



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

**SECTION 905(b) ANALYSIS  
WILMINGTON HARBOR NAVIGATION  
IMPROVEMENT PROJECT  
NORTH CAROLINA INTERNATIONAL TERMINAL**

**NEW HANOVER AND BRUNSWICK COUNTIES  
NORTH CAROLINA**

**FEBRUARY 2010**

SECTION 905(b) ANALYSIS  
WILMINGTON HARBOR NAVIGATION IMPROVEMENT STUDY, NORTH CAROLINA  
INTERNATIONAL TERMINAL, NEW HANOVER & BRUNSWICK COUNTIES, NC

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## 1. STUDY AUTHORITY

a. This Section 905(b) (WRDA 1986) Analysis was prepared as an initial response to the Resolution of the Committee on Transportation and Infrastructure, Docket 2755, dated June 28, 2006, which reads as follows:

*Resolved by the Committee on Transportation and Infrastructure of the United States House of Representatives, that the Secretary of the Army is requested to review the report of the Chief of Engineers on Cape Fear – Northeast (Cape Fear) River, published as House Document 164, 105<sup>th</sup> Congress, and other pertinent reports to determine whether any modifications of the recommendations contained therein are advisable in the interest of navigation improvements and associated water resource development opportunities for Wilmington Harbor, North Carolina.*

b. Funds in the amount of \$96,000 were appropriated in Fiscal Year 2009 to conduct the Reconnaissance phase of the study.

## 2. STUDY PURPOSE

The purpose of this Reconnaissance Phase Study is to determine whether there is a Federal (Corps) interest in participating in a cost shared Feasibility Phase Study to modify the existing Wilmington Harbor project in the interest of navigation improvements. In response to the study authority, the Reconnaissance Study was initiated in June 2009. The Reconnaissance Phase Study has resulted in the finding that there is a Federal interest in continuing the study into the Feasibility phase. The purpose of this Section 905(b) Analysis is to document the basis for this finding and establish the scope of the Feasibility phase. As the document that establishes the scope of the Feasibility study, the Section 905(b) Analysis is used as the chapter of the Project Management Plan that presents the reconnaissance overview and formulation rationale.

## 3. LOCATION OF STUDY, NON-FEDERAL SPONSOR AND CONGRESSIONAL DISTRICTS

### A. Study Area

The study area is located in Brunswick and New Hanover Counties, North Carolina as shown in Figure 1 below.

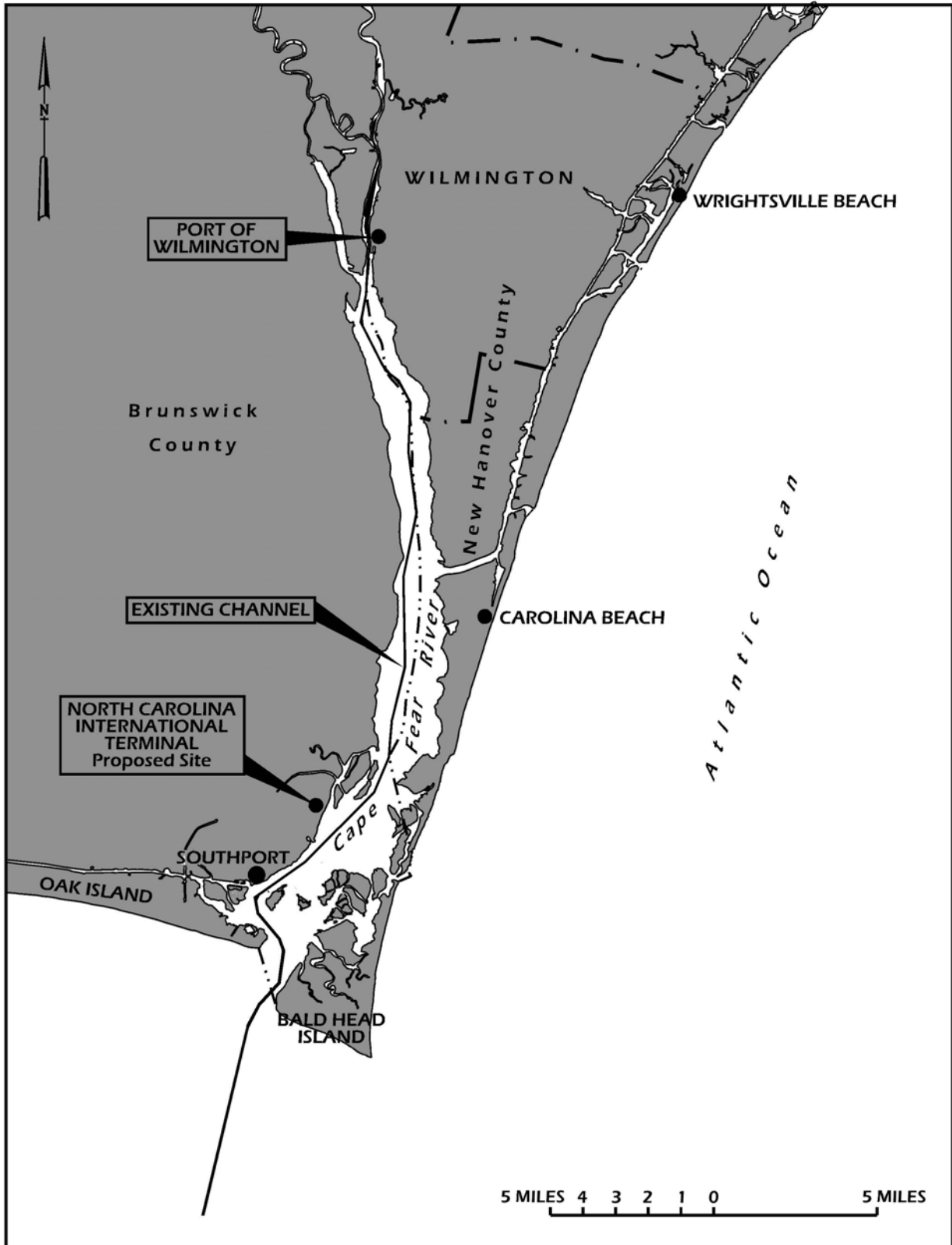


Figure 1 Study Area

## B. Project Sponsors

Potential non-Federal sponsor for the Feasibility phase of the study is the State of North Carolina.

## C. Congressional District

The study area lies within the jurisdiction of the North Carolina Congressional District 7 – Mike McIntyre, Senator Kay Hagan and Senator Richard Burr.

## 4. PRIOR REPORTS, EXISTING PROJECTS AND STUDIES

US Army Corps of Engineers, Wilmington District, *Final Feasibility Report and Environmental Impact Statement on Improvement of Navigation, Cape Fear – Northeast Cape Fear Rivers Comprehensive Study, Wilmington, North Carolina, June 1996.* This report was prepared in final response to a resolution adopted 8 September 1988 by the United States House of Representatives, which directed that the existing Federal project for Wilmington Harbor be reviewed and improvements considered.

