FEASIBILITY REPORT
AND
ENVIRONMENTAL ASSESSMENT

WILMINGTON HARBOR NAVIGATION IMPROVEMENTS
Appendix F - Cost Engineering

June 2014

US Army Corps of Engineers

Wilmington District

Appendix F

Cost Engineering

1. The Cost Engineering Appendix of project costs were prepared to describe the Current Working Estimate (CWE) for the National Economic Development (NED) Plan for the WHIP Study Report.

The NED Plan improvement for WHIP is the widening of Battery Island Turn (BIT) at the intersection where Battery Island Channel (44ft design depth) and Lower Swash Channel (42ft design depth) meet. BIT is located approximately 3 miles upstream from the mouth of Cape Fear River and 14 miles from the Ocean Dredged Material Disposal Site (ODMDS).

Widening of the BIT channels will improve movement and passing time without assistance of tugs thru this turn area. Construction-dredging will be for removal of approximately 500,000 cy of material and disposal into the ODMDS. Currently, less than 1% of the material to be removed is assumed to be rock based on current investigations; but, final geotechnical investigations must confirm final rock quantities and location of rock. Design depths where rock is located will need to be dredged to +1 ft more for rock areas and then provide for 2ft of allowable over depth for dredging. The design depth plus the additional 3 ft would result in potential depths of 47ft (44+3) and 45ft (42+3) for the two channel lengths.

2. Other navigation improvement alternatives were evaluated during the study based on navigation needs to improve (1) turning times in the Anchorage Basin and (2) O&M dredging of Baldhead Shoal Channel, Reach 1, Stations 0+00 to 45+00. These alternatives were to widen the turning radius at the Anchorage Basin (Turning Basin) and a channel alignment shift, of the westward channel toe, along Baldhead Shoal Channel Reach 1.

--Increasing the turning radius of the Anchorage Basin/Turning Basin was determined not to be economically effective. Rough order of magnitude costs, $38 million, for this alternative were used to screen this alternative based on costs from historical project costs of deepening nearby areas of the Wilmington Harbor.

--Moving Baldhead Shoal Channel, Reach 1, westward toe alignment approximately 100 to 130 feet, will be a reduction (one time) of approximately 181,000 cy of maintenance material to be dredged or approximately $2.4 million savings. Additionally, the channel will be farther away from Bald Head Island than the original alignment before the 2001 channel location. After the realignment, annual sediment shoaling quantities of the channel will not change and therefore O&M dredging volumes will not change based on this westward shift. Rough order of magnitude costs for this one time change were based on historical costs for O&M dredging with placement on the beach of about 55,600 cubic yards and a one time hopper dredging of about 125,400 cubic yards of unsuitable material in the westward toe with disposal into the ODMDS.

3. Battery Island Turn (BIT) Improvements

The following channel improvements are based on a combination of EM guidance, previous ship simulations and input from ship pilots. The EM guidance suggests a channel width requirement of at least 720 feet due to the large deflection angles and small radius at this turn.

Ship simulations, done in the 1990's indicate that the passage around Battery Island (Lower Swash thru Southport channels) required an average channel width of about 750 feet along 8,000 feet of channel. Currently, Lower Swash channel is 400 foot wide, Battery Island channel is 500 feet wide and Southport channel is 500 feet wide. An existing cutoff at Lower Swash/Battery Island widens the channel to about 700 feet wide along the apex of the turn.

The following improvements are proposed (Figure 7-green alignment of Main Report): (1) Battery Island channel is widened to 750 feet; (2) A 750 foot wide by about 1,300 foot long cutoff provided between Battery Island and Lower Swash channels; (3) additional tapers are provided where Southport and Lower Swash channels join the widened Battery Island channel. These geometric changes increase the available turning radius from about 2,850 feet to about 3,900 feet; a 37% increase.

The improvements will require removal of approximately 500,000 cy of material by dredging and disposal to the ODMDS approximately 14 miles one way from BIT.

