

areas. Additional survey will be required if new offshore placement or BU areas are proposed by the study.

4) Both the terrestrial and marine surveys will be sufficient to make determinations of potential National Register eligibility of cultural resources.

5) USACE cultural resource staff will visit the study area, produce the survey plans, coordinate proposed investigations with the State Historic Preservation Officer, coordinate the survey and review the survey report. Estimated staff effort to accomplish these tasks is 15 staff days with 2 staff days for site visits.

Final Plan Formulation

If properties potentially eligible for the National Register are identified in project impact areas and project plans cannot be changed to avoid impacting the properties, a Government contractor will perform a National Register assessment during final plan formulation. The terrestrial National Register assessment cost is estimated at \$35,000. USACE cultural resource staff will draft the scope of work, coordinate the work with the SHPO, prepare documents for award of the contract, monitor the fieldwork and review the technical report. If shipwrecks or anomalies potentially eligible for the National Register are identified in areas to be impacted by a recommended plan associated with any of the proposed options, a Government contractor will perform National Register assessments which involve close-order survey and diving. The likelihood for the presence of shipwrecks with National Register significance is high based on historic use of the area during the Mexican-American and Civil Wars. Assessment plans will be developed by USACE cultural resource staff in consultation with the SHPO. USACE cultural resource staff will develop a close-order survey assessment plan, coordinate the scope of work with the SHPO, monitor the fieldwork and review the technical report. The close-order contract cost is estimated at \$90,000 based upon the assumption that 6 anomalies will require close-order survey. Furthermore, it is also assumed that the close-order survey will recommend diving assessments of two potentially significant anomalies. USACE cultural resource staff will produce the diving assessment plans, coordinate proposed investigations with the SHPO, prepare the scope of work and contracts, monitor the contractor's work, and review the technical report. Estimated staff effort to accomplish these tasks is 15 staff days.

No activities or costs are currently included for historic properties mitigation in the PMP. These will be added in future revisions of the PMP if it is determined that properties eligible for the National Register will be adversely affected by the proposed project. In the case that mitigation is required, USACE cultural resource staff will prepare a mitigation plan for adversely affected properties, prepare a draft Memorandum of Agreement (MOA) specifying requirements of the mitigation plan, and coordinate the plan with the SHPO, the Advisory Council on Historic Preservation (ACHP), Native American tribes, the sponsor and other interested parties. The actual mitigation activities would take place after project authorization. No estimate for the cost of preparing a mitigation plan, MOA preparation and coordination, or a mitigation contract is included in the PMP at this time.

USACE cultural resource staff will compose the historic resource impact section of the associated NEPA document based on the impacts to historic properties associated with the selected alternative. A summary of coordination with state and Federal agencies and Native

American tribes will be included along with comments and recommendations from those agencies.

Historic Properties	Days	Cost
Initial Plan Formulation		
Historic/Archival Research	7	\$ 7,000
Plan Formulation		
Survey Task Order (Terrestrial)	Contract	55,000
Survey Task Order (Marine)	Contract	60,000
Survey Coordination & Product Review	15	15,000
Travel	2	2,000
Final Plan Formulation		
NR Assessment, Coordination & Product Review	15	15,000
NR Assessment Task Order (Terrestrial)	Contract	35,000
Marine Close-Order/Dive Assessment Task Order	Contract	90,000
Report Preparation and Approval		
NEPA Document - Historic Properties Section	5	5,000
Total		\$284,000

HYDROLOGY

There is great public and environmental resource agency concern regarding any proposed project that would impact on the Laguna Madre ecosystem. Enlarging the navigation channel may cause changes to water circulation patterns, salinity and sediment transport which may affect critical shellfish nursery and other sensitive habitats at the lower segment of the Laguna Madre.

To address these questions about salinity and circulation, a hydrodynamic/salinity and conservative mass transport model will be used to study potential changes in the channel and shallower estuary. These changes will be shown on maps and discussed as average annual and seasonal changes at selected locations in the estuarine system. Changes under various saltwater inflow conditions will be included. Model parameters will be determined after consultation with technical experts at Engineering Research and Development Center (ERDC) and the resource agencies. Environmental Section costs are for data collection and support for model development. Specific activities and costs regarding these models are discussed in the Engineering Studies section of this document.

The Feasibility Report and EIS will discuss circulation and sediment transport changes in the Laguna Madre system that may result from confined, upland placement and beneficial placement of dredged new work and maintenance material based on the results of hydrodynamic model studies. The before and after project changes in bay circulation will be displayed on maps. Circulation and sediment transport impacts will be discussed and used in preparing a DMMP and predicting impacts to marine resources.

Costs for preparing baseline and impacts sections on hydrology for the EIS are captured in the contract costs for Baseline Environmental Studies and EIS Preparation located under the

appropriate plan formulation phase of the section entitled NEPA Document Preparation and Plan Formulation.

Hydrology Studies	Days	Cost
Initial Plan Formulation		
Baseline Collection for Hydrodynamic/Salinity Model	10	\$ 10,000
Plan Formulation		
Hydrodynamic/Salinity Model - support & report review	10	10,000
Review Impact Sections Draft EIS	2	2,000
Final Plan Formulation		
Review Impact Sections Draft EIS	2	2,000
Report Preparation and Approval		
Review Impacts Sections for Final EIS	2	\$2,000
Total		\$26,000

HAZARDOUS, TOXIC, AND RADIOACTIVE WASTE (HTRW)

USACE staff would complete a reconnaissance level HTRW assessment during the feasibility study phase. Potential sources of contamination and releases identified during investigations would include existing industry located along the Brazos Island Harbor Channel. Due to the potential for unregulated releases of hazardous materials into the project area or the discovery of new sources, the project area will be investigated and information on existing and potential HTRW sites will be recorded. A Corps contractor would be utilized to investigate the project area. In-house efforts will include contract preparation and management, project area site visits, coordination with regulatory and local personnel, and generation of appropriate reports.

Costs for preparing HTRW baseline and impacts sections of the EIS are captured in the contract costs for Baseline Environmental Studies and EIS Preparation located under the appropriate plan formulation phase of the section entitled NEPA Document Preparation and Plan Formulation.

HTRW	Days	Cost
Initial Plan Formulation		
Review Baseline Data	2	\$2,000
Plan Formulation		
Review Draft HTRW Impact Assessment	2	2,000
Final Plan Formulation		
Review Draft HTRW Impact Assessment	2	2,000

Total

\$7,000

WATER AND SEDIMENT QUALITY

An evaluation of potential impacts to sediment and water quality from channel enlargement and placement will be prepared. Dredged material placement plans to be considered include beneficial uses of dredged material, placing material dredged from the entrance channel into an offshore site, and placing the material dredged from the channel into existing upland placement areas. These plans will be used to determine the recommended placement plan, which may consist of a combination of upland, open water, and offshore placement.

Sediment and water quality impacts will be evaluated using, in part, available information from the maintenance dredging program. Water, sediment and elutriate data from 1998 and 2000 are available for the entrance channel to the turning basin. No water or sediment quality issues were found in the 2003 analysis and none are anticipated for this feasibility study. However, some data gaps occur these data and some areas of the proposed alternatives involve areas that have not been previously investigated. Therefore, it is assumed that a contract will be required to collect water and sediment quality data.

The contract estimate is based on sampling 18 sites inshore from Station 0+00 to the turning basin (approximately 1 sample every 5,000 feet), and an estimated 10 sites offshore. An additional four (4) samples will be duplicated in areas previously sampled to validate existing data. It is assumed that no "hot spots" will be found and that bioassay/bioaccumulation studies will not be necessary.

Existing water and sediment quality shall be described for the project area based on all available data, previous research and the results of the physical and chemical analyses; principle sources of municipal or industrial pollution in the project area to be affected will be discussed. Based on this data, an evaluation of water and sediment quality and impacts will be conducted in sufficient detail to allow the selection of placement sites for the discharge of dredged material as required by Section 404(b)(1) of the Clean Water Act. The discussion will also provide information to be used in obtaining new EPA site designation or for enlargement of existing offshore placement sites as required under Section 103 of the Marine Protection, Research, and Sanctuaries Act of 1972 (Ocean Dumping Act). Designation of new Ocean Dredged Material Disposal Sites (ODMDS) in the Gulf of Mexico, if needed, for construction and maintenance of the channel extension will require field studies and extensive coordination with the Environmental Protection Agency.

