

**SERVICE ORDER
PORT OF CORPUS CHRISTI AUTHORITY
OF NUECES COUNTY, TEXAS
MASTER SERVICES AGREEMENT NO. 18-10**

PROJECT NAME: 75-Foot Deepening Project Feasibility Study

PROJECT NO. 18-038A

SERVICE ORDER NO. 1

COMMENCEMENT DATE: May 15, 2018

This Service Order is executed by any between the Port of Corpus Christi Authority of Nueces County, Texas ("**PCCA**") and AECOM Technical Services, Inc. ("**Engineer**"). PCCA and Engineer agree that all of the Services authorized by this Service Order shall be subject to the terms and conditions of PCCA's Master Services Agreement No. 18-10 between PCCA and Engineer, as amended ("**Agreement**"). Upon execution of this Service Order, the Agreement shall be incorporated into and be considered part of this Service Order as if set forth herein in its entirety. Any capitalized terms in this Service Order that are not defined herein shall have the meanings given to them in the Agreement. If there is any inconsistency between the terms of this Service Order and the terms of the Agreement, the terms of this Service Order will control.

Engineer will provide the Services described in the Services of Engineer below in connection with the Specific Project described below.

Description of Specific Project:

Engineer will complete a Feasibility Study, Environmental Impact Statement (EIS), Section 204(f) Federal Assumption of Maintenance Report (204(f) Report), required documentation to satisfy NEPA requirements, and other tasks required to permit the PCCA to deepen the Corpus Christi Ship Channel from its authorized depth of -54 feet Mean Lower Low Water (MLLW) to -75 feet MLLW from the Gulf of Mexico to La Quinta Junction to accommodate Very Large Crude Carrier (VLCC) vessels.

Engineer anticipates an EIS document will be required however, through coordination with USACE an Environmental Assessment (EA) document will be pursued as a first action. Engineer will leverage all previously completed work for the CCSCIP, primarily the CCSCIP EIS completed by USACE in 2003, and all components contained within. The Section 204(f) process will include the development of a 204(f) Report, as well as the management and relevant agency meetings and coordination. The large effort components of work associated with the 204(f) Report include the Without Project Future Condition (WOPFC) Report, Economic Evaluation (Benefits Appendix), the Cost Appendix, Engineering Appendix, and Real Estate Appendix. In addition, a Section 408 decision document and NEPA documentation are also anticipated to be required. The tasks for completing this effort are as follows:

- Program and Project Management
- Section 404 and 408
- 204(f) Assumption of Maintenance Report
- NEPA Documentation
- Hydrodynamic Modeling
- Engineering
- Cost Estimating
- Economic Evaluation
- Real Estate

The specific services to be provided or furnished by Engineer under this Service Order are set forth in "Part I- Services" of Exhibit A, "Engineer's Services for Service Order," modified for this specific Service Order, and attached to and incorporated as part of this Service Order.

PCCA's Responsibilities

PCCA shall have those responsibilities set forth in Section 5.01 of the Agreement.

Service Order Schedule

In addition to any schedule provisions provided in Exhibit A or elsewhere, the parties shall meet the following schedule:

The Section 408 and 204(f) process schedules will be assumed to occur concurrently. Additionally, it is anticipated that the NEPA required process will occur in a manner that does not cause any delays to the Section 204(f) and Section 408 review and approval process. Upon submission of the deliverables to the USACE, Engineer shall not be held responsible for delays in the USACE review process as they are not under Engineer's control. Processing and review of the Section 404,408, and 204(f) depend USACE staff availability and processing times have varied dependent on project scale and other factors. Use of requester funds to expedite review by USACE under Section 214 of WRDA 2000 is possible and can be discussed. The schedule is broken out on a monthly timeline by Section 204(f) deliverable as follows:

- Seven (7) months from NTP, Engineer will submit the 204(f) Report and Section 408 Report for DQC;
- Two (2) months from Initial DQC submittal (9 months from NTP), Engineer will submit the 204(f) Report and Section 408 Report for ATR;
- Two (2) months from initial ATR submittal (11 months from NTP), Engineer will submit the 204(f) Report and Section 408 Report for HQUSACE and ASA Review; and

Should PCCA not return comments and/or instructions in the time listed in the schedule, the Engineer's schedule for subsequent items will be extended by the same number of days by which PCCA comments or instructions exceed the scheduled review with no further recourse by the Engineer against PCCA.

Method of Compensation

A. PCCA shall pay Engineer for services rendered under this Service Order using the Standard Hourly Rates with a Ceiling Price of **\$5,194,451**.

B. For this Hourly Rates Service Order, the estimated amount of compensation payable for each category of services rendered under this Service Order is as follows:

Description of Service	Est. Amounts
Program & Project Management	\$206,880
Section 404 & 408 Services	\$1,188,180
204(f) Assumption of Maintenance Report	\$293,220
NEPA Documentation	\$866,560
Modeling	\$507,600
Engineering	\$1,484,745
Cost Estimating	\$210,460
Economic Evaluation	\$216,960
Real Estate	\$62,280
Other Direct Costs (Travel)	\$96,000
Sub-consultant markup (a), 5%	\$61,566
CEILING PRICE	\$5,194,451

C. The terms of payment are set forth in Article 4 of the Agreement.

Consultants retained or that will be retained as of the Commencement Date of the Service Order: N/A

Other Modifications to the Agreement or the Exhibits to the Agreement: Not applicable

Exhibits or Attachments to this Service Order: Not applicable

Documents (other than the Agreement) Incorporated by Reference: Not applicable

Terms and Conditions

Execution of this Service Order by PCCA and Engineer shall make it subject to the terms and conditions of the Agreement (as modified above), which Agreement is incorporated by this reference. Engineer is authorized to begin performance upon its receipt of a copy of this Service Order signed by PCCA.

[Signature page follows this page]

IN WITNESS WHEREOF, each Party has executed this Service Order effective for all purposes as of the Commencement Date.

PCCA:

Engineer:

Port of Corpus Christi Authority

AECOM Technical Services, Inc.

By: _____

By: 

Name: Sean C. Strawbridge

Name: Rod McCrary

Title: Chief Executive Officer

Title: Vice President, Water, South Region

Date Signed: _____

Date Signed: 

Address for giving notice:

222 Power Street
Corpus Christi, Texas 78401
Attention: Director of Engineering Services

Address for giving notice:

605 Third Avenue
New York, New York 10158

PCCA's Designated Representative for Engineering Services:

Engineer's Designated Representative:

David L. Krams, P.E.