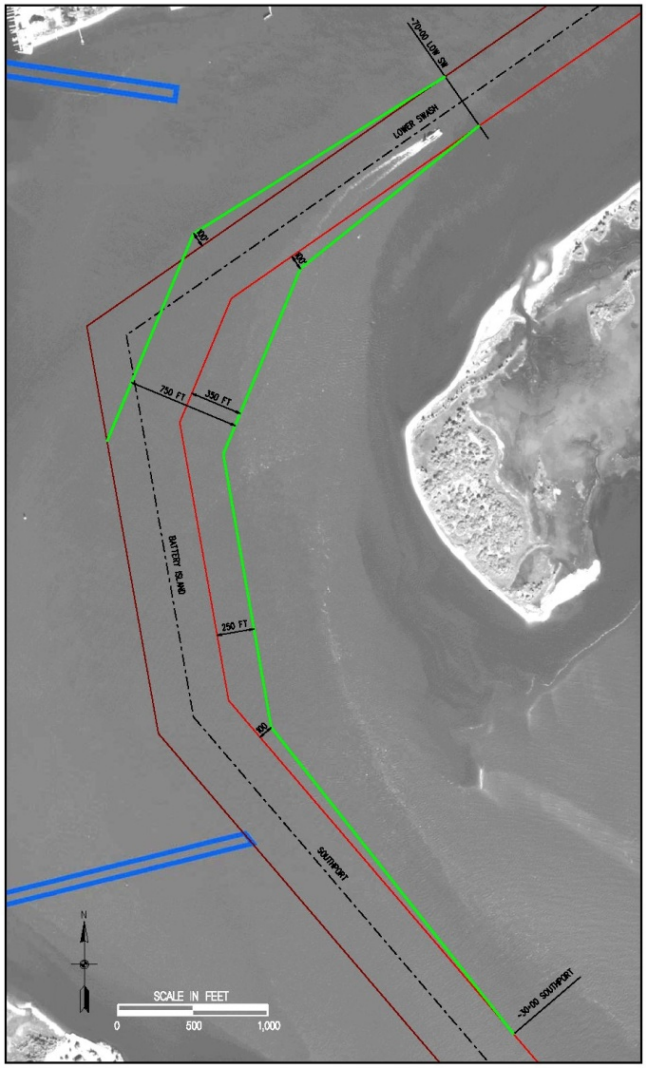

Figure 7. Proposed improvements Battery Island Turn

4. The TOTAL CURRENT WORKING ESTIMATE (CWE) for NED Initial Construction of BIT is $11,045,000 October 2013 pricing ($14,420,000 with 30.5% contingency). The PROJECT FIRST COST, October 2014, is $14,800,000 with contingency. Construction will take 5 months for approximately 500,000 cy and includes structural inventory surveys of buildings and/or structures which may be effected by blasting or vibration from the dredging activity.

There are no environmental calendar restrictions for pipeline cutterhead dredging in the Battery Island, Lower Swash, and Southport Channel navigation channels with disposal into the ODMDS. Work can be performed year round with pipeline cutterhead dredge and the construction schedule assumes dredging will take place with August 2019 midpoint. The CWE for Construction fully funded to midpoint of construction August 2019 is $12,451,000 ($16,256,000 with 30.5% contingency).

5. Baseline most likely CWE, October 2013, is shown in the attached MCACES (Microcomputer Aided Cost Engineering System) MII V4.2 summary sheets. The PROJECT FIRST COST, October 2014, is $14,800,000 with contingency. The summary sheets are formatted into a Code of Accounts framework for reporting. The costs included under each Code of Accounts are described below.

The Cost Estimates were prepared under guidance given in the Corps of Engineers Regulation ER 1110-2-1302, CIVIL WORKS COST ENGINEERING; ER 1110-1-300, Cost Engineering Policy and General Requirements; and ETL 1110-2-573 Construction Cost Estimating Guide for Civil Works.

6. CODE OF ACCOUNTS

CODE OF ACCOUNT 12 – NAVIGATION, PORTS, & HARBORS: This account includes project costs for mobilization and demobilization, dredging, structural inventory & monitoring surveys during construction, and disposal of dredged material in the ODMDS.

Emphasis was placed on accuracy of dredging costs during evaluation of alternative plans to develop the NED Plan. The location and features, as well as historical production of dredges for similar projects, were used in conjunction with the Corps of Engineers Dredge Estimating Program (CEDEP).

CEDEP considers details of dredge area characteristics, depth of dredging, effective production time, haul distances to ODMDS, costs of dredge plant ownership, operating and repair, fuel consumption/prices, and other economic adjustments for labor and equipment at OCT 2013 price levels.

It was assumed that a large pipeline cutterhead dredge would be used along with a spider barge to fill dump scows and then haul material by tugs for disposal to the ODMDS. The average travel distance 1-way to the ODMDS from BIT is approximately 14 miles. Other methods of dredging would be contractually allowed but pipeline cutterhead appears to be the most economical method. Structural inventory of nearby buildings and/or disposal areas will be required as necessary for vibration monitoring and have been included in the cost estimate.

The initial construction time for placement of project is estimated to be 1.5 months.

Additional time for structural inventory, mob/demob and set up added to the dredging time would be approximately 60 days. Demobilization is estimated at another 15-30 days or a total construction period of 5 months.

Although a pipeline cutterhead dredge was used for this estimate, the solicitation for construction will not limit the type of equipment to construct the project. Hopper dredges are limited to dredging during the period of DEC 1 thru MAR 31 and any blasting of rock would be limited to the period AUG 1 thru JAN 31.

A contingency of 30.5% was included to represent unanticipated conditions and uncertainties not known at the time the estimate was developed. There is a better than average level of confidence in the dredge pricing, because of the preliminary geotechnical investigations of BIT and

similarities of other new work dredging and the historical costs for similar projects. A contingency of 30.5% was developed using the Abbreviated Cost Risk Analysis tools recommended by the Mandatory Cost Center of Expertise in Walla Walla, Washington.