US Army Corps of Engineers, Wilmington District, *Environmental Assessment, Preconstruction Modifications of Authorized Improvements, Wilmington Harbor, North Carolina, February 2000.* This EA addressed preconstruction modifications to harbor improvements including Ocean Bar Channel realignment, beach placement of dredged sand, rock blasting without air curtains, and a comprehensive dredging and disposal plan.

U.S. Army Corps of Engineers, Wilmington District, Initial Appraisal. An Initial Appraisal is being prepared to determine the need for further studies authorized by Section 216 of the Rivers and Harbors and Flood Control Act of 1970. This Act authorizes investigations for modification of completed project or their operation when found advisable due to significantly changed physical or economic conditions and for improving the quality of the environment in the overall public interest. The initial appraisal will determine whether there is value in further investigation in two areas: (1) whether there is more shoaling in the channel than was anticipated during the initial planning of the project, causing maintenance costs to be higher; and (2) whether the channel should be optimized for navigation.

## 5. PLAN FORMULATION

As part of any Corps study, six planning steps that are set forth in the Water Resource Council's Principles and Guidelines are undertaken to focus the planning effort and eventually to select and recommend a plan for authorization. The six planning steps are: 1) specify problems and opportunities, 2) inventory and forecast conditions, 3) formulate alternative plans, 4) evaluate effects of alternative plans, 5) compare alternative plans, and 6) select the recommended plan. The iterations of the planning steps typically differ in the emphasis that is placed on each of the steps. As part of the reconnaissance phase, the step of specifying problems and opportunities is emphasized. That is not to say, however, that the other steps are ignored because the initial analysis of preliminary plans that results from the other steps is very important to the scoping of the subsequent Feasibility phase studies.

For the purposes of this reconnaissance phase study, the scope of investigations is focused on the analysis of potential net economic benefits and potential environmental effects associated with modification of the existing federal (Corps) navigation channel. It is understood that associated land based infrastructure improvements which would be implemented by state and/or other Federal agencies are integral to the feasibility of Federal channel modification. These facilities may include upgraded or new terminal facilities, highways and rail improvements or any other such facilities necessary to achieve project benefits. It is the Corps understanding that further evaluation of such landside features by state and other non-federal entities is ongoing and will likely continue concurrent with Corps studies. As the reconnaissance analysis is limited to existing and readily available information, it is assumed for this initial evaluation that all land based infrastructure is feasible.

Though these facilities would be undertaken by others, the Corps must consider the costs and consequences of the associated facilities in this preliminary analysis as well as during detailed studies conducted during the feasibility phase. Consideration of the associated costs and consequences is included in section 5.7. This analysis will be refined and expanded to address these interdependent and connected actions in future iterations of the planning process that will be accomplished during the Feasibility phase.

The discussion that follows presents the results of the initial iterations of the planning steps that were conducted during the reconnaissance phase.

## 5.1 National Objectives

The national or Federal objective of water and related land resources planning is to contribute to National Economic Development (NED) consistent with protecting the nation's environment, pursuant to national environmental statutes, applicable executive orders, and other Federal planning requirements. Contributions to National Economic Development (NED) are increases in the net value of the national output of goods and services, expressed in monetary units. Contributions to NED are the direct net benefits that accrue in the study area and the rest of the nation.

The Corps has added a second national objective for National Ecosystem Restoration (NER) in response to legislation and administration policy. This objective is to contribute to the nation's ecosystems through ecosystem restoration, with contributions measured by changes in the amounts and values of habitat.

## 5.2 Problems and Opportunities

This section describes the need for harbor improvement in the context of problems and opportunities that can be addressed through water and related land resource management. Problems and opportunities statements will be framed in terms of the Federal objective and the specific study planning objectives. Problems and opportunities should be defined in a manner that does not preclude the consideration of all potential alternatives to solve the problems and achieve the opportunities.

## 1) Problem Identification.

- The existing authorized navigation project currently restricts vessel use to a smaller than desired class size due to insufficient channel depth. This limits opportunities to accommodate larger class vessels which are a growing percentage of the world fleet, and allows for economies of scale and transportation cost savings.
- Growth trends in container traffic indicate demand cannot be accommodated by the supply of existing facilities along the East Coast within the planning period (defined in Section 5.7). Lack of available facilities would result in inefficiencies in commodity movement as well as safety concerns resulting in increased transportation costs.

## 2) Opportunities

A review of existing literature indicates a rapid growth of container trade since containerization was begun in 1980. This segment has been the fastest growing US trade for the last 30 years. Trade is growing at twice the rate of Gross Domestic Product (GDP). It is expected that this growth will continue, providing opportunities and requirements for additional container facilities throughout the US.<sup>1</sup>

Existing container facility capacity is rapidly being consumed and is growing much slower than container trade. This difference in growth rates is expected to soon lead to shortages of container facilities and capacity in many parts of the US. Container facilities will reach maximum capacity in the North Atlantic first followed by the West Coast, then the Gulf Coast, and finally the South Atlantic. This will require shifts in container movements as existing facilities reach capacity and are no longer able to expand their throughput.<sup>2</sup>

There is opportunity to address future congestion, delays and associated increased cost of commodity movement through the expansion of existing Wilmington Harbor facilities. This may be accomplished through the development of new facilities and/or improvements to existing facilities.

Opportunity also exists to deepen the Cape Fear River channel to accommodate larger container vessels. Particularly important are those vessels which will be accommodated by the Panama Canal Expansion Project expected to be complete in 2014. These larger vessels, commonly referred to in the shipping industry as the “Post Panamax” vessels are expected to comprise greater percentages of vessel fleet composition over the next several decades. This transition to larger vessels is expected to occur rapidly and current Panamax vessels are expected to no longer be used in the Asia service by 2024. Additional depth would be required to serve existing users

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<sup>1</sup> Seaport Consultants Canada, Inc., “The World Economy and Container Trade Tank,” March 2009: Issue 6

<sup>2</sup> CH2M Hill. “North Carolina International Terminal: Pro-Forma Business Plan” (North Carolina State Ports Authority). March 2008.

of Wilmington Harbor (i.e. Yang Ming/Hanjin) by that time, as the transition from the current Panamax fleet is complete.<sup>3</sup>

### 5.3 Planning Objective

Reduce transportation costs in the most cost effective and environmentally acceptable manner.