Abbas Sarmad

Title: Director of Engineering Services

Title: Senior VP - Global Director of Ports and Marine

Phone Number: (361) 885-6134

Phone Number: (212) 973-2900

Facsimile Number: (361) 881-5161

Facsimile Number: *N/A*

E-Mail Address: krams@pocca.com

E-Mail Address: abbas.sarmad@aecom.com

PCCA's Designated Representative for Environmental Permitting & Planning:

Sarah Garza

Title: Director of Environmental Planning & Compliance

Phone Number: (361) 885-6162

Facsimile Number: (361) 881-5161

E-Mail Address: sarah@pocca.com

**EXHIBIT A
ENGINEER'S SERVICES FOR SERVICE ORDER**

1. PROGRAM AND PROJECT MANAGEMENT

The Engineer Program Management Team and the Project Manager (PM) has responsibility for the oversight and completion of this Scope of Services by Engineer staff and sub-consultants. Engineer will develop a detailed Project Management Plan (PMP) to implement this Scope of Services. The PMP is a task driven plan for individual project deliverables through assignment of task leaders, budget, and scheduled milestones. The PM will provide bi-weekly updates to the PCCA regarding the progress of the task assignments. Project deliverables are identified in this Scope of Services and will be submitted to the PCCA after applicable Quality Assurance/Quality Control (QA/QC) reviews are conducted. PMP deviations in scope, schedule, or budget must be approved by the PCCA and PM in writing.

Quality control and peer reviews will be conducted throughout the Engineer production tasks to confirm that all aspects of the project, including all deliverables, are reviewed for consistency and accuracy prior to submittal and general distribution. In addition to review by Engineer, each sub-consultant that is to supply a component of the document will be required to apply their respective QA/QC procedures to their deliverables.

1.1. CLIENT COORDINATION MEETINGS

Bi-weekly meetings with PCCA will be conducted to coordinate activities, monitor progress, and address issues as they arise. A meeting agenda will be coordinated with the PCCA and its Project Manager. Meeting minutes will be prepared and distributed for each meeting. It is expected that, once a month, this meeting will be conducted in person in Corpus Christi. The remainder of monthly meetings will be held virtually using WebEx. Progress meetings will be attended by the PM, Task Leaders, and additional staff as appropriate. Additionally, PCCA, and Engineer PM and Task Leaders, and sub-consultants will participate in a kick-off meeting to ensure that all parties are in complete agreement on project goals, deliverables, schedule, and initial technical approach. Engineer will maintain decision logs for reference throughout this Service Order.

1.2. TEAM MEETINGS

The Engineer team will meet internally weekly to coordinate activities, monitor progress, and address issues as they arise. Meetings will be attended by the PM, Task Leaders, additional staff, and sub-consultants as appropriate.

1.3. QUALITY CONTROL AND QUALITY ASSURANCE (QA/QC)

Engineer will apply rigorous quality control standards to all deliverables. All comments/edits resulting from PCCA, project team reviews, along with those resulting

from Independent Technical Review internal to Engineer, will be documented and reflected in subsequent drafts.

1.4. PROJECT CONTROLS

Engineer will provide a monthly progress report to document work completed. A monthly invoice will also be prepared and submitted along with the progress report to the PCCA.

2. SECTION 404 AND SECTION 408 PREPARATION AND COORDINATION

2.1. PRE-APPLICATION COORDINATION MEETING

Engineer will prepare for and conduct a pre-application coordination meeting to brief US Army Corps of Engineers (USACE) personnel of the intent to file applications for Department of the Army (DA) Permit and Section 408 approval, disclose the intended project, and discuss the types and level of information, coordination, and potential consolidation or coordination of their review processes. This meeting will also serve to start the procedure to determine the appropriate level of NEPA documentation for the proposed project.

2.2. SECTION 404/10

The Clean Water Act (CWA), Section 404 requires a Department of the Army (DA) Permit for dredging and discharges to Waters of the U.S., including wetlands and special aquatic sites. Section 10 of the Rivers and Harbors Act of 1899 regulates activities to preserve navigable use of those waters, and is typically done through the same permit process. Activities associated with the Project will require the submittal of a USACE Section 10/404 Individual Permit (IP). CWA Section 401 allows States to certify compliance of federally permitted actions with applicable State water quality standards, and effluent limitations may be set as a certification condition. For brevity, these are referred to as the Section 404/10 process. The information required focuses on waters of the U.S. (WOUS) and aquatic impacts.

Engineer will coordinate with PCCA and the USACE and complete an IP application sufficient for review and approval by the USACE. Detail on new work and maintenance dredge quantities and makeup, project limits (e.g. in channel stations), reason for discharge, and description of avoidance, minimization, or compensation for impacts will be collected and produced.

Section 10 waters must be identified, and details of the project that could impact navigability are required, such as Federal channel limits, berth lines, ship-to-shore or other dock structure modifications that could encroach on the existing Federal channel. As part of the USACE IP application requirement for a project proponent to demonstrate that steps have been taken to avoid or minimize the potential impacts to environmental resources,

Engineer will prepare such application text in support of complying with 404(b)(1) Guidelines.

Engineer will coordinate with the Texas Coastal Management Program and the Section 401 Water Quality Certification concurrently with the Section 10/404 Permit application to ensure consistency.

Engineer will coordinate with the United States Army Corps of Engineers Galveston District (SWG) Office; prepare the permit application and supporting information; assist SWG with public notice for the permit and responses to public comments; and coordinate with resource agencies and SWG to gain final approval of the permit for PCCA.

2.3. SECTION 408

Engineer will prepare a complete Section 408 submittal per the current USACE guidance in EC 1165-2-216, Policy and Procedural Guidance for Processing Requests to Alter U.S. Army Corps of Engineers Civil Works Projects Pursuant to 33 USC 408, and USACE-CECW Director's Policy Memorandum Number DPM CW 2018-01, Section 408 -Interim Changes for Immediate Implementation and Future Policy Revisions.

Engineer will prepare a written request with the proposed alteration description and other information for the USACE to determine the location, purpose and need, anticipated construction schedule, and level of technical documentation needed for its evaluation, and PCCA's intentions to pursue a Sections 10/404/103 permit and Section 204(f).

Engineer will prepare the Section 408 report to include the data, analyses, and documentation needed by USACE to evaluate the application, including but not limited to:

- Introduction
- Related and Ongoing Studies
- Public Interest Determination
- Independent External Peer Review Exclusion
- Indirect Effects
- Residual Risk
- Administrative Record
- Discussion of Executive Order 11988
- Environmental Protection Compliance
- Real Estate
- Technical Analysis
- Preliminary Design
- Geotechnical Evaluation
- Structural
- Hydraulics and Hydrology
- Operation and Maintenance Requirements
- References

- Appendices
- Draft EIS or EA
- Project Preliminary Design Plates
- Geotechnical Analysis
- Independent External Peer Review (IEPR) Exclusion Request
- Agency Coordination Listed in Section 408 Guidance Memo
- DQC Documentation
- ATR Documentation and Certification
- Real Estate Appendix
- Legal Certifications

Engineer has developed the scope and schedule under the assumption that the Section 408 Report will undergo the same reviews as the Section 204 Report in a concurrent manner.