O&M Dredging – The O&M dredge cost estimates, for Battery Island maintenance dredging, were based on recent solicitations and CEDEP estimates of approximately $6.25/cy ($7.50/cy with 20% contingency) using a medium hopper dredge with disposal to the ODMDS. The Battery Island O&M dredging would occur when using a hopper dredge for removal of maintenance material in the Wilmington Harbor outer ocean bar, Reach 3.

The existing average O&M shoaling rate for the Battery Island segment of the channel is 12,000 cubic yards per year with a dredge cycle every two years or 24,000 cy. The two years after the widening, an additional 6,000 cubic yards (3,000 cy/year) is anticipated or a total of 30,000 cy to be dredged. Then the shoaling is expected to return to the average shoaling rate of 24,000 cy per cycle.

CODE OF ACCOUNT 30 – PLANNING, ENGINEERING AND DESIGN: The costs included in this account were furnished by those responsible for performing each activity. This account includes plans and specifications, field investigations and surveys, cost estimates, engineering during construction, environmental monitoring, and project management. A 30.5% contingency was assigned to ACCOUNT 30.

CODE OF ACCOUNT 31 – CONSTRUCTION MANAGEMENT – This account includes supervision and administration of the contracts by construction management, hydrologic surveys during construction, environmental/coastal monitoring after construction, and contracting personnel during construction. A 30.5% contingency was assigned to ACCOUNT 31.

7. Table 1 shows the current project schedule following authorization of the project. The schedule assumes expeditious review and approval of the project through all steps, including authorization and funding, and as such is subject to change.

Table 1. Project schedule following authorization.

Activity	**Date**
Sign PPA	Jul 2018
Chiefs Report	Mar 2015
Complete Final Plans and Specs	FEB 2019
Award Construction Contract	May 2019
Begin Construction Battery Island widening -500,000 cy	Jun 2019
Complete Construction	Nov 2019
Maintenance Dredge 1st cycle 30,000cy	Dec 2021
Maintenance Dredge 2nd cycle 24,000cy	Dec 2023

12 ACCT Navigation, Ports & Harbors																																																	
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INITIAL NOURISHMENT																																												TOTAL CONTRACT = $10,090,000					
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MCACES-WHIP-JUNE-10-2014

WILMINGTON HARBOR IMPROVEMENTS PROJECT - WHIP - CURRENT WORKING ESTIMATE (CWE) - - - - - - OCTOBER 2013 PRICE LEVEL

Estimated by	CESAW-TS-DE
Designed by	USACE - WILMINGTON DISTRICT
Prepared by	John C. Caldwell
Preparation Date	6/10/2014
Effective Date of Pricing	10/1/2013
Estimated Construction Time	90 Days

Date	Author	Note
3/16/2014	CESAW-TS-DE	New Project Notes - JUNE 10, 2014. See APPENDIX "F" for narrative with OCTOBER 2013 price level.

Description	Quantity	UOM	ContractCost	Contingency	ProjectCost
Project Cost Summary Report			**11,045,000**	**0**	**11,045,000**
WILMINGTON HARBOR IMPROVEMENTS PROJECT - WHIP	**1**	**LS**	**11,045,000**	**0**	**11,045,000**
12 --NAVIGATION, PORTS & HARBORS - - - - - - - - - - - - - - - - - - -	**1**	**LS**	**10,090,000**	**0**	**10,090,000**
30 --PLANNING, ENGINEERING & DESIGN -	**1**	**LS**	**555,000**	**0**	**555,000**
31 --S&A-CONST MGT & MONITORING -	**1**	**LS**	**400,000**	**0**	**400,000**

Currency in US dollars

Description	Quantity	UOM	ContractCost	Contingency	ProjectCost
Contract Cost Summary Report			**11,045,000**	**0**	**11,045,000**
WILMINGTON HARBOR IMPROVEMENTS PROJECT - WHIP	**1.00**	**LS**	**11,045,000**	**0**	**11,045,000**
12 --NAVIGATION, PORTS & HARBORS - - - - - - - - - - - - - - - - - - -	**1.00**	**LS**	**10,090,000**	**0**	**10,090,000**
12_01 --Battery Island Turn Widening	**1.00**	**LS**	**10,090,000**	**0**	**10,090,000**
30 --PLANNING, ENGINEERING & DESIGN - - - - - - - - - - - - - - - - - - -	**1.00**	**LS**	**555,000**	**0**	**555,000**
30_01 --Construction Contracts Documnts	**1.00**	**LS**	**555,000**	**0**	**555,000**
31 --S&A-CONST MGT & MONITORING -	**1.00**	**LS**	**400,000**	**0**	**400,000**
31_01 --Construction Contracts	**1.00**	**LS**	**400,000**	**0**	**400,000**

Labor ID: NC-GA 2013 EQ ID: EP11R03 Currency in US dollars TRACES MII Version 4.2

Abbreviated Risk Analysis

Project (less than $40M): **WILMINGTON HARBOR IMPROVEMENTS PROJECT - WHIP**
Project Development Stage: **Feasibility (Recommended Plan)**
Risk Category: **Moderate Risk: Typical Project or Possible Life Safety**