### 5.4 Planning Constraints

Unlike planning objectives that represent desired positive changes, planning constraints represent restrictions that should not be violated. The planning constraints will be reexamined and finalized in the feasibility phase. The planning constraints identified in this preliminary analysis are as follows:

- 1) Compliance with Applicable Executive Orders, Statutes and Regulations including but not limited to: Archeological and Historic Preservation Act, Archeological Resources Protection Act, Clean Air Act, Clean Water Act, Coastal Barriers Resource Act, Coastal Zone Management Act, Magnuson-Stevens Act, Marine Protection, Research and Sanctuaries Act, Endangered Species Act and National Environmental Policy Act.
- 2) Project must be economically justified with expected benefits over the 50-year project life.

### 5.5 Planning Criteria

The following are preliminary criteria for evaluating proposed project alternatives. These criteria will be finalized in the feasibility report.

- 1) The navigation project must be economically justified with expected benefits exceeding expected costs over the 50-year project life.
- 2) The recommended alternative will provide a long-term solution that is technically and environmentally feasible.

### 5.6 Potential Alternatives:

This reconnaissance level alternatives analysis does not constitute a complete analysis of the full array of potential alternatives nor does it define a preferred alternative or National Economic Development (NED) plan. Detailed analysis would be conducted in the feasibility phase and would involve evaluation of all reasonable alternatives to address the problems and opportunities. Such alternatives would include, but would not be limited to analysis of alternative channel alignments, terminal locations, structural and non-structural measures and

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<sup>3</sup> Ralph, Bill. "Some thoughts on what the future holds for the Economy & our Ports," South Atlantic & Caribbean Ports Association Meeting, 6 Nov 2009. <[http://aapa.files.cms-plus.com/SeminarPresentations/2009Seminars/09Facilities/09FACENG\\_Ralph\\_Bill.pdf](http://aapa.files.cms-plus.com/SeminarPresentations/2009Seminars/09Facilities/09FACENG_Ralph_Bill.pdf)>



channel depths. Feasibility level studies allow for an in-depth understanding of environmental, economic and technical considerations allowing for a thorough analysis and documentation of tradeoffs between project alternatives. In contrast, the limited analysis during the reconnaissance phase requires the development of reasoned assumptions and best professional judgment to support the analysis of federal interest in further study. As the North Carolina State Ports Authority (NCSPA) has acquired a site for proposed terminal development, this location will be utilized as the basis for this preliminary analysis. The assumed design vessel for this analysis is the same as that which guided the improvements to the Panama Canal by the Panama Canal Authority. This Post Panamax vessel is 1,200 feet long, 160 feet wide and has design draft of 50 feet with a nominal cargo capacity of 12,000 Twenty-Foot Equivalent Units (TEU).<sup>4</sup> A brief discussion regarding reconnaissance level assumptions on channel alignment, depth and dimension and are provided below.

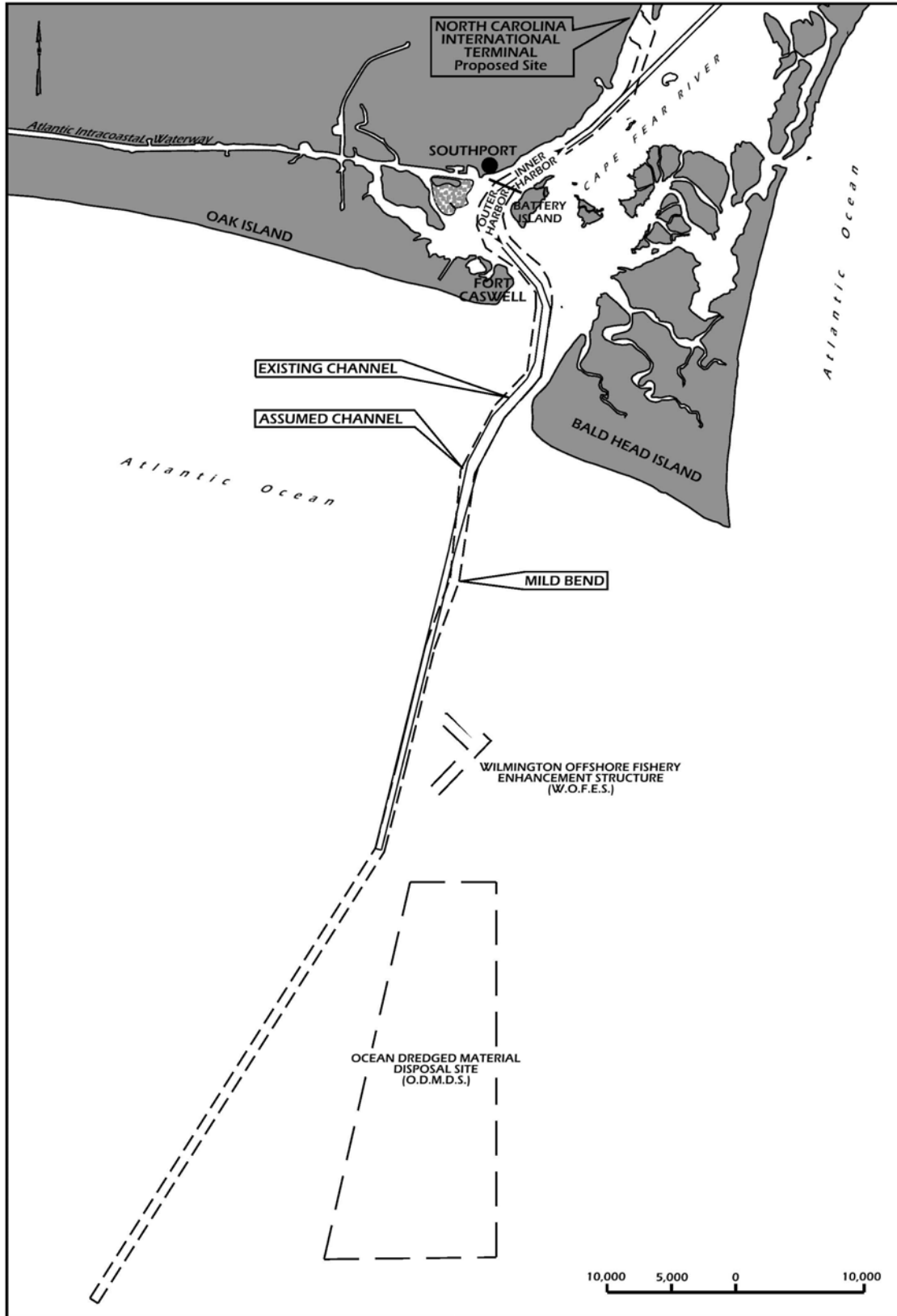
### 5.6.1 Channel Alignment

The study team utilized best professional judgment and review of existing information in selecting an assumed channel alignment for this reconnaissance study. The Corps considered the straightened alignment referred to as the “Cut Thru” by the NCSPA in their planning documentation. This alignment, which forms the basis for NCSPA dredging cost estimations, will be considered further in the feasibility phase.<sup>5</sup> However, based on limited analysis and existing information, it was determined that utilization of the existing channel alignment, with some modification could accommodate the design vessel while minimizing costs and environmental impact. The alignment would include extension of the existing channel seaward approximately 8 miles to provide for the required depth for the design vessel. This extension is described in greater detail in the following section. A mild bend in the channel was also included to avoid excavating rock as indicated in [Figure 2](#) below. It is important to note that an in-depth analysis of all reasonable alternative alignments would be considered during the feasibility phase.