At the conclusion of this Task, Engineer will deliver to PCCA a Draft Section 408 Report for USACE Independent Technical Review (ITR), Final Section 408 Report for District review, USACE Agency Technical Review (ATR) and U.S. Army Corps of Engineers Headquarters (HQUSACE)/Assistant Secretary of the Army (ASA) review and approval.

2.4. AGENCY COORDINATION

Engineer will coordinate with representatives from State and Federal resource agencies including, the United States Fish and Wildlife Service (USFWS), National Marine Fisheries Service (NMFS), Texas Parks and Wildlife (TPWD), Texas Commission on Environmental Quality (TCEQ), and the Environmental Protection Agency (EPA) during project development to reduce project impacts on the environment, coordinate on mitigation should it be required, and provide early coordination and engagement on various Federal or State resource issue approvals such as Endangered Species Act, Magnuson-Stevens Fishery Conservation and Management Act, Coastal Zone Management Act (CZMA), the Marine Protection, Research and Sanctuaries Act (MPRSA), CWA, and Clean Air Act. Coordination will also be conducted to get input on dredged material placement planning, especially as relates to aquatic environment placement and beneficial use.

2.5. PUBLIC INVOLVEMENT

Engineer, as part of the Public Involvement task, will prepare for and distribute public notices, conduct public workshops, assess project user's views, and assist PCCA in incorporating public's views in reaching project decisions.

Engineer will coordinate two public outreach efforts during study development. For each event, the Engineer will prepare a notice/invitation for distribution which presents the current status of the study; announces the date, time, and location of the meeting; discloses the purpose of the meeting and the information being sought; and provides an alternate means to submit the information. The Engineer will also prepare exhibits and other visual aids and provide sufficient personnel to adequately conduct the meeting. Engineer will be

supported by Crouch Environmental Services, Inc. which may be required to prepare for and support public involvement and coordination.

- At the beginning of the study and as part of the scoping process, a public meeting will be held to solicit public and agency comments regarding issues the EIS should consider. This scoping meeting will aim to provide an overview of the project, present the proposed action, define resources to be analyzed, present the project approach, and provide key milestones in the EIS.
- When the Draft EIS is available, a Public Hearing may be held, if required, to present the findings.
 - o The notice for this Hearing will advise the public of the availability of the EIS, and disclose the time frame for public review and comment on these documents in addition to advertising the date/time/location of the Hearing.

To facilitate all of the above activities, the Engineer will prepare and maintain a mailing list of all agencies, organizations, media, and individuals known to be interested in the project.

PCCA will ensure that the maritime community is fully aware of the proposed project. This type of outreach will be especially valuable very early in the study and will be accomplished by a mix of formal meetings, informal meetings, publications, etc. Cross-utilization of public meeting materials will be maximized; however, the Engineer will support PCCA in materials development as needed to ensure that these meetings are effective in communicating relevant project information.

2.6. ODMDS COORDINATION

Under the MPRSA, it is the responsibility of the EPA and the USACE to monitor and manage ocean dredged material disposal sites (ODMDSs) to ensure that ocean dredged material disposal activities will not unreasonably degrade the marine environment or endanger human health. Engineer will coordinate with EPA and USACE to execute the ODMDS designation process.

In order to designate a new ODMDS, new work and maintenance material will require that representative sediment, water, and Suspended Particulate Phase (SPP) samples be collected and analyzed to determine potential environmental impact from the dredging and placement of material. In addition to the physical testing, bulk chemistry, elutriate preparation and analysis, water column toxicity testing, 10-day whole sediment toxicity testing, 28-day bioaccumulation testing, and tissue analysis will be performed. The results of testing will be coordinated with USACE and the U.S. Environmental Protection Agency (EPA) to evaluate the suitability of the dredged material for the proposed placement options. This work shall be performed in accordance with the following guidance:

- EPA and USACE (1991). Evaluation of Dredged Material Proposed for Ocean Disposal (Green Book)

- USACE (1995). QA/QC Guidance for Sampling and Analysis of Sediments, Water and Tissues for Dredged Material Evaluations (Chemical Evaluations). EPA-823-B-95-001
- USACE (2003). Evaluation of Dredged Material Proposed for Disposal at Island, Nearshore, or Upland Confined Disposal Facilities - Testing Manual
- EPA and US Army Corps of Engineers (2003). Regional Implementation Agreement (RIA) for Testing and Reporting Requirements for Ocean Disposal of Dredged Material off the Louisiana and Texas Coasts

The short and long term fate of disposed dredged material will be simulated using the USACE developed model, STFATE. STFATE enables the computation of the physical fate of dredged material disposed in open water and simulates the movement of the disposed material as it falls through a water column, spreads over the bottom, and is transported and diffused as suspended sediment by the ambient current

Engineer will develop a site analysis report to document possible environmental impacts associated with a new ODMDS.

A Site Management and Monitoring Plan (SMMP) for the ODMDS will be developed in accordance with Section 102(c)(3) of the MPRSA, as amended by WRDA 92. The SMMP will be coordinated with EPA and USACE and, at a minimum, will include the following:

- A baseline assessment of conditions;
- A program for monitoring;
- Special management conditions or practices to be implemented that are necessary for the protection of the environment;
- Consideration of the quantity and physical/chemical characteristics of dredged materials to be disposed of;
- Consideration of the anticipated use over the long-term; and,
- A schedule for review and revision of the plan.

3. SECTION 204(f) ASSUMPTION OF MAINTENANCE REPORT

Engineer will prepare the 204(±) Report in accordance with Section 204(±) and assist PCCA in executing a written agreement relating to Operation and Maintenance (O&M) of the proposed Project improvement as further described in sub-tasks below.

Engineer will work with PCCA in identifying the Project alternatives to be covered in the 204(±) Report. Engineer will also prepare a Dredged Material Management Plan (DMMP) for a minimum 20 years of maintenance.

3.1. INITIAL STUDY CHARETTE WITH USACE

Due to the expedited schedule of the work under this Service Order, it will be necessary to have coordination and reviews for all three major approvals under Sections 404, 408, and 204 proceeding simultaneously as much as possible.

Since these approvals occur through different sections of USACE SWG, an initial meeting is imperative with the various staff to define and coordinate specific review, and identify efficient review, coordination and document sharing that can be done to address issues under all three processes. The meeting can also be used to help determine common and appropriate NEPA documentation to avoid duplication of effort.

Engineer will arrange and conduct a meeting with PCCA and USACE staff to perform this coordination and confirm that they are in agreement with the assumptions and conduct of the study. This meeting will provide a formal review of the work plan and scope. Key assumptions will be addressed and the work plan modified as needed to obtain USACE approval.