Total Construction Contract Cost = **$ 10,090,000**

	CWWBS	Feature of Work	Contract Cost		% Contingency	$ Contingency	Total
	01 LANDS AND DAMAGES	Real Estate	$ -		0.00%	$ -	$ -
1	12 NAVIGATION, PORTS AND HARBORS	MOB-DEMOB	$ 3,750,000		28.08%	$ 1,053,088	$ 4,803,087.55
2	12 NAVIGATION, PORTS AND HARBORS	DREDGING	$ 6,000,000		35.55%	$ 2,132,894	$ 8,132,894.21
3	12 NAVIGATION, PORTS AND HARBORS	SURVEYS	$ 280,000		27.25%	$ 76,301	$ 356,301.29
12		Remaining Construction - BONDS	$ 60,000	*0.6%*	10.62%	$ 6,374	$ 66,374.24
13	30 PLANNING, ENGINEERING, AND DESIGN	Planning, Engineering, & Design	$ 555,000		12.82%	$ 71,128	$ 626,128.26
14	31 CONSTRUCTION MANAGEMENT	Construction Management	$ 400,000		7.37%	$ 29,486	$ 429,485.76

Totals				
Real Estate	$ -	0.00%	$ -	$ -
Total Construction Estimate	$ 10,090,000	32.40%	$ 3,268,657	$ 13,358,657
Total Planning, Engineering & Design	$ 555,000	12.82%	$ 71,128	$ 626,128
Total Construction Management	$ 400,000	7.37%	$ 29,486	$ 429,486
Total	$ 11,045,000	**30.50%**	$ 3,369,271	$ 14,414,271

USIING 30.5% CONTINGENCY	$11,045,000	30.50%	$3,368,725	$14,413,725
	$11,045,000	30.56%	$3,375,000	$14,420,000 rounded
		after rounding		1.30556813

WILMINGTON HARBOR IMPROVEMENTS PROJECT -
Feasibility (Recommended Plan)
Abbreviated Risk Analysis

Meeting Date: 25-Mar-14

Risk Level

	Negligible	Marginal	Significant	Critical	Crisis
Very Likely	2	3	4	5	5
Likely	1	2	3	4	5
Possible	0	1	2	3	4
Unlikely	0	0	1	2	3

Risk Element	Feature of Work	Concerns Pull Down Tab (ENABLE MACROS THRU TRUST CENTER) (Choose ALL that apply)	Concerns	PDT Discussions & Conclusions (Include logic & justification for choice of Likelihood & Impact)	Likelihood	Impact	Risk Level
Project Scope Growth							
						Max Potential Cost Growth	**75%**
PS-1	MOB-DEMOB	• Potential for scope growth, added features and quantities?	• Potential for scope growth, added features and quantities? • Investigations sufficient to support design assumptions? • Design confidence?	Estimate assumes MOB-DEMOB pipeline-spider and barge to dispose in ODMDS. It's possible scope may change wherein variance in equipment may be needed but considering pipelline-spider and barge to ODMDS has the most equipment (including possible blasting) of any dredging method, any change to equipment would be marginal.	Possible	Marginal	1
PS-2	DREDGING	• Potential for scope growth, added features and quantities?	Scope of estimate considers minimal rock, less than 1%, based on wash probe refusals and anticipated contours which could change. Estimated rock at this stage of development of less than 1% could change after additional geotechnical investigations.	Scope may change to have more rock after borings are completed. This could significantly change having to have a pipeline suction cutter dredge for rock with heavier ladder and cutterhead teeth losses. Estimated rock at this stage of development of less than 1% could change after additional geotechnical investigations.	Likely	Marginal	2
PS-3	SURVEYS	• Potential for scope growth, added features and quantities?	More geotechnical evaluations and testing could be required if rock percentages become greater than 1% or formation of rock requires a rock dredge/blasting.	If surveys-investigations of Battery Island indicate there may be more rock, then there may be more testing of rock strength to provide information to bidders. This would cause a marginal increase in the cost for investigations.	Likely	Marginal	2
PS-12	Remaining Construction - BONDS	• Potential for scope growth, added features and quantities?	Bond price would increase as a result of other cost increases.	Since bonds are a small percentage of overall costs the increase in bonds would be marginal.	Likely	Marginal	2
PS-13	Planning, Engineering, & Design	• Potential for scope growth, added features and quantities?	More geotechnical evaluations and testing could be required if rock percentages become greater than 1% or formation of rock requires a rock dredge/blasting.	An increase in investigations for defining material/rock characteristics at Battery Island turn would also require additional labor /time to prepare engineering documents but should be marginal impact.	Possible	Marginal	1
PS-14	Construction Management	• Potential for scope growth, added features and quantities?	Changes in scope for more rock removal may require additional Engineering/Govmnt review during construction reviews of Contractor's methods of removal.	Additional reviews are possible during construction if rock removal is required but will be marginal increase.	Possible	Marginal	1