Corps contractors will be utilized to conduct sediment sampling and analysis. Corps in-house efforts will include preparing scopes of work, managing the contract, conducting site visits, coordinating with regulatory and local personnel, reviewing documentation and preparing the documentation for the Feasibility Report and EIS. Costs for preparing baseline and impacts

sections of the EIS related to water and sediment quality are captured in the contract costs for Baseline Environmental Studies and EIS Preparation located under the appropriate plan formulation phase of the section entitled NEPA Document Preparation and Plan Formulation.

Water & Sediment Quality	Days	Cost
<i>Initial Plan Formulation</i>		
Contract support & baseline data review	2	\$2,000
Coordination with EPA	3	3,000
<i>Plan Formulation</i>		
Water & Sediment Sampling & Analysis	Contract	100,000
ODMDS Testing & Appendix	Contract	150,000
Contract support & report review	2	2,000
<i>Final Plan Formulation</i>		
Review Section 404(b)(1) Analysis Appendix	2	2,000
Review ODMDS EIS Appendix	2	2,000
Coordinate ODMDS Appendix with EPA	2	2,000
<i>Report Writing and Processing</i>		
Respond to EPA's Comments on Draft ODMDS Appendix	3	3,000
Total		\$266,000

CUMULATIVE IMPACTS ASSESSMENT

A cumulative impact evaluation will be prepared which emphasizes how the selected plan will compensate for past, present and reasonably foreseeable future impacts to the ecosystem. Historical maps, literature and other records will be searched for information on past changes in estuarine and water salinity patterns, bay bottom losses and disturbances, wetland losses, and water and sediment quality changes. A chronological account of these changes will be presented.

Past, present and future projects and other foreseeable development around the Laguna Madre system will be considered in addition to the above. Existing and planned Federal and State projects and USACE Regulatory permits in the project area will be described. Project induced changes will be added to the historical changes. The major findings of the environmental section will be summarized and the most important environmental concerns emphasized.

An environmental consultant under contract to USACE staff will perform the assessment of cumulative impacts; costs for preparing baseline and impacts sections of the EIS related to water and sediment quality are captured in the contract costs for Baseline Environmental Studies and EIS Preparation located under the appropriate plan formulation phase of the section entitled NEPA Document Preparation and Plan Formulation.. In-house efforts include initiating and managing the contract, collection of available data, a field trip, and preparing the documentation for the Feasibility Report and EIS.

Cumulative Impacts	Days	Cost
Initial Plan Formulation		
Review Baseline Data Collection (e.g. past and present actions) report review	1	\$1,000
Plan Formulation		
No Activity		
Final Plan Formulation		
Review Draft Cumulative Impact Assessment (selected plan)	1	\$1,000
Report Preparation and Approval		
Review Final Cumulative Impact section for EIS	1	\$1,000
Total		\$3,000

Summary of Environmental Study Costs	Cost	Subtotal
Initial Plan Formulation		
NEPA Document Preparation and Plan Formulation	\$154,000	
Baseline Environmental Resources Report	\$5,000	
Threatened and Endangered Species	\$10,000	
Fish and Wildlife Coordination Act	\$5,000	
Essential Fish Habitat	\$1,000	
Coastal Zone Management Program	\$1,000	
Socioeconomic Resources and Environmental Justice	\$21,000	
Air Quality and Noise Assessments	\$11,000	
Traffic Assessments	\$6,000	
Historic Properties	\$7,000	
Hydrology	\$10,000	
Hazardous Toxic and Radioactive Wastes	\$2,000	
Water and Sediment Quality	\$5,000	
Cumulative Impacts Assessment	\$1,000	
Phase Total		\$239,000

Plan Formulation		
NEPA Document Preparation and Plan Formulation	\$184,000	
Impact, Mitigation and Restoration Assessments	\$203,000	
Threatened and Endangered Species	\$15,000	
Fish and Wildlife Coordination Act	\$10,000	
Essential Fish Habitat	\$1,000	
Coastal Zone Management Program	\$3,000	
Socioeconomic Resources and Environmental Justice	\$1,000	
Air Quality and Noise Assessments	\$1,000	
Traffic Assessments	\$1,000	

Historic Properties	\$132,000	
Hydrology	\$12,000	
Hazardous Toxic and Radioactive Wastes	\$2,000	
Water and Sediment Quality	\$252,000	
Phase Total		\$817,000
<i>Final Plan Formulation</i>		
NEPA Document Preparation and Plan Formulation	\$59,000	
Impact, Mitigation and Restoration Assessments	\$4,000	
Threatened and Endangered Species	\$15,000	
Fish and Wildlife Coordination Act	\$10,000	
Essential Fish Habitat	\$1,000	
Coastal Zone Management Program	\$3,000	
Socioeconomic Resources and Environmental Justice	\$1,000	
Air Quality and Noise Assessments	\$1,000	
Traffic Assessments	\$1,000	
Historic Properties	\$140,000	
Hydrology	\$2,000	
Hazardous Toxic and Radioactive Wastes	\$2,000	
Water and Sediment Quality	\$6,000	
Cumulative Impacts Assessment	\$1,000	
Phase Total		\$246,000
<i>Report Preparation and Approval</i>		
NEPA Document Preparation and Plan Formulation	\$40,000	
Impact, Mitigation and Restoration Assessments	\$2,000	
Threatened and Endangered Species	\$3,000	
Fish and Wildlife Coordination Act	\$10,000	
Coastal Zone Management Program	\$2,000	
Socioeconomic Resources and Environmental Justice	\$1,000	
Air Quality and Noise Assessments	\$1,000	
Traffic Assessments	\$1,000	
Historic Properties	\$5,000	
Hydrology	\$2,000	
Hazardous Toxic and Radioactive Wastes	\$1,000	
Water and Sediment Quality	\$3,000	
Cumulative Impacts Assessment	\$1,000	
Phase Total		\$72,000
Total		\$1,374,000

The local sponsor will provide \$400,000 of these costs as in-kind services, with \$974,000 being Federal costs. Allocation by activity will be determined annually.

ENGINEERING STUDIES

ENGINEERING BRANCH

The Engineering Branch office will provide general project oversight and coordination within the Branch, A-E and professional service contract oversight, and Branch administrative support for correspondence, financial management, and resource scheduling. In addition the office will provide all required Cost Estimating and Value Engineering services required during the study period. Upon completion of the Engineering Appendix (EA), the office will delegate to Project Engineering the task of compilation of the EA and coordination of an Independent Technical Review of that document to be performed by another Corps District.

PROJECT ENGINEERING SECTION

Project Engineering Section will serve as the PDT's technical representative and liaison in coordinating and otherwise administering the technical work necessary to evaluate and develop the plan alternatives during plan formulation and to develop the feature designs for the selected plan. Throughout the study, the section will coordinate the technical planning, engineering, and design work requirements among the engineering disciplines within Engineering Branch. Project Engineering Section will also coordinate the planning and design of proposed improvements and project features with other PDT members outside Engineering and Construction Division. The principle responsibilities of the section will be to assure that the final product produced, which will be a technical report or Engineering Appendix to the main report that supports the project baseline construction cost estimate, is of adequate detail and quality commensurate with the scope of the work for the study, is delivered on time, consistent with the study schedule, and is within the budget allotted for engineering-related work. Product quality will be measured against the standards of Engineering and Construction Division's standard Quality Management Plan (<http://intranet.swg.usace.army.mil/ec/wordfiles/ceswg-ec%20qmp.doc>). In addition, a specific Quality Control Plan will be developed by Engineering Branch. Project Engineering Section will periodically update Engineering Branch budget estimates when requested to do so, or to account for changes in tasks or added tasks that fall outside the scope of work of the initial study plan. The section will monitor expenditures of allocated funds and compare these with the work progress to ensure that the funds are being effectively spent to produce the products needed.