3.2. SECTION 204(f) REPORT PREPARATION

Engineer will prepare the 204(f) Report which will document the information elements required in ER 1165-2-211 to demonstrate justification of Federal Assumption of Maintenance (AOM). This includes economic benefit analysis of the proposed project and the NED Plan, environmental compliance for implementing the project, designed to applicable USACE engineering standards, 20-year DMMP, and the need for independent external peer review.

The following list provides a typical outline of the 204(f) Report to be prepared by the Engineer:

- Executive Summary
- Study Authority
- Project Introduction
- Proposed Project Description
- Purpose and Need
- Description of Study Area
- Formulation of Plans
- Economic Justification
- Environmental Acceptability
- Engineering Acceptability
- Consistency with Federal Policy
- Construction, Operation, and Maintenance
- Real Estate
- Timeline
- References
- Appendices
- 33 U.S.C Section 408 Approval
- Cost Estimate
- Economics Appendix
- ATR Documentation
- DQC Documentation

- Report Checklist
- Approval Letters
- Operations White Paper (if needed)

At the conclusion of this task, Engineer will provide a draft 204(f) Report to PCCA.

3.3. USACE SOUTHWESTERN DIVISION (SWD) USACE AND HQUSACE REVIEW

Engineer will submit the draft 204(f) Report for USACE Engineer Independent Technical Review (ITR). Upon completion of the ITR, the Engineer will compile necessary documentation into a Quality Control Report to meet the USACE requirements for decision documents.

Engineer assumes that the Draft Report will undergo up to four cycles of review and comment with the USACE, including up to two SWG Reviews (DQC), an Agency Technical Review (ATR), and a concurrent HQUSACE/ASA Review.

Engineer assumes that USACE Division level review will be done concurrent with ATR. Engineer assumes that three phases of review will be conducted for which the Engineer will provide updated Draft reports for three phases of review. Upon receipt of all comments, Engineer will prepare the Final 204(f) Report for approval by the ASA.

4. NEPA DOCUMENTATION

Because three different Federal permit and approvals are being sought for the 75-foot project, NEPA is applicable. The existing Final EIS (FEIS) for the previously authorized channel improvement project may contain some information useful to developing an updated NEPA document for the 75-foot project to satisfy the NEPA requirements for the Section 204(f) Assumption of Maintenance. However, Engineer anticipates that an updated NEPA document will be required given its date of April 2003.

Given the scale of the project, it is assumed at least an Environmental Assessment (EA) will be required. Procedurally, the USACE determines the level of NEPA documentation required, and if it deems the potential impacts or public interest to be significant, could require an EIS. Other options possible under Council on Environmental Quality (CEQ) guidance are proceeding with an EA to determine if an EIS is necessary, and the use of a mitigated Finding of No Significant Impact (FONSI) under an EA process. This should be discussed and resolved at the pre-coordination meetings and initial charrette. For the purposes of this Service Order, Engineer proposes to develop an EA but prepare a scope of work for the level of effort of an EIS.

It is anticipated that the issues of greatest concern for USACE determining the level of NEPA required and extent of analysis expected will be the hydrodynamic and associated environmental effects of deepening the channel by another 25 feet, and accommodating the placement of tens of millions of cubic yards of dredged material. In general, it is expected that the NEPA document will make use of information previously provided in the April

2003 FEIS and will cover similar resources and effects topics, but it will have updated baseline information where resource changes require newer information.

In addition, Engineer will identify the appropriate agency coordination required, including Federal, State, and local agencies. Engineer will assist in drafting letters, coordinating and attending meetings, and conducting telephone calls to obtain relevant information and agency reviews of the potential environmental effects of the proposed project, as well as communicate updates to the proposed project. Upon receipt of comments from public and agency review of the draft NEPA document, Engineer will respond to comments and revise the draft document to produce the final NEPA document and FONSI or ROD as appropriate.

The work will be carried out as described in sub-tasks below.

4.1. BASELINE ENVIRONMENTAL DATA COLLECTION AND ENVIRONMENTAL IMPACT ANALYSES

Engineer will reuse the data from the 2003 FEIS as much as practicable, and collect or update data to produce the Affected Environment chapter of the NEPA document. Engineer will then use the information developed for the proposed project and associated **DMMP** to analyze the impacts for the following major resource or issue categories to support development of the Environmental Consequences and Cumulative Impacts chapters. Typical sub-topics are listed by each category below:

- Physical Environment - geological, water & sediment quality, air noise, hydrodynamic/oceanography
- Biological Environment - aquatic, terrestrial flora, fauna and habitat, threatened and endangered (T&E) species, essential fish habitat
- Socioeconomic - population, demographics, community & recreational resources, environmental justice
- Cultural Resources - historical and archeological resources, especially marine
- Hazardous, Toxic, and Radioactive Waste - hazardous waste cleanup and spill sites
- Land Use and Coastal Zone Management Resources
- Utilities & Infrastructure - impacted pipelines, roads, other structures etc. as applicable

Inherent in this analysis will be impacts to resources protected by statutes such as Endangered Species Act (ESA), Magnuson- Stevens Fishery Conservation and Management Act (MSFCMA), CZMA, Marine Protection, Research and Sanctuaries Act (MPRSA), Clean Water Act (CWA), Clean Air Act (CAA), Marine Mammal Protection Act, Migratory Bird Treaty Act (MBTA), Coastal Bend Bays & Estuaries Program (CBBEP) and other potentially relevant Federal and State resource statutes. Also, since Federal permitting of alterations to a water body (including for navigation) is involved, Fish and Wildlife Coordination Act (FWCA) consultation is expected.

4.2. REPORT PREPARATION

Engineer will prepare the EIS (or EA) as applicable, which will contain the following sections:

- Purpose & Need
- Alternatives Analysis
- Affected Environment
- Environmental Consequences
- Cumulative Impacts
- Compliance
- Conclusions
- List of Preparers & Reviewers

As needed, sections required for an EIS but not an EA, such as irreversible or irretrievable commitments of resources, will be added. Engineer will prepare draft and final documents for electronic dissemination.

4.3. MITIGATION

Some amount of habitat may be adversely impacted by the project and may result in a requirement for mitigation. Potential impacts might be unvegetated bay bottom, oyster reef, sea grass and possibly marsh. Engineer anticipates that mitigation for marine impacts to aquatic habitats will be achieved through the DMMP using dredged material beneficially to create or protect habitat to offset project impacts. Engineer will provide conceptual design for these features, which will most likely consist of marsh, oyster reef or placement areas protecting existing aquatic habitats. The conceptual design will include the geotechnical analysis for the settlement of dredged material to target marsh elevations, as well as conceptual engineering design as required for adequate circulation. Because not enough is known at this point where placement features will ultimately be and what resources will require mitigation, Engineer has allowed for a fixed amount of effort as provided in the fee proposal to conduct habitat impact field work, modeling, and preparation of a mitigation plan.

