

## Cost Engineering Appendix

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**MIDDLE PENINSULA STATE PARK  
CHESAPEAKE BAY ENVIRONMENTAL RESTORATION AND PROTECTION  
PROGRAM, SECTION 510**

**GLOUCESTER COUNTY, VIRGINIA**

### APPENDIX D

November 2024



**US Army Corps  
of Engineers®**  
Norfolk District

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## 1 INTRODUCTION

### 1.1 Cost Narrative

The United States Corps of Engineers (USACE) cost estimates for planning purposes are prepared in accordance with the following guidance:

- Engineer Technical Letter (ETL) 1110-2-573, Construction Cost Estimating Guide for Civil Works, 30 September 2008
- Engineer Regulation (ER) 1110-1-1300, Cost Engineering Policy and General Requirements, 26 March 1993
- ER 1110-2-1302, Civil Works Cost Engineering, 15 September 2008
- ER 1110-2-1150, Engineering and Design for Civil Works Projects, 31 August 1999
- ER 1105-2-100, Planning Guidance Notebook, 22 April 2000, as amended.
- Engineer Manual (EM) 1110-2-1304 (Tables revised 30 March 2007), Civil Works Construction Cost Index System, 31 March 2013
- The Civil Works Planning Community of Practice (CECW-CP) Memorandum for Distribution, Subject: Initiatives to Improve the Accuracy of Total Project Costs in Civil Works Feasibility Studies Requiring Congressional Authorization, 19 September 2007
- The Chief of Engineering and Construction Division, Civil Works Directorate (CECW-CE) Memorandum for Distribution, Subject: Application of Cost Risk Analysis Methods to Develop Contingencies for Civil Works Total Project Costs, 3 July 2007
- Cost and Schedule Risk Analysis Guidance, 17 May 2009

The goals of the cost engineering for the Middle Peninsula State Park Feasibility Study are to present a total project cost (construction and non-construction costs) for the Tentatively Selected Plan (TSP) at the current price level to be used for project justification/authorization and to project costs forward in time for budgeting purposes. Costing efforts are intended to produce a final product, or cost estimate, that is reliable, accurate, and supports the definition of the government's and the non-federal sponsor's obligations.

### 1.2 Project Description & Background

Located in Gloucester County, Virginia, the 431-acre MPSP contains 2,260 linear feet of York River shoreline. The park also includes approximately 3,776 linear feet of frontage along Aberdeen Creek. The main access road into the park is State Route 632, located roughly five miles west from US highway, Route 17.

Within MPSP, the study area is limited to nearly 2,000 linear feet of York River shoreline. Based on the physical characteristics of the site, the study area can be described as three different segments. Areas 1 and 3, consist of tidal marsh habitat, with approximately 600 linear feet and 390 linear feet of shoreline, respectively. Area 2, located in between the marsh areas, is approximately 1,000 linear feet of modified

shoreline, comprised of dilapidated wooden bulkheads and timber groins, stone revetments, and gabion cages. **Figure 1-1** shows the study area.



**Figure 1-1. Study Area Boundary**

### 1.3 Scope of Work

All alternatives for the Middle Peninsula State Park Feasibility Study include the following civil works feature accounts:

- **01 Account – Lands and Damages:** This feature includes all costs of acquiring for the project (by purchase or condemnation) real property or permanent interests therein, including Government costs, damages, and costs of disposal of real estate. Government costs include planning expenses for the real estate portion of the General Design Memo and for the detailed Real Estate Memo; and project real estate office administration, surveys, and marking for land acquisition purposes and appraisals.

- 02 Account – Relocations: This feature includes removing and relocating, or reconstructing property of others, such as roads, railroads, cemeteries, utilities, buildings, and other structures; and lands or interests purchased for such relocations and conveyed to others, including real estate planning and acquisition expenses.
- 06 Account – Fish & Wildlife Facilities: This feature includes items such as ladders, elevators, locks and related facilities for passage of fish at dams and navigation locks and maintenance of fish runs; and provision for wildlife preservation. In support of wildlife, this feature includes environmental mitigation and monitoring costs.
- 16 Account – Bank Stabilization: This feature includes revetments, linings, training dikes, and bulkheads for stabilization of banks of watercourses to prevent erosion, sloughing, or meandering.
- 17 Account – Beach Replenishment: This feature includes replacement of eroded beaches, for purposes of recreation and shore protection, by direct deposit of materials obtained by dredging or land excavation.
- 18 Account – Cultural Resource Preservation: The proposed project area has potential impacts on cultural resources that may require extensive archaeological mitigations. Since no surveys were done, areas that are currently considered significant sites may potentially have extensive impacts or none at all. A conservative approach was taken, assuming most sites are high-probability sites and will have substantial archaeological mitigations. The cost for archaeological mitigation was conservatively estimated and provided by NAO cultural resources PDT member.
- 30 Account – Planning, Engineering, and Design (PED): This feature includes all engineering, design, surveys, preparation of detailed plans and specifications, and related work required for the construction of the project, including relocations.
- 31 Account – Construction Management (CM) & Supervision and Administration (S&A): This feature includes such functions as inspection, supervision, project office administration, and distributive costs of area office and general overhead charged to the project. Costs for Office of the Chief of Engineers CE and Division Office Executive Direction and Management are not charged to Construction, General but to the General Expenses appropriation title.