A Project Engineer will be assigned to perform the section's duties, primarily acting as a liaison between the Design Team members and the other team members comprising the PDT. The Project Engineer will work closely with the PM and the PL in developing in-progress scopes of work and strategies for meeting project objectives, coordinating funding requirements, and statusing the progress of the engineering work tasks. The Project Engineer will be an integral member of the PDT. In this capacity, he or she will relay important information to the Design Team members about team decisions that have been made, team objectives, and project needs to keep them apprized of project status and developments. Matters of concern to the Design Team will be elevated to the PM and PL when necessary for clarification, resolution, or consensus of approach. The Design Team members will be encouraged to attend and participate in all PDT meetings, and will be required to participate in these meetings as circumstances dictate to ensure that they have a common understanding of purpose in meeting the PDT's objectives.

The engineering studies and design work conducted for the selected plan will be presented in an Engineering Appendix to the main feasibility study report. The extent to which the engineering studies are conducted, including level of detail, will be enough to proceed directly into a pre-construction engineering and design (PED) phase soon after the feasibility study phase has concluded. The assigned Project Engineer will prepare the Engineering Appendix by compiling the write-ups provided by each of the engineering disciplines. The only plan that will be documented in the Engineering Appendix will be the selected plan. None of the alternative plans considered during plan formulation will be developed or designed beyond a preliminary analysis stage. Project Engineering Section will ensure that the Engineering Appendix is structured following guidance found in Appendix C of Engineer Regulation (ER) 1110-2-1150 – “Engineering and Design – Engineering and Design for Civil Works Projects.” Project Engineering Section will forward the compiled EA with funds to the District conducting the ITR. Once approved by Engineering Branch, the Engineering Appendix will be submitted to Planning Branch for its use as support documentation for the main feasibility study report.

The time and labor cost estimates given below assume that six structural improvements and one non-structural improvement will be considered during the initial plan formulation phase of the study. Screening of the improvements will be accomplished by comparing a preliminary monetary benefit calculated for each improvement in the economic analysis to a preliminary cost for the construction of the improvement. The construction cost associated with each improvement will be critical in determining whether or not there is a Federal interest in implementing the improvement. The costs below assume that in the Plan Formulation Phase of the study four of the structural improvements and one non-structural improvement will be carried forward for further, more investigative evaluation as a result of the screening process. For the Final Plan Formulation Phase of the study, only one structural plan will be developed in enough detail to estimate the baseline construction cost and the operations and maintenance cost in M_{II} format. The plan ultimately developed will be the plan selected by the PDT for implementation. Design of the improvement’s features will only be carried to the extent necessary to prepare the M_{II} cost estimate. This means that at least a modest amount of PED effort after feasibility is expected to further develop the design of the project features. The cost to administer a PED phase is not included in Project Engineering Section’s costs for the feasibility study. Project Engineering Section estimate of time and cost is based on a duration of four years for the feasibility study.

Project Engineering Section	Days	Cost
Financial Management & Scheduling	48	\$48,000
PDT Meetings/Meetings w/Project Sponsor	48	48,000
Design Team Coordination	96	96,000
Prepare and Compile DQCP	6	6,000
Product Review & Coordination	15	15,000
Report Compilation & Writing	58	58,000
Contract Administration Support (ACASS & CONTRACTS)	20	20,000
MIPR to ITR District		40,000
Total		331,000

The local sponsor will provide \$40,000 of these costs as in-kind services, with \$291,000 being Federal costs. Allocation by activity will be determined annually.

GENERAL ENGINEERING SECTION

Initial Plan Formulation

Channel optimization studies will be conducted to determine a limited number of channel alternatives that will be studied in greater detail during Plan Formulation. This number of alternatives for the depth will be 45, 50 and 55 foot. The number of alternatives for the width will be 300 feet and 400 feet for a total of six (6) structural alternatives. Additionally Turning Basin scenarios will be identified for the project. The optimization will include all channel deepening and widening, which would include the Gulf Extension through the Brownsville Turning Basin. The purpose of the optimization studies will be to develop preliminary quantities to calculate life cycle costs for each of the alternatives. The life of the project will be assumed to be 50 years. Quantities will include estimated new work dredging, estimated maintenance dredging, berthing area dredging requirements, and pipeline/dock/utility relocations and removal requirements. The PL will furnish the design vessels and the traffic pattern (1 way or 2 way) for each scenario in the optimization process. General Engineering Section will then determine channel dimensions based on criteria from EM 1110-2-1613, "Hydraulic Design Guidance for Deep-Draft Navigation Projects." The product will be a report describing each of the channel options studied, the assumptions used in the study, and the results. The scope of the studies will be as defined below:

- *Optimizing channel deepening by evaluating 3 different channel depths.*
- *Optimize 300' and 400' width for the BIH Channel*
- *Optimize Selective Widening of the Channel by evaluating 2 widths.*
- *Optimize 2 Turning Basins at all depths*

Pipeline and Utility Relocations

Pipeline and utility relocations requirements (if any) will be studied in greater detail than that in the Reconnaissance Report. Existing pipelines, utilities and bridges will be identified from existing dredging drawings, USACE permits, commercial sources and site visits. An in-house permit search will be conducted. A letter campaign will be performed to discover current pipeline and utility owners and for verification of location. Pipeline permits will provide initial data to aid in determining impacts related to the widening and deepening of the waterway. Associated impacts will be passed on to the Cost Engineer.

Dock and Wharf Relocations

Aerial photos will be used to identify current locations of docks and wharfs. The Brownsville Navigation District will contact current users and owners of the docks and wharfs along the waterway. Obtained information will be forwarded to Real Estate Division.

Determine Existing Shoaling Rates

Existing shoaling rates will be studied in much greater detail than in the Reconnaissance Report. Dredging quantities for the various channel reaches will be estimated using dredging records of the existing projects, as defined in the Dredging History Database. The Shoaling Rate Table will be provided to the Cost Engineer to use in developing costs associated with O&M dredging.

<u>Activity</u>	<u>Days</u>	<u>Cost</u>
Identify Pipelines and Utilities	8	\$8,000
Dock and Wharf Relocations	5	5,000
Determine Existing Shoaling Rates	5	5,000
Determine Preliminary Dredging Quantities	10	10,000
Subtotal		\$28,000

SURVEYS

Channel Surveys

Preliminary surveys of the existing channel, from bank to bank, will be conducted to provide initial cross sections for the deepening and widening study. The Southern Area Office, Brownsville Survey Group, will perform the work.

<u>Activity</u>	<u>Cost</u>
Channel Survey	\$70,000

Beneficial Use Sites

All hydrographic surveys required for Beneficial Use Sites (BUS) will be accomplished by AE Survey contract. The AE will provide all plant, equipment and personnel required for obtaining bathymetric data, surveying and mapping required for design of BUS that may be required. Task Orders will be issued against the Galveston District IDC type AE survey contract as needed.

<u>Activity</u>	<u>Contract</u>	<u>Cost</u>
Beneficial Use Sites	Contract	\$30,000

Land Surveys

All land surveys required for the design of upland Placement Areas, dredge pipeline routes and environmental restoration/mitigation surveying and mapping will be provided by AE Survey contract. Task Orders will be issued against Galveston District IDC type AE survey contracts as needed to accomplish required land surveys.

<u>Activity</u>	<u>Contract</u>	<u>Cost</u>
Land Surveys (3 PA's X \$80,000 ea.)	Contract	\$240,000

Survey Administration

Engineering Branch and General Engineering Section will accomplish all administrative work associated with AE Survey contracts and in-house survey work. Administrative work includes preparation of the Statements of Work, Independent Government Estimates, Negotiations and coordination with Contracting Division and the Southern Area Office.

<u>Activity</u>		<u>Cost</u>
Survey Administrative Costs	Labor	\$20,000
Subtotal Surveys		\$360,000
Initial Plan Formulation Total		\$388,000

Plan Formulation

Evaluate Without Project Conditions

Quantities for maintaining the existing channels will be developed and provided to the Cost Engineer for determining without project conditions. Quantities for levee lifts will be developed with the assistance of Geotechnical and Structures Section, who will estimate the projected life of each placement area, as well as bulking and shrinkage factors.