WILMINGTON HARBOR IMPROVEMENTS PROJECT -
Feasibility (Recommended Plan)
Abbreviated Risk Analysis

Meeting Date: 25-Mar-14

Risk Level

	Negligible	Marginal	Significant	Critical	Crisis
Very Likely	2	3	4	5	5
Likely	1	2	3	4	5
Possible	0	1	2	3	4
Unlikely	0	0	1	2	3

Risk Element	Feature of Work	Concerns Pull Down Tab (ENABLE MACROS THRU TRUST CENTER) (Choose ALL that apply)	Concerns	PDT Discussions & Conclusions (Include logic & justification for choice of Likelihood & Impact)	Likelihood	Impact	Risk Level
Acquisition Strategy							
						Max Potential Cost Growth	**30%**
AS-1	MOB-DEMOB	• Limited bid competition anticipated?	Limited bid competition could cause mob-demob from distances further from Wilmington. • Limited bid competition anticipated?	Additional distances for mob-demob during times of limited bid competition could be reduced if acquisition was scheduled early in dredging season. There are no environmental windows for pipeline suction cutterhead dredge into barges and hauling to ODMDS for this area of the river. Cost changes should be marginal if acquisition is scheduled in timely manner.	Possible	Marginal	1
AS-2	DREDGING	• Bid schedule developed to reduce quantity risks?	• Limited bid competition anticipated? There is always limited competition in dredging industry but advertising early for commitments to dredge can help improve pricing. • Bid schedule developed to reduce quantity risks? Unit prices will be used to mitigate quantity risks. Unit price will be unclassified.	Bidding schedule based on unit price for unclassified dredging should mitigate quantity variation risks. Any changes would be marginal.	Possible	Marginal	1
AS-3	SURVEYS	• Contracting plan firmly established?	Surveys and geotechnical subsurface investigations for widening/deepening at Battery Island Turn are similar to past/historical contract acquisitions.	Distirct has had many acquisitions similar to WHIP subsurface investigations and dredging contracts. Any changes to increased scope for acquisition should be negligible for surveys.	Possible	Negligible	0
AS-12	Remaining Construction - BONDS	• Contracting plan firmly established?	No concerns.	NONE	Unlikely	Marginal	0
AS-13	Planning, Engineering, & Design	• Contracting plan firmly established?	No concerns for any acquisition changes effecting costs for PED.	NONE	Unlikely	Negligible	0
AS-14	Construction Management	• Contracting plan firmly established?	No concerns for any acquisition changes effecting costs for Const Mgt.	NONE	Unlikely	Negligible	0

WILMINGTON HARBOR IMPROVEMENTS PROJECT -
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Abbreviated Risk Analysis

Meeting Date: 25-Mar-14

Risk Level

	Negligible	Marginal	Significant	Critical	Crisis
Very Likely	2	3	4	5	5
Likely	1	2	3	4	5
Possible	0	1	2	3	4
Unlikely	0	0	1	2	3

Risk Element	Feature of Work	Concerns Pull Down Tab (ENABLE MACROS THRU TRUST CENTER) (Choose ALL that apply)	Concerns	PDT Discussions & Conclusions (Include logic & justification for choice of Likelihood & Impact)	Likelihood	Impact	Risk Level
Construction Elements							
						Max Potential Cost Growth	**25%**
CE-1	MOB-DEMOB	• Unique construction methods?	• Special equipment or subcontractors needed? • Unique construction methods?	The need for special equipment has been considered by estimating pipeline - spider - haul material to ODMDS; however, changes could occur for more unique equipment such as heavier ladder and losses of cutterhead teeth with more rock quantity material. Changes should be marginal considering this also relates to changes in material in PS-1.	Likely	Marginal	2
CE-2	DREDGING	• Potential for construction modification and claims?	• Special equipment or subcontractors needed? • Unique construction methods? • Potential for construction modification and claims?	The need for special equipment has been considered by estimated pipeline - spider - haul material to ODMDS; however, changes could occur for more unique equipment such as heavier ladder and losses of cutterhead teeth with more rock quantity material. Changes should be marginal considering this also relates to changes in material in PS-2.	Likely	Marginal	2
CE-3	SURVEYS	• Special equipment or subcontractors needed?	• Special equipment or subcontractors needed?	Special equipment for rock boring investigations & surveys may be needed which also relates to PS-3 risks of scope growth already considered and would be considered marginal in relation to PS-3.	Likely	Marginal	2
CE-12	Remaining Construction - BONDS	• Accelerated schedule or harsh weather schedule?	No concerns.	NONE	Unlikely	Negligible	0
CE-13	Planning, Engineering, & Design	• Unique construction methods?	• Unique construction methods?	Consideration of unique or special equipment for rock boring investigations & surveys may require a marginal increase in PED preparation for plans and specs for bidding.	Likely	Marginal	2
CE-14	Construction Management	• Accelerated schedule or harsh weather schedule?	No concerns.	NONE	Unlikely	Negligible	0