4.3.1. FIELD WORK

Engineer will carry out the required field work to verify presence or absence of wetlands, seagrasses, or oyster reef in new areas proposed for dredged material placement or where existing Dredge Material Placement Areas (DMPA) will be expanded. Engineer will be also responsible for collecting data in support of habitat modeling.

4.3.2. HABITAT MODELING

Engineer will carry out the required habitat modeling in the event that impacted aquatic resources regulated by the USACE Regulatory Process (e.g. wetlands, seagrasses) and National Marine Fisheries Service (NMFS) require mitigation determined by those agencies. This could include use of tidal marsh functional models, or habitat equivalency analysis (HEA). At the time of this Service Order, it cannot be determined which model will

be required by the Engineer. Habitat modeling required for Federal feasibility studies is not included as ER 1165-2-211 does not require this for 204(f) reports.

4.3.3. MITIGATION PLAN

A mitigation plan to meet the requirements of CWA Section 404, or for mitigation required for Essential Fish Habitat (EFH) or by the State (e.g. oyster reef) may need to be developed. Engineer has assumed a fixed amount of hours to develop a compensatory mitigation plan that meets the requirements in 40 CFR 230 for scoping purposes.

4.4. USACE DISTRICT REVIEW & COMMENT

Engineer will coordinate review of the Draft NEPA document and provide responses to comments and revisions to the NEPA document following the USACE Galveston District's Agency Technical Review. Engineer will also provide responses to comments from the public and resource agency comment period following the release of the Draft NEPA document.

4.5. FINAL REPORT PACKAGE

Engineer will revise and prepare the Final NEPA document, and either a FONSI or Record of Decision (ROD). This will include the necessary transmittal to USACE and EPA filing authorities. Deliverables: Draft NEPA document for PCCA review and Final versions for all deliverables.

5. HYDRODYNAMIC MODELING

5.1. HYDRODYNAMIC MODEL

Engineer will develop and implement a 3-Dimensional hydrodynamic and salinity transport model of the Corpus Christi Bay and adjacent areas in order to assess the feasibility of deepening the channel to -75 feet MLLW to accommodate VLCC tankers at Port Corpus Christi.

Engineer will undertake hydrodynamic modeling study to assess impacts to currents, water levels, and salinity due to the proposed Project channel modifications. The model will simulate hydrodynamics and salinity, with and without project modifications, for comparative analysis. Model development will include calibration against tidal water levels, currents, and salinities. Simulations for impact analysis will include a longer simulation period for normal conditions and two storm events. Salinity will only be included in the modeling of normal conditions. The analysis of the modeling results will be used to quantify the impact due to both the channel modification and the dredged material placement alternatives. Results will consist of 2D maps, time series and/or tables of the simulation results, or the difference between a baseline result and the project result, to highlight a change or impact.

Engineer will carry out these assessments for water levels, current velocities and salinities for the simulations under normal conditions. For the simulations with storm events, changes in water levels and currents will be used as indicators of the potential for causing surge-related erosive and inundation forces due to the Beneficial Use (BU) placement areas at neighboring areas, and a discussion of this potential impact will be provided. Engineer will combine the impacts determined by the analysis with sensitive habitat data to determine the significance of any major impacts.

Engineer will undertake this task as defined in following 6 sub-tasks.

5.1.1. DATA COLLECTION AND REVIEW

Engineer will obtain existing data and previous modeling analysis reports from the Port Authority and USACE and will review them to determine the availability of data required for modeling. Engineer will also review the general literature relating to the bay hydrodynamics.

Engineer will use the collected data to configure, force and calibrate the model. Data for configuration includes bathymetric data, shoreline geometry and navigation channel alignments. PCCA will provide dredging records to document the history of channel modification and depth and widths. Forcing data includes offshore tides, offshore salinity data, winds and river discharges. Calibration and validation data includes salinity, velocity and water elevation measurements within the bay as well as discharge measurements across sections of the bay. Engineer will use the existing modeling reports, such as the "TxBLEND Model Calibration and Validation for the Nueces Estuary", for existing data sources and providing guidance on required model parameters.

5.1.2. DATA GAP ANALYSIS

Engineer will review the data identified in Task 5.1.1 in the context of the project requirements. Data characteristics such as location, duration of the record, frequency and vertical resolution will be considered. Data gaps will be identified and the requirement monitoring will be specified. The results of this task will be used to design a field program to collect the required data.

5.1.3. MODEL DEVELOPMENT

Engineer will develop the site conceptual model to guide the modeling analysis. The conceptual model is essentially a road map of the analysis, and specifies each element of the process. Typical elements include:

- The extent of the model domain and grid cell size. This usually is a balance to minimize the required number of grid cells, provide the necessary grid resolution and locate the model boundaries sufficiently far from the study area.
- The required vertical resolution. This is dictated by the level of vertical mixing of salinity and temperature and can be determined from the measured data.

- Time step and simulation times. This is a balance between model accuracy and stability with objective of minimizing the time it takes to conduct a simulation.
- Initial conditions - if sufficient data is available, salinity initial conditions can be specified which will reduce the 'spin-up' time needed to initiate a model simulation.
- Suitable period for model calibration and validation runs.
- Suitable periods for the production runs. The production runs should cover the range of environmental forcing as characterized by bay/river discharges, tide amplitude and wind energy for durations sufficiently long to provide robust comparisons between the "with" and "without" projects.

The data identified in Task 5.1.1 and collected as a result of Task 5.1.2 will be reviewed and analyzed to quantify these elements of the conceptual model.

5.1.4. MODEL CALIBRATION AND VALIDATION

Engineer will configure the hydrodynamic model for existing conditions for calibration and validation periods specified in the site conceptual model. The model will then be calibrated to the historic data and data collected from the monitoring program. Key model parameters controlling friction and dispersion will be varied until the simulated flows, water elevations and salinity concentrations calibrate well with the measured data. Standard metrics will be used to evaluate time series comparisons. The model will then be validated by simulating another time period and the results will be compared to measured data using the same metrics. The results of the model validation will be used to assess the reliability of the model results.

5.1.5. MODEL SIMULATION

Engineer will use the calibrated and validated model to simulate a series of 'production runs' determined in the site conceptual model. The model will also be modified to represent the channel improvements and then used to simulate the same series of production runs. The results of the "with" and "without" project will be compared to estimate the potential impacts of the project on the salinity patterns in the bay.

5.1.6. DOCUMENTATION

Engineer will document the model input parameters, development method and results in a technical report. The report will include all work completed, key modeling assumptions and limitations and recommendations. The documentation will include maps of salinity characteristics throughout the bay for both "with" and "without" project conditions (maximum, minimum and average salinity). The maps will also be generated in a digital form for comparison with sensitive marine habitat data that can be subsequently used to determine the significance of potential impacts.

5.2. VESSEL DRAWDOWN AND WAKE EFFECTS

Engineer will develop and implement a two dimensional (2D) hydrodynamic model of Corpus Christi Bay and navigation channels to simulate the impacts of vessel drawdown and wakes effect on the adjacent areas and shoreline. The work is divided into six sub-tasks as described below.