Ship Simulator Study

A ship simulation study will be conducted on the recommended channels as determined by the Preliminary Analysis. General Engineering Section will assist H&H Section in providing input, developing the scope of work, reviewing and participating in the ship simulation work that the Engineering Development and Research Center's (ERDC's) Coastal Hydraulics Laboratory (CHL). General Engineering will also provide existing and proposed channel designs, identify specific areas of concern to ERDC, as well as witness validation and plan testing. General Engineering will review the study results for incorporation in to detailed design.

Sediment Study

A sediment study will be conducted on the recommended channels as determined by the Preliminary Analysis. General Engineering Section will assist H&H Section in providing input, preparing scope of work, providing existing and proposed channel designs, identifying specific areas of concern and reviewing study results for incorporation into the detailed design. Future shoaling rates are required to estimate O&M costs of the proposed project, which in turn will affect the life-cycle cost of the project. If beneficial uses are planned, reasonably accurate shoaling rate estimation becomes even more important. The sediment study will be used to identify expected future shoaling rates, verify current shoaling rates and predict any shoaling rate changes for the proposed channel.

Pipeline and Utility Relocations

Progressive communications with pipeline owners will yield "as-built" plans, and current condition surveys to give support to identification of impacts. A contractor (to be determined)

will be hired to field verify existing pipeline locations and prepare preliminary plans to assist General Engineering with pipeline relocations. Any additional associated impacts will be passed on to the Cost Engineer.

Dock and Wharf Relocations

Progressive communications with dock and wharf users will identify if design project depths are wanted, as well as existing conditions of their facilities. Information obtained will be passed on to Structural Section for structural evaluation of impacts associated with widening and deepening of the waterway. Dredging quantities required to deepen the facilities to the level of the new project and estimated maintenance quantities will be included in the 50-year disposal plan. Associated impacts will be passed on to the Cost Engineer.

Update Channel Alternatives

An updated cost of the selected alternatives will be required for the AFB. The number of channel alternatives will be a combination of 3 alternatives for deepening, 2 alternatives or selective widening, and 2 turning basins. Model studies, surveys, and geotechnical analysis will be completed in time to incorporate the same into the document prepared for the AFB. Life cycle quantities will be updated for each of the alternatives. A report will be written describing study results and assumptions used for each of the alternatives. General Engineering will provide complete set of plates of the entire waterway with the alternatives identified.

Activity	Days	Cost
Evaluate Without Project Conditions	3	\$3,000
Ship Simulator Study Coordination	8	8,000
Sediment Study Coordination	5	5,000
Pipeline and Utility Relocations	5	5,000
Dock and Wharf Relocations	3	3,000
Update Channel Alternatives	10	10,000
Civil Analysis	30	30,000
Plan Formulation Total		\$64,000

Final Plan Formulation

Determine Maintenance Shoaling Rates

The sedimentation model will predict proposed shoaling rates for the new project. The goal will be to estimate future shoaling rates for discrete intervals of the project, which can be associated with individual placement areas. General Engineering Section will utilize the information for the advanced maintenance study.

Advanced Maintenance Study

Advanced maintenance is the deepening of a particular reach of the waterway for anticipated shoaling, in an attempt to decrease the number of dredging cycles. Advanced maintenance amounts will be determined on each channel segment through a life cycle cost analysis. Various depths of advanced maintenance will be combined with the estimated future shoaling rates to

determine the frequency and quantity of dredged material in a given reach. The unit cost for dredging the material will be determined by using the USACE' dredge estimating program. The life cycle analysis will include both dredging costs and costs associated with rehabilitation of placement areas. General Engineering will determine advanced maintenance depths and associated reaches for final channel design.

Ship Simulation Results

Anticipated results from the barge simulation that would be conducted under a separate study of the GIWW – Vicinity of Port Isabel project, would be utilized by the BIH project. Because ERDC will be preparing these two simulation studies simultaneously, it would be advantageous that both studies run concurrently.

Pipeline, Utilities Relocations, Docks and Wharfs Relocations

Information received from the Project Sponsor will be used to update existing impact information. General Engineering will establish a point of contact with the users for future use during the PED stage. Information exchange provides a clear idea of what is being studied, and allows the Project Sponsor to plan for anticipated relocations. Information obtained will be utilized in the formulation of cross sections depicting assumed true locations of any pipelines (if any) within the new proposed channel. Determination of required relocations will be finalized. As geotechnical investigations progress, possible stability issues may arise. Contingencies within the baseline cost will reflect these unknowns. Coordination with owners' relocations and rehabilitations will be during the PED stage. General Engineering will be the lead in providing information, and plans for use by the District. All information obtained will be forwarded to Real Estate Division.

Placement Plans

General Engineering Section, working with Geotechnical and Structures Section, will provide assistance to environmental representatives in developing and performing preliminary design on feasibility placement options. General Engineering will review and help finalize proposed placement plans. General Engineering will also assist with the coordination with final preparation of plates to incorporate into the EIS.

Mitigation Requirements

Although the type and extent of mitigation is not known at this time, it is very likely that some form of mitigation will be required. General Engineering will assist Environmental Section and Geotechnical Section with the design of the mitigation features.

Final Channel Design

Final channel design will consist of incorporating results from both the ship simulation study and the advanced maintenance study to develop final recommended channel geometry. During this phase, the location of docks, structures, and other fixed objects will be pinpointed and the channel centerline modified, if possible, to avoid impacts to these items. Expected unknowns and

uncertainties may contribute to design changes of the channel centerline and will be considered in the PED stage. Hydrograph surveys will form the basis for new work dredging quantities using a digital terrain-modeling program. These quantities will be provided to the Cost Engineer for incorporating into the baseline estimate. The final design will be provided to Real Estate.

Project Design and Construction Schedule

General Engineering will assist with the schedules for design, performance of utility/facility relocations, provisions of placement area improvements, and construction for preparation of the Management Plan. These schedules shall be based on engineering judgment and indicate the optimum schedule for completing design and construction.

Activity	Days	Cost
Draft Engineering Appendix		
Civil Plates	60	\$60,000
Civil Write-up	8	8,000
Civil Analysis	20	20,000
Engineering Tasks (Meetings, Supervision, etc.)	5	5,000
Subtotal		93,000

The Draft Engineering Appendix will undergo an in-house Independent Technical Review (ITR). Upon the completion of the review appropriate comments will be incorporated in a Final Engineering Appendix.

Activity	Days	Cost
Final Engineering Appendix		
Independent Technical Review	10	\$10,000
Incorporate Comments	8	8,000
Subtotal		18,000

Total Final Plan Formulation \$111,000

<i>Summary of Feasibility Study Costs, General Engineering Section</i>		Cost
<i>Initial Plan Formulation</i>		\$388,000
<i>Plan Formulation</i>		64,000
<i>Final Plan Formulation</i>		111,000
General Engineering, Feasibility Study, Total		\$563,000

GEOTECHNICAL AND STRUCTURES SECTION

Initial Plan Formulation

Scope of Work. During the Initial Plan Formulation phase, EC-ES will review existing data and in conjunction with EC-EG, develop preliminary dredging and earthwork quantities for each plan, review existing foundation data, and develop a placement plan for each of the various deepening/widening alternatives.

Existing Geotechnical and Soils Data. EC-ES will review existing files to evaluate the engineering characteristics of the soils within the various channel template alternatives. Data will be re-plotted in current format for use during design and in subsequent presentations.

Assessment of Engineering Requirements: EC-ES will compile and document existing project information and identify specific information or data deficiencies that are needed to evaluate the proposed alternatives and ultimately develop the Engineering Appendix. This information includes estimates of new work and maintenance materials to be dredged, available placement area capacities, and locations and limits of areas possibly requiring shore protection. Information regarding the development of beneficial use alternatives for placement of new work and maintenance dredge material will also be developed. This information will be documented and incorporated into the Engineering Appendix as necessary.

EC-ES will conduct a field reconnaissance to review the various alternatives, confirm the availability of storage capacity at the upland placement areas considered for use, and review site access for drilling activities. Field reconnaissance will facilitate assessing the total volumetric storage capacity afforded by the existing and proposed placement areas. For new placement areas extensive field surveys and real estate acquisition are needed. Suitable borrow material for constructing and raising the levees must also be identified.