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<sup>4</sup> Panama Canal Authority. 2006. Proposal for the Expansion of the Panama Canal.

<sup>5</sup> CH2M Hill. “North Carolina International Terminal: Planning Assumptions” (North Carolina State Ports Authority). March 2008



**Figure 2** Proposed channel alignment.

## 5.6.2 Channel Depth and Dimension

Additional channel depth would allow current and future shippers to more fully utilize larger class vessels and would reduce anticipated future congestion. The current depth of the existing inner harbor channel is 42 feet. For the purposes of this reconnaissance level study deepening the existing harbor to depths of 48 feet and 50 feet were investigated. A depth of 48 feet, though shallower than the preferred depths documented by the NCSPA, could reasonably accommodate the Post Panamax vessel with some tidal delays and/or lightloading. Both depths would require additional deepening of approximately 2 feet in outer harbor channel reaches to account for the potential for wave action and swells. The delineation between the inner harbor channel and outer harbor channel is at the intersection of Battery Island Channel and Lower Swash Channel as indicated in [Figure 2](#).

An additional channel depth, referred to as “overdepth” is also needed to provide for adequate underkeel clearance. There are two types of overdepth, required and allowable. One foot overdepth is required in areas of rock for safety clearance purposes. Two foot allowable overdepth applies to all areas and is provided because of the inability to dredge to a uniform depth due to fluctuation of water surface. Therefore, deepening would include two feet of allowable overdepth in all areas and one foot of required overdepth in areas of rock. A comprehensive analysis to incrementally analyze multiple depths in selected increments would be conducted in the feasibility study.

The channel depths investigated in this analysis are summarized below:

### 48 Foot Inner Harbor Channel

#### Inner Harbor Channel

- Non rock areas -48’ plus 2’ of allowable overdepth (-50’)
- Rock areas -48’ plus 1’ required overdepth plus 2’ of allowable overdepth (-51’)

#### Outer Harbor Channel

- Non rock areas -50’ plus 2’ of allowable overdepth (-52’)
- Rock areas -50’ plus 1’ required overdepth plus 2’ of allowable overdepth (-53’)

### 50 Foot Inner Harbor Channel

#### Inner Harbor Channel

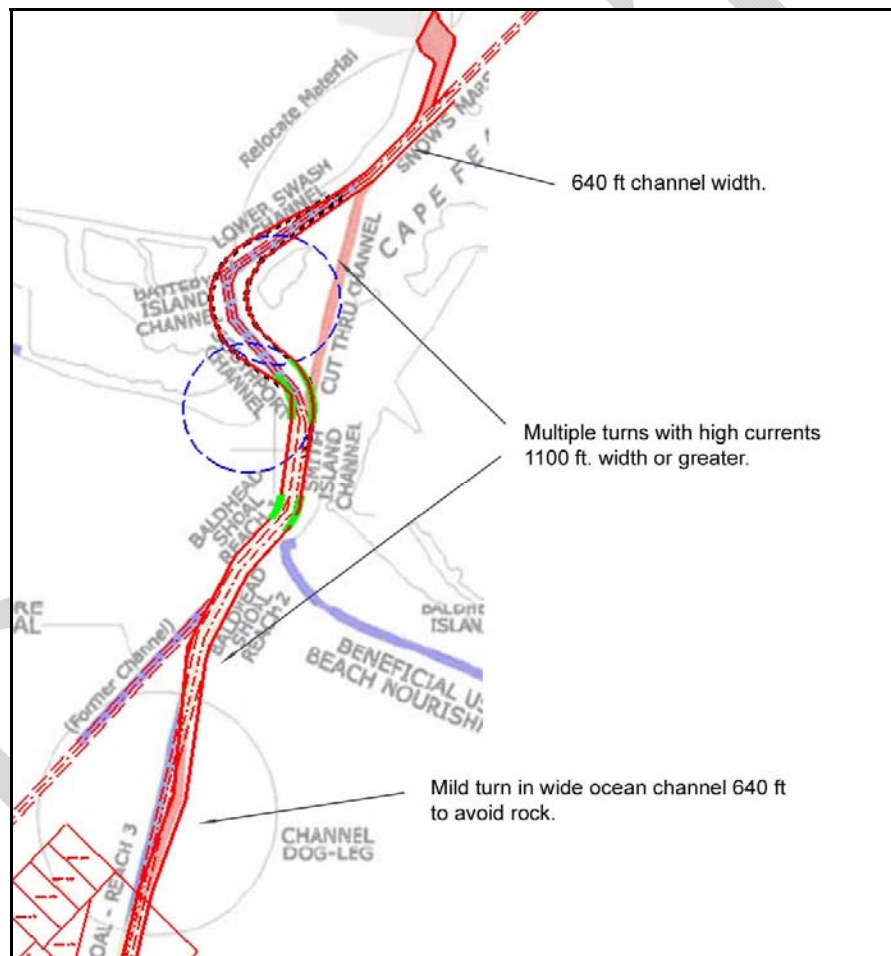
- Non rock areas -50’ plus 2’ of allowable overdepth (-52’)
- Rock areas -50’ plus 1’ required overdepth plus 2’ of allowable overdepth (-53’)

#### Outer Harbor Channel

- Non rock areas -52’ plus 2’ of allowable overdepth (-54’)
- Rock areas -52’ plus 1’ required overdepth plus 2’ of allowable overdepth (-55’)

Based on the design vessel, the necessary channel dimensions were developed per U.S. Army Corps of Engineers guidance in Engineering Manual (EM) 1110-2-1613, “Hydraulic Design of

Deep Draft Navigation Channel”. Channel sideslopes would be 5 horizontal to 1 vertical. EM 1110-2-1613 recommends a channel width of four times the design vessel’s beam. Four times 160 feet results in a channel width of 640 feet. The strong currents near the mouth of the Cape Fear River complicate the design of the turns in this area. After examining the ship tracks from a previous ship simulation study, it was decided to use the existing ratio of ship length to turn radius as a design parameter. Increasing the length of the design vessel from 950 feet to 1,200 feet increases the turning radius for the Battery Island and Smith Island turns from 2,900 feet to 3,900 feet. **Figure 3** below illustrates the assumed turning radii and resulting channel configuration. A comprehensive ship simulation study would be performed during the feasibility phase for alignment alternatives to assist in determination of an optimal channel configuration.