WILMINGTON HARBOR IMPROVEMENTS PROJECT -
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Very Likely	2	3	4	5	5
Likely	1	2	3	4	5
Possible	0	1	2	3	4
Unlikely	0	0	1	2	3
	Negligible	Marginal	Significant	Critical	Crisis

Risk Element	Feature of Work	Concerns Pull Down Tab (ENABLE MACROS THRU TRUST CENTER) (Choose ALL that apply)	Concerns	PDT Discussions & Conclusions (Include logic & justification for choice of Likelihood & Impact)	Likelihood	Impact	Risk Level
Quantities for Current Scope							
						Max Potential Cost Growth	**20%**
Q-1	MOB-DEMOB	• Level of confidence based on design and assumptions?	• Appropriate methods applied to calculate quantities? • Sufficient investigations to develop quantities? • Level of confidence based on design and assumptions?	Changes in quantities could change MOB-DEMOB costs by some negligble amount if some different speical equipment were needed but not anticipated considering this was also idenfified in PS-1.	Likely	Negligible	1
Q-2	DREDGING	• Level of confidence based on design and assumptions?	• Sufficient investigations to develop quantities? • Appropriate methods applied to calculate quantities? • Level of confidence based on design and assumptions?	Variations in quantities because of shoaling can always occur for channels, but not necessarily for NEW WORK material removal. The change of material type or quantity of rock could be significant after final investigations. This anticipation of risk has also been covered under PS-2	Likely	Significant	3
Q-3	SURVEYS	• Level of confidence based on design and assumptions?	• Sufficient investigations to develop quantities? • Appropriate methods applied to calculate quantities? • Level of confidence based on design and assumptions?	Because of similar projects in the Cape Fear River, there is a better than average confidence level that investigations to date and method of determining quantities are better than average. Based on similar historic projects, there is a negligible risk that costs for survey/investigations will vary quantity changes under PS-3.	Likely	Negligible	1
Q-12	Remaining Construction - BONDS	• Level of confidence based on design and assumptions?	NO CONCERNS	NONE	Possible	Negligible	0
Q-13	Planning, Engineering, & Design	• Appropriate methods applied to calculate quantities?	• Appropriate methods applied to calculate quantities?	Because of similar projects in the Cape Fear River, there is a better than average confidence level that investigations to date and method of determining quantities are better than average. Based on similar historic projects, there is a negligible risk that costs for PED will vary with quantity changes.	Likely	Negligible	1
Q-14	Construction Management	• Level of confidence based on design and assumptions?	NO CONCERNS	NONE	Unlikely	Negligible	0

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Very Likely	2	3	4	5	5
Likely	1	2	3	4	5
Possible	0	1	2	3	4
Unlikely	0	0	1	2	3

Risk Element	Feature of Work	Concerns Pull Down Tab (ENABLE MACROS THRU TRUST CENTER) (Choose ALL that apply)	Concerns	PDT Discussions & Conclusions (Include logic & justification for choice of Likelihood & Impact)	Likelihood	Impact	Risk Level
Specialty Fabrication or Equipment							
						Max Potential Cost Growth	**75%**
FE-1	MOB-DEMOB	• Unusual parts, material or equipment manufactured or installed?	N-A		Unlikely	Negligible	0
FE-2	DREDGING	• Confidence in suppliers' ability?	N-A		Possible	Negligible	0
FE-3	SURVEYS	• Unusual parts, material or equipment manufactured or installed?	N-A		Unlikely	Negligible	0
FE-12	Remaining Construction - BONDS	• Unusual parts, material or equipment manufactured or installed?	N-A		Unlikely	Negligible	0
FE-13	Planning, Engineering, & Design	• Unusual parts, material or equipment manufactured or installed?	N-A		Unlikely	Negligible	0
FE-14	Construction Management	• Unusual parts, material or equipment manufactured or installed?	N-A		Unlikely	Negligible	0

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Abbreviated Risk Analysis

Meeting Date: 25-Mar-14

Risk Level

	Negligible	Marginal	Significant	Critical	Crisis
Very Likely	2	3	4	5	5
Likely	1	2	3	4	5
Possible	0	1	2	3	4
Unlikely	0	0	1	2	3