Initial Plan Formulation – Geotechnical and Structures Section

Activity	Days	Cost
Review of Existing Geotech Data	4	\$4,000
Foundation Analysis	3	\$3,000
Site Visits (Geotech/Structures)	3	\$3,000
Placement Area Capacity Review	2	\$2,000
BUS Analysis	3	\$3,000
Structural Review	4	\$4,000
Alternatives Analyses	4	\$4,000
Reconnaissance Report	5	\$5,000
Total Initial Plan Formulation		\$28,000

Plan Formulation

Scope of Work. During the Plan Formulation phase, EC-ES will work with the PDT to develop the design quantities for the chosen alternatives. From these alternatives, one preferred plan will be developed and carried through to Final Plan Formulation. The level of engineering for this phase will be sufficient to “establish a realistic comparison of costs” (ER 1110-2-1150), provide assurance that all alternative plans are functional, and are likely to be constructible. Inherent in the ER guidance is that the quantities and construction descriptions provided to Cost Engineering are adequate for determining a consistent and reasonably accurate construction cost for each alternative to allow for a fair comparison of alternatives.

Site Visits. A site visit will be conducted to locate and investigate required placement areas and further assess access conditions for drilling equipment. A second site visit will be conducted to initiate the drilling contract and oversee the initial drilling activities.

Core Drilling and Soils Testing. Subsurface investigations will be conducted to evaluate foundation conditions at the proposed PA and BU sites as well as characterize new work material, and evaluate slope stability in the widened and/or deepened channel. This work will be conducted by the District's core drilling and soils testing contractor. Four contracts are planned, two drilling contracts – one upland and one offshore and two corresponding laboratory testing contracts. The subsurface drilling and testing programs will provide sufficient data to establish design parameters for the various project alternatives including embankments for placement areas, foundation concerns, and new work considerations.

Few borings will be needed along the existing channel alignment for the various deepening/widening alternatives. Additional boring will be required for new alignments, placement areas and structural foundation considerations. This estimate provides 400 linear feet of soil borings to fulfill project purposes. All borings to be drilled and sampled in accordance with provisions in the current open-ended core drilling, soil sampling, and laboratory testing contract.

A laboratory testing program will be developed after reviewing the soil samples to determine the physical and strength characteristics dredge and foundation material. The results of testing dredge material will be used to establish the stiffness of the new work material for dredging purposes, its suitability for building confinement embankments, and to calculate the additional volumetric storage capacity that will be needed to accommodate this material. The results of testing foundations material will be used to determine stable slope angles for levees and channels and the anticipated settlement of the foundation material.

Erosion protection will be designed where placement areas are exposed to severe wave and tidal action. Quantities will be calculated for levee construction, levee raising, erosion protection and other design features. Placement area capacities, levee heights, side slope quantities will be determined.

It is assumed that one BU site will be developed, in coordination with the environmental section, for this project. A preliminary design of this feature will be developed during this phase and include foundation considerations, hydraulic fill, loss and retention factors, and fill quantities. A BU plan will be developed and include quantities, and construction description to allow Cost Engineering to determine construction costs.

The condition of the outlet structures at the existing placement areas will be reviewed. Where new placement areas are planned, new outlet structures will be designed. Likewise, where embankments are raised, existing outlet structures will be rehabilitated.

Preliminary DMMP. A DMMP will be required if any changes are made to the channel. This plan is developed for a 50-year operation and management period. A preliminary DMMP will be developed for various alternative plans to the extent that this information is required to develop cost estimates for use in screening the alternatives.

Plan Formulation – Geotechnical and Structures Section

Activity	Days	Cost
Develop and Administer Boring and Laboratory Contracts	3	\$3,000
Contract Administration Support (ACASS & CONTRACTS)	3	3,000
Site Visit (Geotech)	4	4,000
Analyze Geotechnical Parameters	2	2,000
Develop Channel Template	2	2,000
Stability Analyses	4	4,000
Preliminary Erosion Protection	2	2,000
BU Site Design	4	4,000
PA Capacity Review	4	4,000
Preliminary DMMP	5	5,000
Quantities	2	2,000
Geotech. Plates, Figures, Exhibits	2	2,000
Structural Analysis / Design	12	12,000
Struct. Plates, Figures, Exhibits	2	2,000

Total \$51,000

Subcontracts	Cost
Coring and Soil Sampling (2)	\$32,000
Laboratory Testing (2)	8,000

Total Subcontracts \$40,000

Total Plan Formulation \$ 91,000

Final Plan Formulation

During the Final Plan Formulation phase, EC-ES will develop preliminary engineering design on the project features for the selected alternative to the level outlined in ER 1110-2-1150. This level of engineering is generally equivalent to the 35% design stage, which will allow for development of the Plans and Specifications in the subsequent PED phase, provided the project is authorized. The design effort will include stability analyses of the channel slopes and embankment slopes, evaluation of settlement at the upland sites, levee placement configuration including maximum levee heights, shore protection, and storage capacity of the PAs.

The final plan formulation design will include refining and verifying the preliminary design for the chosen alternative. This includes refining the quantities and construction description, reevaluating constructability, and identifying additional field data required for the PED phase. These data along with design criteria and results, associated drawings, and field and laboratory data will be compiled in a Geotechnical and Structural Section of the Engineering Appendix. All data to be presented in the Engineering Appendix will be reviewed, and all design parameters will be verified. Analyses will be performed using revised parameters to confirm slope stability, foundation design, and complete final design of typical sections for all channel slopes, and all earth levees and other fills.

Technical Support and Supervision. Technical support for plan formulation will be the responsibility of the Team Geotechnical Engineer, under technical supervision by the GS-13 Technical Specialist. The Team Geotechnical Engineer will perform final review of the completed design work, and summary report sections. General Supervision and management of

all activities in this section will be the responsibility of the Geotechnical and Structures Section Chief.

Finalized DMMP. The DMMP will be finalized for the selected plan from the alternative 50-year operation and management plan. It will be used to develop the baseline cost estimate and will be presented in the Engineering Appendix. The level of detail in the presented plan will be sufficient to support the project and provide sufficient information and detail to assure the capability to provide maintenance during the project life. Additionally, the details will be adequate for a reasonably accurate calculation of the long-term maintenance cost. Operations Division, Southern Area Office and the Project Sponsor will all be included in review of the document and will be expected to offer their corresponding level of expertise and detail, prior to finalizing the 50-year plan for the Engineering Appendix.

Structural Analyses. The Structural Section will provide design input for the spill boxes required for the placement areas of all of the channel alternatives. The section will also provide consultation services (not design services) for bridge, bulkhead, and dock analyses, if required by local entities affected by the project.

Internal Technical Review. An ITR will be conducted on this project to verify design and constructability aspects of the project. It is assumed that this work will be conducted by a sister District and that members of EC-ES will support this District as needed and respond to associated inquiries.

Final Plan Formulation – Geotechnical and Structures Section

<u>Activity</u>	<u>Days</u>	<u>Cost</u>
Slope Stability	3	\$3,000
Upland Site Design	5	5,000
BU Site Design	3	3,000
Shore Protection	3	3,000
DMMP	4	4,000
Geotech Plates, Figures, Exhibits	3	3,000
Structural Design	6	6,000
Struct. Plates, Figures, Exhibits	3	3,000
ITR	5	5,000
Engineering Appendix	12	12,000

Total Final Plan Formulation \$47,000

Summary Feasibility Study Costs, Geotechnical and Structures Section

	<u>Cost</u>
<i>Initial Plan Formulation</i>	\$28,000
<i>Plan Formulation</i>	91,000
<i>Final Plan Formulation</i>	47,000

Total \$166,000

The local sponsor will provide \$30,000 of these costs as in-kind services, with \$136,000 being Federal costs. Allocation by activity will be determined annually.