**Figure 3. Channel Turns.**

### 5.6.3 No Action Alternative

The No Action alternative would involve no action on the part of the Corps of Engineers. The existing navigation channel would remain at its current authorized depth, dimension and

location. This alternative will be considered further in the feasibility phase and will also be used as a basis of comparison to all action alternatives considered.

## 5.7 Project Area Conditions: Existing, Future-with and Future-without Conditions

The existing conditions are defined in this report as the project conditions that exist today (2010) plus any changes that are expected to occur prior to project year one, anticipated in 2020. The with and without project condition represent future states beginning in project year one and extending over a 50-year project life. For the purposes of this reconnaissance study, the years 2020 through 2070 will be examined. The purpose of identifying the differences between the with and without project conditions is to note the changes that would be expected to occur in the future as a result of the project compared to the conditions that would occur in the future without the project. As a result of these different conditions, project benefits and project related costs can be identified and quantified. The without project condition is the most likely condition expected to exist over the 50-year life of the project in the absence of the proposed project, including any known changes in the law or public policy. In other words for this project, the without project conditions are those that are expected to occur over time without further channel deepening and/or expansion of the existing harbor facilities.

Project area conditions for the existing, future without-, and future with-project conditions were evaluated based on both economic and environmental considerations. They are described separately in the following sections.

### 5.7.1 Economic Considerations

The economic considerations documented below are a preliminary analysis of potential benefits attributable to the proposed navigation improvement. Detailed analysis would be conducted in the feasibility phase and would involve economic evaluation of all reasonable alternatives to address the problems and opportunities.

Benefits for the proposed project are based on transportation cost savings for the expected container throughput. These benefits were developed using a cost per mile analysis, utilizing information from Corps of Engineers findings on transportation costs per Twenty Foot Equivalent Units (TEU) using different size vessels.<sup>6</sup> Transporting containers using Panamax ships at typical service draft costs about \$30 per TEU per 1,000 miles sailing distance. Using various trip lengths from 4,000 to 11,000 miles (depending on trade route) results in TEU costs from \$120 to \$330 each way for shipping from Northern Europe, the Far East and South Asia. Shifting those containers to Post-Panamax ships saves about 30 percent or \$36 to \$99 per TEU. Weights were developed based on analysis of expected number of TEU's transported along trade routes in similar South Atlantic ports. When the savings are weighted by the number of TEUs on each route, the average savings are about **\$85** per TEU. The table below summarizes the calculation of potential benefits.

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<sup>6</sup> Moser, David. "Issues in Economics of Container Ship Driven Channel Deepening," U.S. Army Corps of Engineers Senior Economist Meeting. June 2009.

Trade Route	One-way Distance (Miles)	Current cost per TEU mile (\$)	Current Cost per TEU (\$)	Cost per TEU mile Post Panamax (\$)	Cost per TEU Post Panamax (\$)	Savings per TEU (\$)	Weighting by # TEU's	Weighted Savings per TEU (\$)
Far East - Panama Canal	11000	0.03	330	0.021	231	99	0.6	59.4
South Asia - Suez Canal	10000	0.03	300	0.021	210	90	0.2	18
Northern Europe	4000	0.03	120	0.021	84	36	0.2	7.2
							Total Savings	84.6

Adjusting this savings for the possibility that up to 25 percent of the container traffic may not benefit yields an average savings of just over \$63 per TEU. Using 1,000,000 TEUs in the base year realizes a savings of about \$63,000,000. The savings would grow to \$189,000,000 by project year 10. Benefits are expected to be flat once the facility capacity is reached.

Costs are based on expected first costs for the assumed channel alignment with the described depth and dimensions. These numbers include the estimated costs for dredging, disposal, mitigation and project maintenance. Projections in shoaling were used to compute the increased costs of maintenance dredging, which were included to determine Average Annual costs. These costs were then increased to include interest during construction. Interest and amortization was calculated at the current interest rate of 4 3/8 percent over the 50-year project life. Cost and benefits for the channel depths are summarized below.

The Table below summarizes the expected costs and benefits for the proposed project depths.

	<b>48' Inner Harbor</b>	<b>50' Inner Harbor</b>
First Costs	900,000,000	1,035,000,000
Add Interest During Construction	150,000,000	173,000,000
Financial First Costs	1,050,000,000	1,208,000,000
Average Annual Costs		
Interest and Amortization	52,100,000	59,900,000
Increased Operation and Maintenance	4,500,000	4,500,000
Total Average Annual Costs	55,100,000	64,400,000
Present Worth Average Annual Benefits	234,000,000	234,000,000
Net Average Annual Benefits	178,900,000	169,600,000

The costs for associated landside facilities (including mitigation) are assumed for this preliminary analysis to be self-liquidated by the \$225 per TEU facility charges that would be available to the terminal operator. This can be summarized as cash flow of about \$225 million annually growing to \$775 million annually by year 10 and remaining constant thereafter. The container traffic projection is based on the North Carolina International Terminal initially capturing a market share of 3 percent of the East Coast containerized trade volume, and growing to 6.75 percent market share by 2030. Within 10 years, the estimated throughput of the port facility would be 3 million TEUs.<sup>7</sup> Economic modeling suggests that project revenues under these volumes are sufficient to fund construction of the terminal and provide a return on investment.

This preliminary analysis contains significant uncertainty in benefit estimation due to lack of availability of information. However, even with a significant reduction of the potential benefits there is still a Federal interest in further study as the potential benefits would still outweigh the costs.

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<sup>7</sup> CH2M Hill. "North Carolina International Terminal: Pro-Forma Business Plan" (North Carolina State Ports Authority). March 2008.

### 5.7.2 Environmental Consideration

A preliminary identification of potential resource impacts utilizing professional judgment and readily available existing information was performed. Mitigation is discussed in Section 5.7.2.1 below and is based primarily on the assumed channel configuration previously described.

Effects of landside facilities implemented by others (non-federal sponsor, state and/or federal agencies) including, but not limited to terminal development, associated highway and rail transportation infrastructure will be considered comprehensively during the feasibility phase. Though not federally implemented or funded, the Corps considers these project aspects to be a “connected action” as defined by the Federal Regulations for Implementing National Environmental Policy Act (NEPA) regulations codified in 40 CFR 1508.25. This statute defines actions as connected if they: i. Automatically trigger other actions which may require environmental impact statements; ii. Cannot or will not proceed unless other actions are taken previously or simultaneously; or iii. Are interdependent parts of a larger action and depend on the larger action for their justification.” The Corps also holds regulatory responsibilities that also bear on landside activities affecting Waters of the U.S. As such, the Corps anticipates a combined interagency Environmental Impact Statement which would facilitate environmental impact considerations and ensure impacts are documented and addressed comprehensively to fully understand the direct, indirect and cumulative effects of multiple potential actions associated with this project.