5.2.1. DATA COLLECTION AND REVIEW

Engineer will obtain and review existing data and previous modeling analysis reports to determine the availability of required data required for modeling. The general literature relating to the bay hydrodynamics will also be reviewed. The data are needed to configure, force and calibrate the model. Configuration data consist of bathymetry, channel alignments and shoreline geometry. Forcing data includes offshore tides, winds, river discharges and vessel characteristics for both existing and projected future vessels. The characteristics include design vessel length, width; draft and forward speed. Calibration data consist of water level measurement in the vicinity of transiting vessels.

5.2.2. FIELD MEASUREMENTS

Engineer will undertake field measurements of ship wakes and drawdown for relevant sections along the Project to provide model calibration and validation data. PCCA will provide the vessel traffic logs which the Engineer will review and then develop a plan for collecting data for a variety of vessels transiting the navigation channel.

5.2.3. MODEL DEVELOPMENT

Engineer will develop the site conceptual model to guide the modeling analysis. The conceptual model is essentially a road map of the analysis, and specifies each element of the process. Typical elements are:

- The extent of the model domain and grid cell size. This usually is a balance to minimize the required number of grid cells, provide the necessary grid resolution and locate the model boundaries sufficiently far from the study area.
- Time step and simulation times. This is a balance between model accuracy and stability and minimizing the time it takes to conduct a simulation.
- The vessels characteristics and vessel transits to be used for model calibration and validation
- The future vessel characteristics and vessel transits

The data identified in Task 5.2.1 and collected as a result of Task 5.2.2 will be reviewed and analyzed to quantify these elements of the conceptual model.

5.2.4. MODEL CALIBRATION AND VALIDATION

Engineer will configure the model for existing conditions for the calibration and validation periods specified in the site conceptual model. The model will then be calibrated to reproduce the drawdown and wakes measured during the field program. Key model parameters controlling friction and dispersion will be varied until the simulated results are

calibrated with the actual field measurements. Validation simulations will be conducted using another set of vessel characteristics and used to assess the reliability of the model results.

5.2.5. MODEL SIMULATION "WITH" AND "WITHOUT" PROJECT

Engineer will reconfigure the calibrated and validated model to represent the improved channel and to simulate future vessel traffic. The simulated drawdown, wakes, and impacts to the shoreline will be reviewed and used to characterize the potential impacts of the improved channel and impacts due to VLCC vessel traffic.

5.2.6. DOCUMENTATION

Engineer will document the model development and implementation results in a technical report. The report will include all work completed, key modeling assumptions and limitations and recommendations. The documentation will include maps showing the changes in drawdown, wakes and shoreline impacts due to the anticipated future traffic associated with the channel improvements.

5.3. SHIP SIMULATIONS

In addition to scoping, this effort includes simulation preparation and research time, development and installation of various simulation databases and VLCC models in support of simulation research for the study.

6. ENGINEERING

6.1. SURVEYING

Bathymetric surveys are necessary to calculate dredging quantities and to inform preliminary engineering and will be utilized throughout the design process. USACE conducts regular surveys of CCSC and tributaries. Therefore, existing USACE survey data will be used. However, bathymetry is not available for the offshore portions of the project area from approximate Stations -210+00 to -600+00. It is estimated that the hydrographic survey fieldwork will take approximately five (5) days to complete and will provide full coverage of the 600-foot-wide channel plus 350 feet on either side of channel toes.

Side scan and magnetometer surveys of the channel will be collected from LaQuinta Junction (approximate USACE Station 530+00) to the 75-foot contour (at approximately USACE Station -600+00).

Engineer has not included the scope of work for topographic surveys of existing DMPAs or BU sites.

6.2. VOLUME ESTIMATES

Engineer will evaluate material types and quantities in the channel. The evaluation will be based on both existing and new channel boring logs and laboratory test results together with the proposed new channel template. The evaluation will be used to develop Engineers Opinion of Probable Costs (EOPC) and develop the Dredged Material Management Plan (DMMP).

6.2.1. NEW WORK DREDGE MATERIAL

Engineer will prepare estimates for the New Work dredge volumes and types for the channel deepening Project. For any material placed in a confined placement area, bulking factors will be developed for each material type. Likewise, consolidation factors will be developed for the materials to be placed in the alternative Dredged Material Placement Areas (DMPAs). Bulked volumes of the various dredged materials by reach will be tabulated.

6.2.2. MAINTENANCE MATERIAL

Engineer will review historical maintenance dredging records and other available studies from PCCA to calculate the predicted annual maintenance dredging volumes for each alternative. The predicted annual volume will be used to formulate the 20-year DMMP.

6.3. GEOTECHNICAL INVESTIGATION

Engineer will utilize available geotechnical data from LaQuinta Junction to Harbor Island (approximate USACE Station 30+00). Engineer will perform a geotechnical investigation from Harbor Island (or USACE Station 30+00) to the -75 foot MLLW contour in the Gulf of Mexico (at approximate Station at -600+00). The scope of work includes:

- Sample Collection
 - 42 borings to a maximum depth of 85 feet MLLW
 - Borings for this project are located in water depths of -50 to -75 feet MLLW
 - Borings will be performed using mud rotary drilling techniques
- Testing
 - Engineer will provide on-site and laboratory material testing services in accordance with American Society Testing Materials (ASTM) standards or other industry standards accepted by PCCA

The geotechnical analyses will be documented and be included in the Engineering Appendix. The work product will include geotechnical plates, figures and exhibits, geotechnical design, and all technical review. Geotechnical analyses will include identification of physical and engineering characteristics of the anticipated new work materials from channel excavation in order to determine proper placement schemes in existing or proposed upland or beneficial use sites.

Engineer assumes that feasibility level plan for BU or DMPA as part of the DMMP will be provided under this Service Order. Based on estimated quantities of new work and

projected maintenance dredge materials and as part of Task 6.4, an analysis will be performed to determine whether adequate capacity is available in existing DMPAs. If the analysis of existing placement capacity indicates additional placement capacity is required for the project, then new upland and/or beneficial use placement capacity may need to be further analyzed to determine required size and construction requirements. This Service Order does not include the scope of work for additional geotechnical investigations or geotechnical analyses to support final design of any new BU or DMPA.

6.4. DREDGED MATERIAL MANAGEMENT PLAN (DMMP)

Using the information listed above in Task 6.2, the new work dredged materials and maintenance dredged materials will be assigned to placement areas in a sequence and location/use that efficiently manages the materials based on the existing DMMP.

Engineer will perform and undertake evaluation of dredged material suitability, equipment suitability analysis, limited analysis of sediment resuspension during dredging, and estimation of suspended solids in placement area effluent.