COST ENGINEERING

Initial Plan Formulation

For the Initial Plan Formulation phase, Cost Engineering will prepare six alternative estimates proposed for evaluation during the screening process. These estimates will assume rough material quantities that have been calculated on the basis of existing field information and historical maintenance dredging data. The new work and maintenance material to be dredged will be disposed into existing available placement areas. These estimates will have reasonable contingency costs included into the estimates to cover any unknowns. The cost estimates will be developed using a spreadsheet format. The cost engineer will be an integral part of the Design Team and make a field trip with the team while developing the estimates.

Plan Formulation

During the Plan Formulation phase, further refinement will occur to the estimates. Four alternatives will need refining of the seven initial estimates. Detailed cost estimates will not be performed on any of the alternative plans considered during the screening process.

Final Plan Formulation

Cost Engineering will prepare a fully funded M_{II} baseline estimate for the selected plan and the locally preferred plan. Cost Engineering will develop an M_{ii} estimate for Economics study based on old fuel prices for the BC ratio. This includes developing contingencies with PDT members, calculating O&M costs, completing the cost estimate supplement to the Engineering Appendix, and developing both inflated dollar and constant dollar estimates. The cost engineer is an important member of the Design Team and PDT who will be consulted as the project features for the selected plan are being developed.

<u>Activity</u>	<u>Days</u>	<u>Cost</u>
<i>Initial Plan Formulation</i>		
Preliminary Cost Estimates for Screening Purposes	21	\$21,000
<i>Plan Formulation</i>		
Cost Estimates for Refined Screening Purposes	14	14,000
<i>Final Plan Formulation</i>		
M_{II} baseline estimate	40	40,000
M_{ii} baseline estimate for economics study	20	20,000
Cost Estimates, Final Plan Formulation	5	5,000
Cost Estimates for Selected Plan	20	20,000
Independent Technical Review	5	5,000
Total		\$125,000

The local sponsor will provide \$40,000 of these costs as in-kind services, with \$85,000 being Federal costs. Allocation by activity will be determined annually.

VALUE ENGINEERING PLAN

Public Law 99-662, Section 911 requires a Value Engineering (VE) Study on Civil Works Projects with a CWE of \$10,000,000 and greater. Also a VE Study shall be performed on all Civil Works Construction General (CG) Projects with a Current Working Estimate (CWE) of \$2,000,000 and greater and \$1,000,000 and greater for O &M Projects in accordance with OMB Circular A-131.

A VE Study for BIH 50-Foot Project will be performed under the direction of the Value Engineering Officer (VEO) of Galveston District. The subject VE Study will be performed by the Office, Chief of Engineers, Value Engineering Team (OVEST) or by a qualified Architect Engineer (AE) contract. The VE Study will be performed after review of the Feasibility Report by higher authority. Value Engineering Proposals resulting from the VE Study will be reviewed and evaluated by Galveston District for possible incorporation into the Project Design.

<u>Value Engineering</u>	<u>Days</u>	<u>Cost</u>
VE Study by OVEST or by AE	90	\$ 60,000
VE Study Participation, Review, Evaluation and Implementation of approved VE proposal by SWG	30	30,000
Total		\$ 90,000

HYDROLOGY AND HYDRAULICS SECTION (H&H)

Hydrology and Hydraulics (H&H) Section will collect and review existing relevant hydrology and hydraulics data encompassing the project study area and determine what new data will be needed for model studies to be done cooperatively between the USACE of Engineers' Engineering Development and Research Center's Coastal Hydraulics Laboratory (ERDC-CHL) and possibly the Texas Water Development Board (TWDB) and the US Geological Survey gage records. ERDC-CHL will administer the modeling work and write the technical reports. H&H Section will write the summary of the results in the Engineering Appendix. For this study, the Initial Plan Formulation will consist of performing preliminary evaluation and screening for structural and non-structural alternatives. Non-structural alternatives consist of analyzing the no-action plan. In the Plan Formulation Phase, the structural alternatives will be narrowed down to three alternatives to be studied further. These will be channel deepening and widening alternatives.

The Corps, the Port of Brownsville, and consultants will develop detailed scopes of work for executing the work delineated in this section of the PMP. The detailed scopes of work will be developed in coordination with the PDT and under the oversight of ERDC-CHL. Work to be performed by the Port of Brownsville as in-kind services will include development of the H&H initial plan formulation, new data collection needed for modeling studies, hydrodynamic (circulation) modeling, sediment transport (shoaling) modeling, constituent transport (salinity) modeling, vessel induced hydrodynamic modeling, gulf shoreline erosion

study (include wave modeling and sediment transport modeling, if needed), and hurricane and surge propagation modeling. The Port of Brownsville's intent is to perform these in-kind services in coordination with and under review of the ERDC-CHL.

There are potential opportunities to improve flow conditions in the vicinity of the jetties. The studies can address apparent changes in accretion and erosion patterns on the outside of the jetties in recent years that have intermittently resulted in sand build up to near the top of the jetty structure on one side and concerns about erosion resulting in flow around or through the jetty walls as well as sedimentation that has recently necessitated emergency dredging.

Initial Plan Formulation

The Initial Plan Formulation phase of the study for H&H section will be the research and review of existing models, coordination of SOWs with ERDC for modeling efforts, and the start of the data collection effort for the models. If existing models are deemed usable by ERDC and the PDT, every effort will be made to utilize these models to save the project time and money.

Data Collection

The existing-data review and additional data collection efforts are fundamental components to the H&H studies of the BIH navigation project. The available and collected data will be used for H&H studies, model testing, and verification to existing conditions of the system for this study. ERDC-CHL will review available data on the system to avoid duplication of data collected by other agencies, contractors, or offices and then monitor the data collection program to insure that requirements and method of data collection meet the needs of the model input format. The data collection program will include objectives that are well defined and detailed. Typical areas of interest include:

- Bay and Offshore Tides and Currents
- Channel surface, mid-depth and bottom currents
- Freshwater Inflows
- Scour and deposition including placement area erosion
- Wave Climate
- Salinity with depth
- Surveys of submerged channel banks
- Tide Range/Frequency
- Sediment Transport
- Bank Erosion
- Suspended Sediment
- Climatologic
- Bank Erosion

An analysis of historical data on tide, wind, rain, inflows to the bay, salinity, water elevations, and storm data will be performed. The hydrology of present condition inflows will be obtained from the TWDB and project future conditions of inflow into the bay system will be estimated for input into the salinity model study scenarios.

Channel Optimization Studies	Days	Cost
Preliminary Evaluation	10	\$8,000
Review of Data	10	8,000
ERDC Coordination on SOWs	10	8,000
Data Collection - ERDC	132	250,000
Total		\$274,000

Plan Formulation

Hydrodynamic and Salinity Model

A hydrodynamic model is necessary to provide input to the ship simulation, estimate storm surge, and predict potential changes with a deeper and/or wider channel. The 3-D model work is estimated to require about 10 months

The final channel width dimensions will be screened economically before the ship simulation model study is complete. This will aid in selection of the proposed channel design plan to be evaluated by the hydrodynamic model.

A hydrodynamic model is necessary as a tool to help predict the potential salinity to the Laguna Madre hyper-saline bay system that could be caused by the deepening and widening of the ship channel. The model output will include comparisons between baseline (existing) conditions and future scenarios for bay circulation patterns, currents, and salinity for various seasonal and freshwater inflow conditions. The model study will incorporate project features with specific interest in salinity changes in the Laguna Madre, the intersection between the proposed GIWW (realignment study) and the proposed BIH widening and deepening project.

Sufficient salinity modeling has been done on the Laguna Madre. It is assumed that the costs associated with reviewing these models will be minimal and are not reflected in the estimate.

ICT meetings are usually concerned with the salinity model. In using an existing model, ERDC travel to ICT meetings are not reflected in the estimate.