The potential effects on resources are summarized in the table below. A detailed analysis of potential environmental effects from all reasonable alternatives would be conducted in the feasibility phase.

Resource	Existing Condition	Conditions without Project	Conditions with Project
Geology and Groundwater	The existing channel is currently maintained to a depth of 42 feet (+ overdepth) in the inner harbor and 44 feet (+ overdepth) in the outer harbor. Prior to deepening, this depth was investigated for effect to groundwater. These studies (Lautier 1998) indicated that the past deepening to 45 feet would not adversely impact groundwater resources.	No change from existing conditions.	Channel deepening would require the removal of additional rock. The impact of blasting and further deepening of the navigation channel during construction may have adverse effect on geology and groundwater. Effect of project alternatives would be investigated, in detail, during feasibility studies.
Water Resources	Two water quality classifications of the State of North Carolina apply to the waters of Cape Fear River in the project area: SA and HQW. SA waters are saltwaters suitable for shellfishing, fishing and contact recreation. HQW waters are high quality waters rated as excellent based on biological and physical/chemical characteristics.	No change from existing conditions.	Further deepening may result in increase potential for saltwater intrusion on surrounding aquifers. These potential effects would be investigated in detail for alternatives considered during feasibility studies.



Resource	Existing Condition	Conditions without Project	Conditions with Project
Water Quality	Turbidity and suspended solids are temporarily elevated from propeller wash from large ships and also during maintenance dredging and disposal operations. These conditions return to background levels shortly after dredging stops and vessel passage.	No change from existing conditions.	Turbidity and suspended solids would be elevated during the entire construction period. This would result in adverse impact to benthic resources adjacent to the channel. Maintenance operations will be similar to existing conditions. Long-term effects on water quality associated with increased vessel traffic may result from potential project alternatives. These effects would also need to be investigated in detail during feasibility studies.
Air Quality and Noise	All dredging work would be conducted in the ocean and/or within Brunswick County. This area is classified as an attainment area by the NC Division of Air Quality. There are currently no major air quality issues. Noise is a prominent feature in navigation channel and surrounding area due to ship, small boats, and roadway traffic and other sounds associated with urban and rural environments in Brunswick County near the harbor.	No change from existing conditions.	Implementation of project alternatives would likely result in temporary increases in criteria pollutants. Effects on air quality could also occur from increases in shipping vessel traffic utilizing new harbor facilities. Detailed studies to determine effects of project alternatives on air quality would be completed during the feasibility phase.
Aquatic Resources	<p>The Cape Fear River contains a diverse aquatic community of marine and estuarine species. Among the important habitats are shallow (&lt; 10 feet deep) water areas that contain marsh and mudflats. Deep (&gt; 10 feet deep) water areas have minimal habitat value. Existing channel maintenance disturbs benthic populations in the existing deep channel and nearby side slopes.</p> <p>There are no seasonal restrictions in the lower harbor on dredging except for hopper dredges. Hopper dredging is restricted to cooler months to avoid taking sea turtles.</p>	No change from existing conditions.	Among the important habitats that may be impacted by the assumed channel alignment are shallow (< 10 feet deep) areas. Dredging may impact about 202 acres of shallow water habitat, 13 acres of tidal marsh and 442 acres of deep water habitat within the Cape Fear River. No primary or secondary nursery areas (PNA) are located near the assumed channel or turning basin, but some of the shallow water areas may still function as nursery areas. There is potential to impact live hard bottom from the ocean portion of the channel extension. The channel improvements may also effect several essential habitat areas (EFH) designated by NMFS. These effects would be investigated in detail during the feasibility phase for project alternatives.
Terrestrial Resources	Maintenance of the existing channel does not involve terrestrial resources except for disposal of sandy material on nearby beaches and to maintain two existing islands for colonial water bird nesting. The major impacts are minimized by conducting work during cooler months when biological activity is low. For example work during cooler months avoids sea turtle and bird nesting, the growing season for the threatened beach plant sea beach amaranth, and the spawning time for beach organisms like mole crabs and coquina clams.	No change from existing conditions.	As indicated in section 5.7.2, landside facilities would be implemented by the non-federal sponsor and other state and or Federal agencies. These facilities may include terminals, highway and rail facilities. These will be considered comprehensively during the feasibility phase in collaboration with the other agencies. For this preliminary analysis the scope of considerations are focused on potential effects from navigation channel improvements. Terrestrial impacts associated with channel improvement may include potential island and inlet beach erosion. Battery Island is an important white ibis rookery. There may also be impacts associated with beach disposal of sandy dredged material. These effects would be investigated in detail during the feasibility phase for project alternatives.
Endangered and Threatened	The listed species that may occur in the harbor and near ocean waters are sea turtles, right whales, shortnose	When fish passage is constructed at	Adverse effect to protected species may occur in water via dredging, blasting, and vessel activities and on area beaches through disposal of sandy dredged material.

Resource	Existing Condition	Conditions without Project	Conditions with Project
Species	sturgeon, and Florida manatee.  On the area beaches, piping plovers, sea beach amaranth, and nesting sea turtles occur. Disposal of sand on the beaches occurs during cooler months to avoid impacts to these species.	Lock and Dam #1, the Shortnose sturgeon population is expected to increase.	Mitigation measures will be considered in detail in the feasibility phase. Measures may include performing dredging work during the cooler months, and implementing the measures indicated under existing conditions. See "aquatic resources" for information on reducing impacts of blasting. Disposal of compatible sand on nearby beaches can be beneficial to sea turtles if suitable nesting habitat is eroding and placement occurs during non nesting/hatching season.
Cultural Resources	A large number of sites are known through historic documentation and others have been discovered as a result of professional surveys. Properties listed in or eligible for listing in the National Register of Historic Places are known throughout the lower Cape Fear area.	No change from existing conditions.	The proposed project would likely affect underwater cultural resources. Affects can be expected either through direct impact to sites and or through modifications to hydrology, especially changes in currents. Professional surveys would be required to fully identify potential effect on cultural resources. Mitigation of any impacts to resources from project alternatives would be formulated in the feasibility phase.
Wetlands	Tidal marsh, primarily <i>Spartina alterniflora</i> is abundant in the project area.	No change from existing conditions.	Adverse effects on tidal marsh may occur with the implementation of project alternatives. These effects would be considered in detail during the feasibility phase. For the purposes of this preliminary evaluation, mitigation was estimated for the assumed channel alignment (see section 5.7.2.1).

### 5.7.2.1 Mitigation

The most likely need for mitigation associated with channel modification is related to impacts to shallow water habitat and tidal marsh. To establish an approximate mitigation cost for this preliminary evaluation, the assumed channel configuration was utilized. For this channel configuration, there would be an estimated loss of about 13 acres of tidal marsh and 202 acres of shallow (< 10 feet deep) water habitat. About 442 acres of deep (> 10 feet deep) water habitat would also be impacted. Deep water habitat is assumed to have a lesser ecological value therefore no mitigation is considered for this habitat for the purposes of this analysis.