The timing, volume, and material type for each assigned placement area will be tabulated. The volume capacities of the placement areas will be estimated using the applicable bulked volumes, material types and consolidation factors. These volumes will assist in developing the opinions of probable construction costs for dredging alternatives as discussed in Task 7.

Engineer will perform cost estimating using the USACE's Dredging Estimating Program (CEDEP). Cost estimating will cover dredging portions of the work (including mobilization/demobilization of dredges, pipeline, and ancillary items) and the associated placement area preparation.

Engineer will prepare a 20-year DMMP that utilizes all available management strategies that are determined feasible and cost effective for this portion of the CCSC. The DMMP will be based on the estimated new work quantities and long-term maintenance requirements. General strategies will target using the existing permitted placement areas.

PCCA has indicated a new Offshore Dredged Material Disposal Site (ODMDS) may be required. The efforts for offshore placement at a new ODMDS are regulated, requiring testing to comply with Section 103 of the Marine Protection, Research and Sanctuaries Act (MPRSA). Along with sediment testing and modeling, additional coordination with the Environmental Protection Agency (EPA) will be required. The DMMP will be developed in coordination with the PCCA and resource agencies to determine optimum locations, elevations, and quantities for material placement. The 20-year DMMP will be prepared as a stand-alone document that will be included with the 204(f) Report.

Engineer will develop the construction quantities for the recommended plan based on the preliminary design and the following elements will be considered for the DMMP:

- Beneficial Use of Dredged Material

- Existing Offshore Dredged Material Disposal site(ODMDS)
- NewODMDS
- Existing DMPAs
- NewDMPAs
- Shoreline protection for new or modified DMPAs
- Marsh and/or bird island restoration sites
- Shoreline protection for marsh and/or bird island restoration sites
- Beach nourishment
- Levee raising and maintenance for confined placement areas

Engineer has not included scope of work related to additional field studies including hydrologic and topographic surveys and subsurface exploration to obtain additional soils data which may be required for new or expanded DMPAs and/or BU sites.

6.5. ENGINEERING APPENDIX

Engineer will prepare and present the engineering and design work conducted for the selected plan in an Engineering Appendix to the 204(t) 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 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. The Engineering Appendix will be structured following guidance found in Appendix C of Engineer Regulation (ER) 1110-2-1150 - "Engineering and Design - Engineering and Design for Civil Works Projects."

7. COST ESTIMATES

Engineer will prepare alternative cost 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. 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.

During the Plan Formulation phase, further refinement will occur to the cost estimates. Engineer has assumed that detailed cost estimates will not be performed on any of the alternative plans considered during the screening process.

Engineer will prepare a fully funded Micro-computer Aided Cost Estimating System (Mii) baseline estimate for the selected plan and the locally preferred plan. Engineer will develop a Mii estimate for Economics study based on old fuel prices for the B/C ratio. This includes developing contingencies with Project Development Team (PDT) members, calculating O&M costs, completing the cost estimate supplement to the Engineering Appendix, and developing both inflated dollar and constant dollar estimates.

7.1. PARAMETRIC COST ESTIMATES FOR THREE ALTERNATIVES

Engineer will prepare opinions of probable construction cost (construction cost estimates) for use in alternatives comparison for up to three channel alternatives for deepening the CCSC. The parametric cost estimates will be based on unit costs and lump sums derived from actual costs or estimates from similar projects in the region, but will not be based on MCACES (Mii) or CEDEP estimates. The objective of these estimates is to provide relative costs for comparison of alternatives, not to develop project budgets. Estimates will be based on quantities, volume estimates, and take-offs provided by Engineer.

At the conclusion of this task, Engineer will provide a Draft and Final Parametric Cost Estimate Tables to PCCA.

7.2. COST ESTIMATE FOR PREFERRED ALTERNATIVE

Engineer will prepare opinions of probable construction cost (construction cost estimates) for use in Cost Appendix in support of the 204(f) Report. The construction cost estimates will adhere to the following USACE guidance:

- ER 1110-2-1302 Civil Works Cost Engineering (Sep 2008)
- ER 1110-1-1300 Cost Engineering Policy and General Requirements (Mar 93)
- EI O1ODO10 Construction Cost Estimate
- EM 1110-2-1304 Civil Works Construction Cost Index System

The following cost estimating software will be utilized to prepare the estimate:

- U.S. Army Corps of Engineers Dredge Estimating Program (CEDEP)
- Micro-computer Aided Cost Estimating System (MCACES) Second Generation (Mii)

The cost estimate for the preferred alternative will have reasonable contingency costs included into the estimates to cover any unknowns. Local and regional databases will be utilized and unique cost items, not in the databases, will be estimated based on Engineer experience in the area.

7.3. COST AND SCHEDULE RISK ANALYSIS

Engineer will prepare a cost and schedule risk analysis for the 20-year maintenance dredging program costs for the CCSC for use in the Cost Appendix in support of the 204(f) Report. The cost and schedule risk analysis will be performed in two separate phases, the first phase covering the initial 10 years of maintenance dredging, and the second phase covering the remaining 20 years of maintenance dredging. It is envisioned that two separate meetings will be held with the appropriate members of the project team including USACE Galveston District personnel, PCCA, and Engineer and Engineer personnel. The first meeting will allow the project team to develop the project risks and associated impacts involved with both phases of the 20-year maintenance dredging life cycle. Based on input during the meeting and using the maintenance dredging life cycle costs, Engineer will develop the risk register and perform the required sensitivity analysis using the Crystal Ball

software. The corresponding cost and schedule contingencies will be developed using the risk analysis processes as mandated by the following USACE guidance:

- ER 1110-2-1150 Engineering and Design for Civil Works (Aug 1999)
- ER 1110-2-1302 Civil Works Cost Engineering (Sep 2008)
- Cost and Schedule Risk analysis Process guidance prepared by USACE Cost Engineering Directory of Expertise (DX).

This task includes the effort necessary to prepare draft and final reports covering the cost and schedule risk analysis including risk register, impacts, cost sensitivity analyses, cost contingency results, cost risk analysis model (crystal ball report), and associated meetings.

7.4. COST APPENDIX

Engineer will prepare draft and final documents for the CEDEP and MCACES (Mii) estimates covering the general navigation project features.

The document will include the MCACES estimates prepared and narrative documentation of the construction techniques, the quantity estimates, and contingency items. The Cost Appendix including non-construction costs will be assembled by Engineer. Engineer will apply discount rates and/or inflation as necessary to assemble net present values or annualized costs for future maintenance.

At the conclusion of this task, Engineer will provide Draft and Final Cost Estimates for Cost Appendix (Concurrent with 204(f) Report Deliverable).

8. ECONOMIC EVALUATION

To obtain Federal AOM, a Section 204(f) Study must demonstrate that a project is economically justified by showing that the project has excess benefits when considering the costs and Without Project Future Condition (WOPFC) baseline condition.