Risk Element	Feature of Work	Concerns Pull Down Tab (ENABLE MACROS THRU TRUST CENTER) (Choose ALL that apply)	Concerns	PDT Discussions & Conclusions (Include logic & justification for choice of Likelihood & Impact)	Likelihood	Impact	Risk Level
Cost Estimate Assumptions							
						Max Potential Cost Growth	**35%**
CT-1	MOB-DEMOB	• Assumptions regarding crew, productivity, overtime?	• Assumptions regarding crew, productivity, overtime? • Site accessibility, transport delays, congestion? • Assumptions related to prime and subcontractor markups/assignments?	There is good-reasonable historical info to support crew, production, effective working time for deepening/widening projects in the Wilmington Harbor with and without rock quantities. Variations based on cost estimate assumptions for MOB-DEMOB should be marginal risk when also considering other risks were also identified in PS-1, CE-1, & Q-1	Likely	Marginal	2
CT-2	DREDGING	• Assumptions regarding crew, productivity, overtime?	• Assumptions regarding crew, productivity, overtime? • Site accessibility, transport delays, congestion? • Assumptions related to prime and subcontractor markups/assignments?	There is good-reasonable historical info to support crew, production, effective working time for deepening/widening projects in the Wilmington Harbor with and without rock quantities. Variations based on cost estimate assumptions for dredging should be marginal risk when also considering other risks were also identified in PS-2, CE-2, & Q-2	Likely	Marginal	2
CT-3	SURVEYS	• Assumptions regarding crew, productivity, overtime?	• Assumptions regarding crew, productivity, overtime? • Site accessibility, transport delays, congestion? • Assumptions related to prime and subcontractor markups/assignments?	There is good-reasonable historical info to support crew, production, effective working time for deepening/widening projects in the Wilmington Harbor with and without rock quantities. Variations based on cost estimate assumptions for MOB-DEMOB should be negligble risk when also considering other risks were also identified in PS-3, CE-3, & Q-3	Likely	Negligible	1
CT-12	Remaining Construction - BONDS	• Assumptions regarding crew, productivity, overtime?	NO CONCERNS	NONE	Unlikely	Negligible	0
CT-13	Planning, Engineering, & Design	• Assumptions regarding crew, productivity, overtime?	NO CONCERNS	NONE	Unlikely	Negligible	0
CT-14	Construction Management	• Assumptions regarding crew, productivity, overtime?	NO CONCERNS	NONE	Unlikely	Negligible	0

WILMINGTON HARBOR IMPROVEMENTS PROJECT -
Feasibility (Recommended Plan)
Abbreviated Risk Analysis

Meeting Date: 25-Mar-14

Risk Level

Very Likely	2	3	4	5	5
Likely	1	2	3	4	5
Possible	0	1	2	3	4
Unlikely	0	0	1	2	3
	Negligible	Marginal	Significant	Critical	Crisis

Risk Element	Feature of Work	Concerns Pull Down Tab (ENABLE MACROS THRU TRUST CENTER) (Choose ALL that apply)	Concerns	PDT Discussions & Conclusions (Include logic & justification for choice of Likelihood & Impact)	Likelihood	Impact	Risk Level
External Project Risks							
						Max Potential Cost Growth	**40%**
EX-1	MOB-DEMOB	• Unanticipated inflations in fuel, key materials?	• Potential for market volatility impacting competition, pricing? • Unanticipated inflations in fuel, key materials?	Historical increases of fuel over the last 10 years has been approximately 10% per year but has leveled off somewhat over the last 2 years. Even still the volatitlity of fuel and competition is the greatest impact to risk and could be significant for dredging MOB-DEMOB increases.	Likely	Significant	3
EX-2	DREDGING	• Potential for market volatility impacting competition, pricing?	• Unanticipated inflations in fuel, key materials? • Potential for market volatility impacting competition, pricing?	Historical increases of fuel over the last 10 years has been approximately 10% per year but has leveled off somewhat over the last 2 years. Even still the volatitlity of fuel and competition is the greatest impact to risk and could be significant for dredging unit price increases.	Likely	Significant	3
EX-3	SURVEYS	• Unanticipated inflations in fuel, key materials?	• Unanticipated inflations in fuel, key materials? • Potential for market volatility impacting competition, pricing?	Historical increases of fuel over the last 10 years has been approximately 10% per year but has leveled off somewhat over the last 2 years. Even still the volatitlity of fuel and competition is the greatest impact to risk and could be significant for increases to overall project surveys/investigations.	Likely	Significant	3
EX-12	Remaining Construction - BONDS	• Potential for severe adverse weather?	NO CONCERNS	NONE	Unlikely	Negligible	0
EX-13	Planning, Engineering, & Design	• Potential for severe adverse weather?	NO CONCERNS	NONE	Unlikely	Negligible	0
EX-14	Construction Management	• Potential for severe adverse weather?	NO CONCERNS	NONE	Unlikely	Negligible	0

Abbreviated Risk Analysis

WILMINGTON HARBOR IMPROVEMENTS PROJECT - Feasibility (Recommended Plan)

Meeting Date: 3/25/2014 and 5/20/2014

PDT Members

Note: PDT involvement is commensurate with project size and involvement.