Mitigation can take many forms, but the most acceptable is in-kind mitigation (e.g. replacing marsh and tidal shallow water habitat with the same). Mitigation requirements would be fully formulated and coordinated with resource agencies for alternatives investigated during detailed feasibility studies. However, for the purposes of this reconnaissance analysis reasoned assumptions are utilized to approximate mitigation costs. A 2 for 1 acre replacement is assumed for tidal marsh. Using previous mitigation costs of about \$200,000/acre (Island 13, Wilmington Harbor); the marsh mitigation costs are approximately \$5.2 million. Since the shallow water habitat is not designated as primary or secondary nursery but still has habitat value, a 1 for 1 acre replacement is assumed. Assuming the same replacement costs per acre as indicated above, that mitigation cost would be approximately \$40.4 million. Therefore, the total mitigation cost including sediment testing for ocean disposal of dredge material (estimated at approximately \$500,000) is about \$46.1 million. Suitable mitigation sites would be determined during the feasibility phase. Other impacts may occur that could require mitigation such as impacts to cultural resources, salt water intrusion, impacts due to propeller

wash, and potential presence of live hard bottom in the ocean portion of the channel extension. These potential mitigation requirements cannot be determined at this time due to lack of information. Detailed studies to evaluate effects to all resources affected by project alternatives would be conducted during the feasibility stage. Appropriate monitoring plans would also be developed to assess the performance of feasible mitigation measures formulated during the feasibility study.

Mitigation costs associated with the construction of landside facilities are included as a part of the total construction cost of the landside facilities. These costs are considered self-liquidating for the purposes of this preliminary evaluation as discussed previously in Section 5.7.1.

#### 5.7.2.2 Indirect and Cumulative Effects

The projected indirect and cumulative impacts of the proposed action cannot be determined until detailed investigations are performed during the feasibility phase. In addition to other resource areas indicated elsewhere in this document, indirect and cumulative impacts to address further in the feasibility phase include but is not be limited to 1) security concerns related to proximity of potential terminal facilities (and associated transportation related development) to a nuclear power plant and munitions terminal, 2) increased risk of vessel accidents and product spills, 3) induced development and resulting socioeconomic and environmental impacts on the local communities, and 4) sea level rise.

### 6. FEDERAL INTEREST

Because transportation savings for waterborne commerce is a high-priority project purpose for the Corps of Engineers and because transportation savings in the form of National Economic Development Benefits (NED) appear to exceed the cost of project implementation, there is a strong Federal interest in conducting the feasibility study of navigation improvements at Wilmington Harbor. Based on the preliminary analysis, there appears to be potential project alternatives that would be consistent with Army policies, costs, benefits, and environmental impacts.

### 7. PRELIMINARY FINANCIAL ANALYSIS

As the non-Federal sponsor, the **State of North Carolina** will be required to provide 50 percent of the cost of the feasibility phase. A letter of intent from the local sponsor stating its willingness and ability to pursue the feasibility study and to share in its cost and indicating an understanding of the cost sharing that is required for potential project construction is included as an attachment to this report.

## 8. SUMMARY OF FEASIBILITY STUDY ASSUMPTIONS

- The without project condition will consider existing ports and planned improvements within the planning period.
- Full analysis of reasonable alternatives would be performed, including the no action alternative to optimize potential feasible alternatives in terms of depth and alignment while minimizing environmental effects.
- A detailed economic analysis will be performed in the economic evaluation in order to identify the effect of using neighboring ports.
- An incremental analysis will be performed in selected increments of channel depth to identify the optimum channel depth.
- Public involvement will be achieved through public meetings and/or workshops and interagency work group meetings.
- An Environmental Impact Statement (EIS) would be prepared as appropriate to fully document the decision-making process and any recommendation in compliance with NEPA and other statutes.
- The feasibility study and EIS will address alternative methods of disposal of dredged material.
- Modeling studies conducted during the feasibility phase will include hydrodynamic, shoreline erosion, saltwater intrusion and ship simulation models.
- Consideration of alternatives will be fully coordinated with the U.S. Fish and Wildlife Service, National Marine Fisheries Service, and other appropriate agencies pursuant to environmental statutes.
- The consideration of alternatives in the study would fully comply with the requirements of the Clean Water Act, as amended and the National Environmental Policy Act.
- Appropriate cultural resources investigations will be conducted within the study area to ensure historic areas are not adversely affected by proposed project plans.
- Additional Hazardous Toxic and Radioactive Waste surveys will be conducted to update existing data and to assess areas of interest not previously studied.

## 9. FEASIBILITY PHASE MILESTONES

<b>Milestone Description</b>	<b>Duration (mo)</b>	<b>Cumulative (mo)</b>	<b>Estimated Date</b>
Initiate Study	0	0	Mar-2011
Public Workshops/Scoping	3	3	May-2011
Feasibility Scoping Meeting	9	12	Feb-2012
Alternative Review conference	9	21	Nov-2012
Alternative formulation Briefing	6	27	May-2013
Draft Feasibility Report/EIS	6	33	Nov-2013
Public Review of DEIS/Feasibility Report (Public Hearing)	3	36	Feb-2014
Feasibility Review Conference	2	38	Apr-2014
Agency Technical Review (ATR)	6	44	Oct-2014
Independent External Peer Review (IEPR)	6	50	Apr-2015
Final Report to SAD	3	53	Jul-2015
DE's Public Notice	1	54	Aug-2015
Chief's Report	4	58	Dec-2015
Project Authorization	4	62	Apr-2016

## 10. FEASIBILITY PHASE COST ESTIMATE

A detailed Feasibility Phase cost estimate for the Feasibility Report will be developed and included in the Project Management Plan. It is estimated that the Study cost share will be approximately \$5.2M Federal and \$4.7M Local sponsor for a total feasibility cost of approximately \$10M.

The necessary major work items for the feasibility phase are listed in the Table below.

<b>Major Work Items</b>	<b>Study Cost</b>
Public Involvement	\$300,000
Economic Studies	\$1,200,000
Environmental Studies (Except USFWS CAR)	\$750,000
Cultural Resources Studies/Report	\$350,000
USFWS Coordination Act Report	\$40,000
Plan Formulation & Evaluation	\$500,000
Project Management	\$400,000
Surveys & Mapping	\$300,000
Hydrology and Hydraulics Studies/Report (Coastal)	\$600,000
Geotechnical Studies/Report	\$1,200,000
Engineering & Design Analysis Report	\$500,000
HTRW Studies/Report	\$250,000
Cost support	\$350,000
Cost risk analysis	\$60,000
Value Engineering Study	\$60,000
Real Estate Studies	\$100,000

Agency Technical Reviews	\$300,000
Independent External Peer Review (IEPR) *100% Federal Cost	\$500,000
Project Management Plan	\$100,000
Supervision & Administration	\$50,000
Contingencies	\$2,000,000
Total Study Cost (Approximately)	\$9,910,000
Federal	\$5,205,000
Non-Federal	\$4,705,000

## 11. POTENTIAL ISSUES AFFECTING INITIATION OF FEASIBILITY PHASE

- Continuation of this study into the cost-shared feasibility phase is contingent upon an executed FCSA.
- Lack of funding to initiate studies.