Ship Simulation

ER 1110-2-1461, "Design of Navigation Channels, Using Simulation Techniques", 31 October 1989, requires ship simulation. The simulation model study will be initiated by H&H and conducted by ERDC with SWG assistance and direction. The study is estimated to require about 4 months. H&H will manage, monitor, review progress, and assist with the model study. A 2-D hydrodynamic model will be applied initially to the vicinity of the ship channel to generate currents for the ship simulator model. Design deep draft vessels for one-way traffic in some reaches such as the Amphells Plant will be simulated with the assumption that side slopes of the channel can be used for meetings between ship and barge traffic and thus does not require

simulation. Prior to simulation model initiation, the Planning, Environmental, and Regulatory Division will provide the design ship vessels for meetings within the bottom width limits to H&H with concurrence on dimensions by the Engineering and Construction Division. Initial project plan alignment and dimensions as developed or modified by the General Engineering Section and H&H will be tested by simulation and a recommended design channel width will be developed through coordination with design staff as a part of the H&H and ERDC simulation team. Based on coordination with ERDC and the pilots, H&H will recommend meteorological and hydrologic parameters for simulation and monitor the hydraulic and hydrologic aspects and progress of the simulation study up to completion of the final report by ERDC. Channel alternatives will be screened before simulation to reduce the number of scenarios, and then the ship simulation model will be conducted to test the adequacy of the final proposed economic channel depth and width. The simulator study will recommend channel width based on combined beam width of meeting vessels. Simulation results and recommendations will be used for determining a final design channel plan that will be applied to the salinity model studies.

Sedimentation Transport and Shoaling Model

A sediment transport and shoaling model is needed as a tool to aid in predicting environmental impacts of the deepening and/or widening of the BIH channel. A change to sediment contribution to the Laguna Madre is a primary area of interest along with changes to future channel shoaling and maintenance for the proposed channel project. The impact, if any, of the deepening and extension of the Gulf of Mexico offshore channel on longshore transport and beach/shore erosion will also be addressed by ERDC. This study is estimated to take 12 months for completion.

Vessel Effects Study

Numerical modeling of vessel currents and water level changes will be conducted with the two-dimensional (2D) model. Maximum vessel drawdown and return velocity at the shoreline for one-way traffic in both the existing channel and in the proposed channel will occur in straight reaches along the channel where vessel speeds are highest. Meeting conditions will be modeled, should it be proposed that a two-way channel would also occur in these same straight reaches. The 2D modeling is proposed for the straight reaches along the waterway. Field data will be used to determine which vessel size and corresponding speed produces the maximum forces for one-way traffic in the existing channel. Results from the ship simulator studies will be used to determine speeds during the meeting condition in the proposed channel. The study is estimated to take 5 months for completion.

Gulf Shoreline Erosion Study

A cursory assessment will be conducted based on the effect of channel modifications on the local coastal wave conditions in the vicinity of the channel and at adjacent shores. Following which, the team will determine if additional study is required via shoreline change and sediment transport modeling. The study is estimated to take 3 months for completion.

The work performed includes setting up existing and two design alternative condition computational grids. The model execution will use a recently updated 10-year WIS hindcast for the western Gulf of Mexico. After assessing modeling results and conducting cursory potential transport investigations of adjacent shores, the impacts may require quantification for more detailed investigations.

Environmental Coordination

H&H will coordinate with the District environmental personnel and TWDB to insure the modeling studies, model scenarios, and presentation of results address the environmental issues of concern. There is no planned hurricane surge model study. The addition of hurricane surge models could add substantially to study cost and schedule time. Mitigation or beneficial use sites may also be addressed for salinity and flood plain changes. Environmental concerns are expected to play a large role throughout the life cycle of this project, and studies may be expanded or adapted to incorporate new issues or concerns that usually surface during feasibility study. The results of the salinity model studies will be used primarily to analyze environmental impacts of the final channel and dredge placement site plan on the estuary system. H&H participation will continue from start to finish of the ERDC studies.

Activity (H&H Section Continued)	Days	Fed Cost	Non-Fed Cost	Cost
Hydrodynamic Model				
3-D Model - ERDC	220	\$160,000		\$160,000
Storm Surge - ERDC	88	60,000		60,000
SWG Assistance	40	40,000		40,000
Ship Simulation				
Ship Simulation - ERDC	88	200,000		200,000
Ship Currents - ERDC	44	40,000		40,000
SWG Assistance (includes travel to ERDC for simulations)	30	30,000		30,000
Sediment Transport Study				
Sediment Study - ERDC	264	120,000		120,000
SWG Assistance	48	48,000		48,000
Vessel Effects Study				
Data collection - ERDC	7	75,000		75,000
Vessel Study - ERDC	110	120,000		120,000
SWG Assistance	20	20,000		20,000
Gulf Shoreline Erosion Study				
Erosion Study - ERDC	66	50,000		50,000
SWG Assistance	15	15,000		15,000
Environmental Compliance	40	40,000		40,000
Placement & Effluent Return Plan	40	40,000		40,000
Report Write Up & Review	20	20,000		20,000
Technical Review Conference	5	5,000		5,000
Total				\$1,083,000

Final Plan Formulation

Dredged Material Placement

H&H will be involved in all aspects of the dredged material placement plan and design, for control of erosion, effluent return from any proposed confined levee sites, tidal exchange, and impacts to or impedance of local drainage. Wave climate and other H&H design parameters will be provided for each proposed placement area. H&H parameters will be computed and provided to Geotechnical and Design engineers upon request within their proposed schedules.

Engineering Appendix

H&H will provide a written section for the Engineering Appendix, review various reports related to this project, make comments and recommend revisions and additions. H&H will prepare input to the feasibility report describing the H&H studies and models performed and will respond to request for H&H related information to various individuals and agencies concerned with the feasibility tasks or model study work. The report will include the mean lower low water (MLLW) datum as required by ETL 1110-2-249. Further, H&H will continue with study team participation through preparation of plans and specifications.

<u>Activity (H&H Section Continued)</u>	<u>Days</u>	<u>Fed Cost</u>	<u>Non-Fed Cost</u>	<u>Cost</u>
Dredge Material Placement	40	\$40,000		\$40,000
Engineering Appendix	20	20,000		20,000
Total				60,000

Total H&H Costs

Channel Optimization Studies	274,000
Model/Simulation Runs	1,083,000
Engineering Appendix	60,000
Total	1,417,000

The local sponsor will provide \$1,000,000 of the H&H costs as in-kind services, with \$417,000 being Federal costs. Allocation by activity will be determined annually.

SUMMARY OF ENGINEERING BRANCH FEASIBILITY STUDY COST

<u>Activity</u>	<u>Federal Cost</u>	<u>Non-Fed Cost</u>	<u>Cost</u>
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Project Engineering Section	\$291,000	\$40,000	\$331,000
General Engineering Section	563,000	0	563,000
Geotechnical & Structures Section	136,000	30,000	166,000
Cost Engineering	85,000	40,000	125,000
Value Engineering	90,000	0	90,000
Hydrology & Hydraulic Section	417,000	1,000,000	1,417,000
Engineering Branch Total			\$2,692,000

REAL ESTATE STUDIES

The Real Estate effort required for the Project will consist of the preparation of a Real Estate Plan (REP) and a Gross Appraisal for the recommended plan. The REP will contain information in sufficient detail to authorize acquisition of the real property required for the project. The Gross Appraisal will identify the cost of the lands required for the recommended plan. The Gross Appraisal and the REP will require OCE level review and approval. Real Estate investigations and estimates of value will be provided as needed for alternative plans prior to the selection of the recommended plan. Real Estate personnel will provide the real estate portion of the base line cost estimate, prepare status reports on assigned activities, be involved in preparing, modifying and revising the Project Cooperation Agreement (PCA) with the local sponsor, study manager, project manager and other affiliated or concerned agencies and attend study team meetings.

MAPPING

Real Estate Project planning maps will be developed from existing BIH Channel Segment Maps, preliminary Engineering design drawings, aerial mosaics, and real property maps obtained from the various county tax assessors offices. Real Estate will establish tract ownership data, determine the acreage and recommend tract configuration for the required lands. The real estate planning maps will also show existing R.O.W. and placement area easements owned by the government; and will be exhibits to the REP.

The existing conventional real estate segment maps which cover the Brazos Harbor Channel project will be converted to electronic format (CADD) and will become the base maps for the Real Estate Project Maps. As design and ownership data is obtained it will be layered into the base maps to form a Geographic Information System (GIS) for the Project.

RIGHTS OF ENTRY

Real Estate will obtain all rights-of-entry for any activity, such as environmental investigations, cultural assessments, core borings, survey and exploration etc. to gain entry to private property.