Engineer will undertake the Economic Evaluation to describe in detail how the benefits of the project are calculated, including the data used and the assumptions made.

Engineer will use the HarborSym model, as required by the USACE, to calculate economic benefits of harbor improvements considered for the Project. Engineer will study multiple with-project conditions to identify the NED plan which maximizes NED benefits in relation to project costs.

The Engineer economics team will make several trips to the Corpus Christi area to meet with the Corpus Christi Pilots Association and the PCCA staff to discuss historic and projected vessel traffic, channel dimensions in the WOPFC and with-project conditions, pilot rules in the WOPFC and with-project conditions, and other vessel operating practices, including trade routes for the proposed Very Large Crude Carriers (VLCC) vessels

anticipated to call at the Port Corpus Christi. Engineer will also work closely with the PCCA staff to ensure relevant future market conditions are modeled accurately.

Due to the unique nature and requirements of a Section 204(f) AOM Study, the development of an appropriate without-project condition is critical to the benefit calculations. Engineer will work closely with USACE Galveston District, Southwestern Division, and Headquarters staff to develop an accepted without-project condition in order to minimize review comments and revisions.

Engineer will create a without-project vessel call list based on data provided by PCCA and the 2016 WCSC (Waterborne Commerce Statistics Center) data. The HarborSym vessel call list will include all vessel traffic within the harbor, even non-benefiting traffic.

Engineer will use the HarborSym node network provided by the Port of Corpus Christi. Engineer will use this node network and the 2016 vessel call list, pilot rules, and vessel operating practices to calibrate the HarborSym model to ensure its accuracy.

Engineer will also use the Port of Corpus Christi Vessel Network Model (VNM), developed by Engineer, to calibrate the HarborSym Model. After calibration, Engineer will modify the 2016 without-project scenario to create the without-project future condition with Suezmax and VLCC crude oil tankers calling on the new crude oil terminal(s).

The future with-project scenarios will include VLCCs fully loading at the new oil terminal(s). Engineer will use the most recent IWR Economic Guidance Memorandum for guidance on using vessel operating costs.

Engineer will use historic data and information provided by the PCCA to create WOPFC and with-project commodity forecasts for the 50-year life of the project. The commodity forecasts will need to include the region of the world where the commodity is originating or terminating. Engineer will use these forecasts to create detailed vessel call lists for use in HarborSym for future condition. These vessel call lists will include each individual forecasted vessel call at the Port, with vessel dimensions, the amount of commodity carried, and the origin or destination of the vessel. Engineer will create high, low, and most likely commodity forecasts and vessel call lists for each with- and without-project condition and year. This will allow Engineer to conduct a sensitivity analysis, which is a required part of any USACE Feasibility Study.

Engineer will create multiple scenarios in HarborSym associated with each vessel call list, for the with- and without-project conditions for the base year and select years over the course of the 50-year project planning life.

Engineer will run each scenario in the HarborSym model for 50 iterations. Engineer will use these results to calculate the NED benefits of the proposed harbor improvements. Engineer will prepare a detailed economics appendix that explains the data, assumptions, model results, and NED benefits.

The following list provides the proposed outline of the Economics Appendix:

- Introduction
- Historical Commodity Movement and Vessel Traffic
- Projected Commodity Throughput
- Project Alternative
- Future Vessel Fleet
- Harborsym Model Development
- HarborSym Results
- Risk and Uncertainty
- Comparison of Benefits and Costs and Identification of Locally-Preferred Plan

Engineer will document the inputs, process and findings into Draft and Final Economics Appendix.

9. REALESTATE

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 (if applicable). 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, and attend study team meetings.

9.1.1. MAPPING

Real Estate Project planning maps will be developed from existing maps, preliminary Engineering design drawings, aerial mosaics, and real property maps obtained from the various county tax assessor's offices and the PCCA. 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 Right of Ways (ROW) and placement area easements owned by PCCA and USACE and will be exhibits to the REP.

The existing conventional real estate segment maps which cover the project will be converted to electronic format (CADD) if needed 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.

9.1.2. 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 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.

9.1.3. REAL ESTATE PLAN (REP)

Engineer, in coordination with the USACE and PCCA, will prepare a Real Estate Plan in accordance with ER 405-1-12. The Real Estate Plan will address land, easements, right-of-ways and relocation which will be needed to support the project. A cost for the acquisition and processing will be included in the Real Estate Plan, as well as in the Cost Appendix.

The following list provides the proposed outline of the Real Estate Appendix:

- Project description
- Land requirements
- Federally owned land within the project area
- Describe Lands, Easements, Rights-of-Way, and Relocations
- Non-Federal Sponsor-Owned Lands, Easements, Rights-of-Way, and Relocations
- Navigation Servitude issues relevant to the project
- Existing Federal Projects
- 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, and Radioactive Waste and Other Environmental Considerations
- Attitudes of Land Owners
- Recommendation
- Other Relevant Real Estate Issues

At the conclusion of this Task, the Engineer will provide Draft and Final Real Estate Appendix (Concurrent with 204(f) Report Deliverable) to PCCA.

SCHEDULE ASSUMPTIONS AND QUALIFICATIONS

The following additional assumptions and qualifications, in addition to the scope exceptions stated throughout this Service Order, apply to this Service Order:

- Engineer anticipates an EIS document, but through coordination with USACE an Environmental Assessment (EA) document will be pursued as a first action.
- Three project alternatives will be sufficient to for economic evaluation and to satisfy USACE requirements.
- Up to four USACE reviews would be required: up to two DQC, one ATR, and one concurrent HQUSACE and ASA review.
- Topographic surveys of existing DMPAs or BU sites have not been included in this Service Order.
- If the analysis of existing placement capacity indicates additional placement capacity is required for the project, then new upland and/or beneficial use placement capacity may be analyzed to determine required size and construction requirements.
- Additional survey, geotechnical investigations/borings and archeological investigations may be required as part of this scope.
- NED benefits will be based upon transportation cost savings using the HarborSym model.
- The Port of Corpus Christi will provide the HarborSym node network, the current USACE Vessel Operating Costs, and latest vessel call lists.
- Only two alternatives will be evaluated: the without-project condition (WOPC) and the with-project condition (WPC) 75 feet deepening alternative. VLCCs will be used to export crude oil and will either be loaded by reverse lightering in the WOPC or be fully loaded in port in the WPC (75 feet).
- The PCCA will coordinate with Pilots Association and provide harbor rules regarding VLCCs.
- Engineer will not address barge traffic in the Economic Appendix.
- This SOW assumes the current laws and regulations in place at the time of this proposal. Should USACE or other Federal and State regulations or requirements change, additional scope and budget may be required.
- This SOW assumes a specified schedule. If the schedule is extended, due to reasons out of Engineer's control, additional scope or budget may be required.
- PCCA will provide available data in a timely manner or will promptly notify Engineer if they are not available.