Project Management:	CHRIS MOORE
Planner:	TOMMA BARNES
Study Manager:	NAME
Contracting:	DANNY KISSAM
Real Estate:	N-A
Environmental:	FRANK YELVERTON
Cultural Resources:	JOHN MAYER
Engineering & Design:	LEE DANLEY
Technical Lead:	JIMMY HARGROVE
Geotech:	ZACHRY NICHOLS
Hydrology/Coastal:	DOUG WALL
Civil:	N-A
Structural:	N-A
Mechanical:	N-A
Electrical:	N-A
Cost Engineering:	JOHN CALDWELL
Construction:	DENNIS LYNCH
Operations:	NAME
Economics:	Julie McGuire

****** TOTAL PROJECT COST SUMMARY ******

PROJECT: WILMINGTON HARBOR IMPROVEMENTS PROJECT - WHIP
PROJECT NO: P2 - 138564
LOCATION: NEW HANOVER & BRUNSWICK COUNTIES, N. CAROLINA

DISTRICT: CESAW WILMINGTON DISTRICPREPARED: 6/10/2014
POC: CHIEF, COST ENGINEERING, Lee Danley, PE

This Estimate reflects the scope and schedule in report; WHIP STUDY REPORT - JUNE 2014

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)						TOTAL PROJECT COST (FULLY FUNDED)			
						Program Year (Budget EC): 2015									
						Effective Price Level Date: 1 OCT 14									
										Spent Thru:	TOTAL FIRST				
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	**TOTAL ($K)**	**10/1/2013** ($K)	**COST** ($K)	ESC (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*				*M*	*N*	*O*
12	**NAVIGATION PORTS & HARBORS**	$10,090	$3,084	31%	$13,174	1.6%	$10,247	$3,131	$13,378	$0	$13,378	9.7%	$11,241	$3,435	$14,676
	Improvements at Battery Island Turn														
	CONSTRUCTION ESTIMATE TOTALS:	$10,090	$3,084		$13,174	1.6%	$10,247	$3,131	$13,378	$0	$13,378	9.7%	$11,241	$3,435	$14,676
01	**LANDS AND DAMAGES**	$0	$0	-	$0	-	$0	$0	$0	$0	$0	-	$0	$0	$0
30	**PLANNING, ENGINEERING & DESIGN**	$555	$170	31%	$725	2.2%	$567	$173	$740	$0	$740	18.3%	$671	$205	$876
31	**CONSTRUCTION MANAGEMENT**	$400	$122	31%	$522	2.2%	$409	$125	$534	$0	$534	19.5%	$488	$149	$637
	PROJECT COST TOTALS:	$11,045	$3,375	31%	$14,420		$11,223	$3,430	**$14,652**	$0	**$14,652**	10.5%	$12,400	$3,789	$16,189

	CHIEF, COST ENGINEERING, Lee Danley, PE	ESTIMATED FEDERAL COST:	**75%** **$12,142**
	PROJECT MANAGER, Bob Keistler	ESTIMATED NON-FEDERAL COST:	**25%** **$4,047**
	CHIEF, REAL ESTATE, Ralph Werthmann SAS	**ESTIMATED TOTAL PROJECT COST:**	**$16,189**
	CHIEF, PLANNING, Elden Gatwood		
	CHIEF, ENGINEERING, Greg Williams, PE		
	CHIEF, OPERATIONS, Bob Sattin, PE		
	CHIEF, CONSTRUCTION, Dennis Lynch, PE		
	CHIEF, CONTRACTING, Jon Mayo		
	CHIEF, PM-PB, Sam Colella		
	CHIEF, DPM, Christine Brayman		

****** TOTAL PROJECT COST SUMMARY ******

****** CONTRACT COST SUMMARY ******

PROJECT: WILMINGTON HARBOR IMPROVEMENTS PROJECT - WHIP
LOCATION: NEW HANOVER & BRUNSWICK COUNTIES, N. CAROLINA
This Estimate reflects the scope and schedule in report; WHIP STUDY REPORT - JUNE 2014

DISTRICT: CESAW WILMINGTON DISTRICT PREPARED: 6/10/2014
POC: CHIEF, COST ENGINEERING, Lee Danley, PE

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
		Estimate Prepared: 6/10/2014 Effective Price Level: 10/1/2013				Program Year (Budget EC): 2015 Effective Price Level Date: 1 OCT 14								
				RISK BASED										
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	ESC (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*P*	*L*	*M*	*N*	*O*
12	NAVIGATION PORTS & HARBORS	$10,090	$3,084	31%	$13,174	1.6%	$10,247	$3,131	$13,378	2019Q4	9.7%	$11,241	$3,435	$14,676
	IMPROVEMENTS AT BATTERY ISLAND TURN						$0							
	CONSTRUCTION ESTIMATE TOTALS:	$10,090	$3,084	31%	**$13,174**		$10,247	$3,131	$13,378			$11,241	$3,435	$14,676
01	LANDS AND DAMAGES	$0	$0	0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
30	PLANNING, ENGINEERING & DESIGN													
	Project Management	$555	$170	31%	$725	2.2%	$567	$173	$740	2019Q3	18.3%	$671	$205	$876
31	CONSTRUCTION MANAGEMENT													
	Construction Management	$400	$122	31%	$522	2.2%	$409	$125	$534	2019Q4	19.5%	$488	$149	$637
	CONTRACT COST TOTALS:	$11,045	$3,375		**$14,420**		$11,223	$3,430	$14,652			$12,400	$3,789	**$16,189**