PRELIMINARY ATTORNEY'S OPINION OF COMPENSABILITY

A preliminary legal opinion will be prepared on whether provision of a substitute facility is required under the Fifth Amendment as compensation for a facility/utility being acquired for the project. The opinion makes findings on whether the owner has a compensable interest, whether the owner has the legal duty to continue to maintain and operate the facility/utility, and whether Federal law requires the provision of a substitute facility/utility rather than a mere payment of the market value for the property acquired. The preliminary legal opinion differs from the final legal opinion only in its acceptance as fact of the owner's statement of interest in the property, without a search of property records. This task will be performed by the real estate attorney.

GROSS APPRAISAL

A gross appraisal for the recommended plan will be made in accordance with the Real Estate Handbook (ER 405-1-12). The appraiser shall perform a detailed inspection of the proposed project area, noting the number and value of all improvements that fall within the project limits. The appraiser will also note those improvements lying near enough to the project limits to be impacted by the project and any unimproved land that may be damaged by the Project. Severance damage may be caused by loss of access, distortion of tracts or uneconomic remnants, and will be estimated as a lump sum for the recommended plan. During his inspection the appraiser will note which improvements are business related, owner-occupied, or tenant-occupied residences. This information will be used in arriving at the amount (if any) of relocation assistance required by Public Law 91-646 (Uniform Relocation Assistance and Real Property Acquisition Act of 1970). The appraiser will also note the number and type of oil and/or gas wells and other related equipment and/or improvements which would be affected by the Project. This information will be used if it is necessary to acquire or subordinate any mineral rights. The appraiser will prepare a written report giving a general description of the project area, a summary of the highest and best use of the land involved, a summary of sales and offer data with location maps, and a detailed breakdown of the value of the required lands and improvements for the recommended plan.

REAL ESTATE PLAN (REP)

The REP, prepared for the recommended plan will contain land values, supported by the Gross Appraisal, other required topics of discussion include the following:

- Project description
- Land requirements
- Federally owned land within the project area
- Navigation Servitude issues relevant to the project
- Public law 91-646 (relocations)
- Base Line Cost Estimate for Real Estate
- Mineral activity in the project area
- Proposed Estates

Acquisition Schedule
 Relocation of Roads & Utilities\Facilities
 Impact on Aids to Navigation
 Hazardous & Toxic Waste
 Attitudes of Land Owners
 Recommendation

REAL ESTATE STUDY COSTS

The amounts listed below take into account staffing requirements for the various tasks identified, and are based on past experience with real estate studies of a similar nature. The chart below shows the cost of each anticipated real estate study activity.

<i>Activity</i>	<i>Days</i>	<i>Cost</i>
<i>Initial Plan Formulation</i>		
Obtain Rights-of-Entry	5	\$5,000
<i>Plan Formulation</i>		
Preparation of Estimate of Value	10	10,000
Evaluation of Alternative Plans	2	2,000
Preparation of Baseline Cost Estimate	2	2,000
PDT Meetings	5	5,000
Surveying & Mapping	10	10,000
Ownership Data Compilation	5	5,000
GIS Data Entry & Maintenance	5	5,000
Preparation of Legal Opinions/Compensability	5	5,000
<i>Final Plan Formulation</i>		
Preparation of Real Estate Plan	10	10,000
Preparation of PCA	10	10,000
Relocation of Facilities/Utilities	2	2,000
Internal Review	2	2,000
Clerical Activities	3	3,000
Comment Response	2	2,000
Supervision	3	3,000
Total		\$81,000

The local sponsor will provide \$5,000 of these costs as in-kind services, with \$76,000 being Federal costs. Allocation by activity will be determined annually.

SECTION IV - FEASIBILITY STUDY COST

ACTIVITY	FEDERAL COST	NON-FED COST	TOTAL COST
Programs & Project Mngt.	\$440,000	135,000	\$575,000
Overall Study Supervision	95,000	0	95,000
Review Meetings - Conferences	74,000	40,000	114,000
Public Involvement	10,000	45,000	55,000
Plan Formulation	110,000	40,000	150,000
Report Preparation	120,000	20,000	140,000
Technical Review	55,000	20,000	75,000
Economic and Social Analysis	485,000	80,000	565,000
Environmental Studies	974,000	400,000	1,374,000
Project Engineering	291,000	40,000	331,000
General Engineering	563,000	0	563,000
Geotechnical & Structures	136,000	30,000	166,000
Cost Engineering	85,000	40,000	125,000
Value Engineering	90,000	0	90,000
Hydrology &Hydraulics Investigations	417,000	1,000,000	1,417,000
Real Estate	76,000	5,000	81,000
Contingencies	805,000		805,000
Total Feasibility Study Costs:	4,826,000	1,895,000	6,721,000
Federal Share:			3,360,500
Non-Federal Share:			3,360,500
In-Kind Credit Amount:			1,895,000
Required Cash Amount:			1,465,500

SECTION V - WORK BREAKDOWN STRUCTURE

<u>Codes</u>	<u>Description</u>	<u>Responsible Office</u>
I0000 21Q0	PROJECT STUDY PLAN	Planning
IB000 22T0	Updates of PSP	Planning
J0000 2200	FEASIBILITY REPORT	Planning
JA000 2200	Engineering Appendix	Engineering
JAA00 22N0	Survey and Mapping	Geotechnical
JAB00 22J0	Hydrology and Hydraulics Studies/Report	H&H
JAC00 22K0	Geotechnical Studies Report	Geotechnical
JAD00 22P0	Site Development and Analysis/Report	Geotechnical
JAE00 22P0	Engr & Design Anal. Report w/Prelim. Drwgs	General Eng
JAP00 22P0	Model Studies	H&H
JAG00 22P0	All Other Engineering Documents	Engr Mgmt
JB000 2200	Socioeconomic Studies/Report	Economics
JBA00 22G0	Economic Analysis/Report	Economics
JBB00 22C0	Social Studies/Report	Economics
JBC00 22B0	Institutional Studies/Report	Economics
JBD00 2280	Ability to Pay Report	Economics
JBE00 22B0	Financial Analysis Report	Economics
JBF00 22M0	All Other Socioeconomic Analysis Documents	Economics
JC000 22H0	Real Estate Analyses/Documents	Real Estate
JCT00 22H0	Real Estate Supplement/Plan	Real Estate
JCB00 22H0	Gross Appraisal/Report	Real Estate
JCC00 22H0	Preliminary Real Estate Acquisition Maps	Real Estate
JCD00 22H0	Physical Takings Analysis	Real Estate
JCE00 22H0	Prelim Atty.'s Opinion of Compensability	Real Estate
JCF00 22H0	Rights of Entry	Real Estate
JCG00 22H0	All Other Real Estate Analyses/Documents	Real Estate
JD000 22E0	Environmental Studies/Report	Environmental
JE000 22P0	Fish and Wildlife Coordination Act Report	Environmental
JF000 22L0	HTRW Studies/Report	Environmental
JG000 2200	Cultural Resource Report	Environmental
JH000 22P0	Cost Estimates	Cost Engineering
JI000 22A0	Public Involvement Documents	Planning
JJ000 22R0	Plan Formulation and Evaluation Report	Planning
JK000 2250	Draft Report Documentation	Planning
JL000 22L0	Final Report Documentation	Planning
JM000 22Y0	Washington Level Report Approval	Planning
JN000 22M0	All Other Feasibility Studies/Investigations	Planning
JO000 22X0	Damages Assessed AE Contractors	Engineering
JP000 22Q0	Management Documents	Project Mgmt
LO000 22T0	PROJECT MANAGEMENT PLAN	
LB000 30E0	Revisions to PMP	Project Mgmt

SECTION VI – ATTACHMENTS

ATTACHMENT 1 – 905(b) ANALYSIS

ATTACHMENT 2 – GANTT CHART

ATTACHMENT 3 – QUALITY CONTROL PLAN

ATTACHMENT 4 – COMMUNICATION PLAN

ATTACHMENT 5 – PROJECT SCHEDULE

APPENDIX 1 – 905(b) Report