construction or operation and maintenance of the project, any betterments, and the local service facilities, except for damages due to the fault or negligence of the United States or its contractors:
- i. 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 C.F.R., Section 33.20;
- j. 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 U.S.C. 9601–9675, that may exist in, on, or under LER that the Government determines to be necessary for the construction or operation and maintenance of the GNFs. However, for lands, easements, or rights-of-way that the Government determines to be subject to the navigation servitude, only the Government shall perform such investigations unless the 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;
- k. Assume complete financial responsibility, as between the Government and the non-Federal sponsor, for all necessary cleanup and response costs of any hazardous substances regulated under CERCLA that are located in, on, or under LERR that the Government determines to be necessary for the construction or operation and maintenance of the project;
- l. To the maximum extent practicable, perform its obligations in a manner that will not cause liability to arise under CERCLA;
- m. Comply with Section 221 of P.L. 91-611, Flood Control Act of 1970, as amended, (42 U.S.C. 1962d-5b) and Section 101(e) of the WRDA 86, Public Law 99-662, as amended, (33 U.S.C. 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 Sponsor has entered into a written agreement to furnish its required cooperation for the project or separable element;

- n. Comply with the applicable provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, P.L. 91-646, as amended, (42 U.S.C. 4601-4655) and the Uniform Regulations contained in 49 C.F.R. 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;
- o. Comply with all applicable Federal and State laws and regulations, including, but not limited to: Section 601 of the Civil Rights Act of 1964, P.L. 88-352 (42 U.S.C. 2000d), and Department of Defense Directive 5500.11 issued pursuant thereto; 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 U.S.C. 3141-3148 and 40 U.S.C. 3701-3708 (revising, codifying and enacting without substantive change the provisions of the Davis-Bacon Act (formerly 40 U.S.C. 276a et seq.), the Contract Work Hours and Safety Standards Act (formerly 40 U.S.C. 327 et seq.), and the Copeland Anti-Kickback Act (formerly 40 U.S.C. 276c));
- p. 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 one percent of the total amount authorized to be appropriated for the project; and
- q. Not use funds from other Federal programs, including any non-Federal contribution required as a matching share therefore, to meet any of the non-Federal 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 four months 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 that have accumulated in the channels at the time that “before dredging” profiles are taken for construction payment shall be considered as new work material and cost-shared according to the new cooperation agreement. Any dredging in a construction contract reach after the improvements have been completed and the construction contract closed will be considered to be maintenance material and cost-shared according to the new agreement.

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.

Date

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