## 12. VIEWS OF OTHER RESOURCE AGENCIES AND PUBLIC

Because of the nature of the reconnaissance phase, only limited and informal coordination has been conducted with resource agencies and the public. The comments received assisted the district in understanding public concern regarding the potential federal action. These concerns were considered during this reconnaissance study. The comments received will also assist the district plan public involvement activities and supplement information received during the public scoping period which will begin at the onset of the feasibility phase. A summary of comments, concerns and views received by the Corps during the reconnaissance phase is presented below (grouped by general area of concern):

### Cultural Resources

- Construction of proposed project would directly/indirectly harm cultural resources including archaeological remains and standing structures of historic value

### Economics

- Business may move from the current port in Wilmington to the new facility.
- Costs (such as added infrastructure, eminent domain purchases, and mitigation for environmental damages) secondary to direct construction of the proposed project would be necessary
- Economic success of the existing Wilmington Harbor should be assessed before an additional shipping terminal is seriously considered
- Employment opportunities associated with the proposed project may not be as numerous as projected and employment opportunities associated with possibly displaced industries, such as tourism, may be lost
- Fishing industry in Brunswick County will be hurt by destruction of salt marshes should proposed project go forward

- High fuel prices may prevent the proposed project from seeing the volume of business it is being designed for
- Property values in areas surrounding the proposed project would fall
- Proposed project would be unnecessary due to presence of nearby, existing east-coast ports that could be modified to accommodate increases in volume
- Proposed project would allow for inexpensive shipping of freight overseas
- Proposed project would infuse money into the economies of Brunswick County and North Carolina
- Proposed project would provide new local jobs
- Proximity of proposed project to North Carolina businesses would provide increased economic benefits
- Shipping and transportation costs may be reduced by the proposed project as compared to the existing port in Wilmington, NC
- Proposed project would continue to grow foreign economies to the detriment of the economy of the United States
- Proposed project construction methods would contribute to beach erosion placing public/private property and assets at risk
- Proposed project would hurt the tourism industry, causing jobs to be lost
- Revenue to Brunswick County in terms of tourism and recreational opportunities lost due to ecosystem impacts caused by construction and implementation of the proposed project would be high
- Taxes may be increased to pay for infrastructure needs associated with the proposed project
- The North Carolina Secretary of Commerce needs to comment on the value of the proposed project for North Carolina
- The State of North Carolina may not be able to afford the proposed project in terms of both monetary and environmental costs

### Emergency Planning

- Should proposed project be constructed, Progress Energy's Brunswick Nuclear Plant would have to reevaluate its emergency plans and procedures in order to maintain safe operation

### Environmental Impacts

- Effects of sea level rise due to climate change must be taken into consideration, including additional costs and physical changes to the project
- Activities directly and indirectly associated with proposed project would contribute to elevated levels of air, light, noise, and water pollution
- Blasting associated with navigation channel modification may cause fish kills.
- Certain wetlands that the proposed project would impede on are currently protected by law

- Construction of new road and railways associated with the proposed project may promote the formation of unwanted sinkholes
- Dredging and channel deepening/widening associated with proposed project would alter benthic topography and contribute to erosion of adjacent shorelines and beaches
- Essential Fish Habitat would be negatively impacted by the proposed project
- Nesting habitat for birds and sea turtles would be disrupted by the proposed project
- Proposed project construction may cause salt water intrusion and possible contamination of drinking water for citizens living in areas near the proposed project site
- Proposed project would deny future generations the opportunity to observe and appreciate natural phenomena in the project vicinity
- Proposed project would destroy the following habitat types in the Cape Fear River and nearshore Atlantic Ocean: water column, shell bottom, coastal wetland, beach, soft bottom and hard bottom, freshwater aquatic, and uplands
- Proposed project would eliminate areas with high aesthetic and ecological merits
- Proposed project would yield higher sediment loads than are currently seen in the Cape Fear River
- The possibility exists of introducing exotic, invasive species through ballast
- Wildlife (including multiple endangered species) such as shore/sea birds, fish and other aquatic flora/fauna, and land dwelling flora/fauna would be destroyed or displaced by proposed project

#### Environmental Justice

- Disadvantaged peoples may be disproportionately impacted by negative environmental hazards resulting from port construction

#### General

- The proposed project is new in many aspects and should not be thought of as an extension of the existing Wilmington Harbor

#### Facilities Operation

- Should proposed project be constructed, Progress Energy's Brunswick Nuclear Plant would have to address potential operational issues including maintaining proper functionality of and avoiding sediment buildup in the plant's cooling water canal, and avoiding any rainwater runoff from the port facility that may introduce chemicals or hazardous materials into cooling systems.

#### Infrastructure

- Existing roadways may not be adequate in supporting additional traffic associated with the proposed project



- New road/railways would have to be constructed to accommodate proposed project
- Proposed project site is located in an industrially zoned area and lies between existing industrial entities and a military installation (private and military) providing existing compatible uses
- Proposed project site is near existing infrastructure assets such as roads and rails, and also would allow easy access to the AIWW and open ocean
- Current infrastructure of Southport, NC may not be able to support the influx of people associated with the proposed project in terms of housing, utilities, and educational facilities
- Channel widening/deepening required may erode areas of Bald Head Island to the point of property and infrastructure loss
- Brunswick County may not have lands available for new roadway construction
- Establishment of NCIT may create demand for land utilization outside of the facility itself such as for housing, business parks, and shopping malls

#### Quality of Life

- Homeowners and retirees reside in Southport, NC in order to escape the kinds of business and industry that the proposed project would bring to the area
- Proposed project would adversely affect beaches at Bald Head Island and Oak Island and impede recreational use of regions of the Cape Fear River
- Proposed project would bring increased crime, traffic, industry, and pollution to the Southport, NC area
- Proposed project would spill out into the surrounding community upon exhaustion of lands acquired specifically for NCIT
- Proposed project would pose serious health risks for the community including diseases brought by foreign contaminants

#### Security

- The proximity of the proposed project to both Military Ocean Terminal Sunny Point and Brunswick Nuclear Plant provides a threat to national security

### 13. RECOMMENDATIONS

I recommend that the Wilmington Harbor Navigation Improvement study proceed into the feasibility phase.

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JEFFERSON M. RYSCAVAGE  
Colonel, EN  
Commanding