## 2 ALTERNATIVE ANALYSIS

### 2.1 Final Array of Alternatives

Table 2-1 presents the final array of alternatives and the measures each one includes.

**Table 2-1. Final Array of Alternatives**

Alt IDs	Modified Shoreline (Area 2)				Marsh Habitat (Areas 1 and 3)			All
	Breakwaters	Sills	Sand Fill	Vegetation	Marsh Fringe Enhancement	Toe Protection	Offshore Reef Habitat	Removal of Existing Structures
1	No Action							
2A	X	X	X	X	X	X	X	X
2B	X	X	X	X	X	X		X
3A		X	X	X	X	X	X	X
3B		X	X	X	X	X		X

### 2.2 Comparison of Alternatives

Table 2-2 presents the estimated cost (in thousands) by feature account for each alternative.

**Table 2-2. Estimated Cost Comparison (in thousands)**

Alternative	01 Account	02 Account	06 Account	16 Account	17 Account	18 Account	30 Account	31 Account	Total
1	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
2A	\$71	\$223	\$413	\$3,091	\$2,870	\$1,080	\$2,835	\$1,114	\$11,697
2B	\$70	\$223	\$144	\$3,091	\$2,870	\$1,080	\$2,732	\$1,076	\$11,286
3A	\$71	\$223	\$463	\$2,880	\$1,967	\$1,080	\$2,468	\$960	\$10,112
3B	\$70	\$223	\$132	\$2,880	\$1,967	\$1,080	\$2,356	\$913	\$9,621

Table 2-3 presents the project first cost (in thousands) by feature account for each alternative.

**Table 2-3. Project First Cost Comparison (in thousands)**

Alternative	01 Account	02 Account	06 Account	16 Account	17 Account	18 Account	30 Account	31 Account	Total
1	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
2A	\$71	\$223	\$413	\$3,091	\$2,870	\$1,080	\$2,835	\$1,114	\$11,697
2B	\$70	\$223	\$144	\$3,091	\$2,870	\$1,080	\$2,732	\$1,076	\$11,286
3A	\$71	\$223	\$463	\$2,880	\$1,967	\$1,080	\$2,468	\$960	\$10,112
3B	\$70	\$223	\$132	\$2,880	\$1,967	\$1,080	\$2,356	\$913	\$9,621

Table 2-4 presents the total project cost (in thousands) by feature account for each alternative.

**Table 2-4. Total Project Cost Comparison (in thousands)**

Alternative	01 Account	02 Account	06 Account	16 Account	17 Account	18 Account	30 Account	31 Account	Total
1	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
2A	\$77	\$254	\$470	\$3,517	\$3,266	\$1,229	\$3,108	\$1,297	\$13,218
2B	\$77	\$254	\$163	\$3,517	\$3,266	\$1,229	\$2,994	\$1,253	\$12,753
3A	\$77	\$254	\$527	\$3,277	\$2,239	\$1,229	\$2,703	\$1,118	\$11,424
3B	\$77	\$254	\$150	\$3,277	\$2,239	\$1,229	\$2,580	\$1,064	\$10,870

## 3 Construction Cost Estimate

### 3.1 Estimate Development Methodology

The construction cost estimate was developed using MII using the appropriate work breakdown structure (WBS). These cost estimates were developed using cost resources such as RSMeans, MII Cost Libraries, and vendor quotations. The preferred labor, equipment, materials, and crew/production breakdown support the estimates to align with current construction methods. The PDT provided the quantities, and the cost engineer checked them.

The presented estimate is a class 3 cost estimate. A class 3 cost estimate is defined as an estimate having early technical information (including designs) that are approaching a 10-60% quality of project definition. There is greater confidence in project planning and scope, construction elements and quantity development. The estimates rely less on generic cost book items, greater reliance on quotes, recent historical and site-specific crew based details. Class 3 estimates are a reflection of improved technical documents. The estimates must be supported by a technical information (scope, design, acquisition and construction methods, etc.) discussion within the estimate and the uncertainties associated with each major cost item in the estimate. Special attention must be given to large construction elements and items that are sensitive to technical information change. Typical Contingency Range could be 20% to 50%.

### 3.2 Basis of Estimate

The following list details all major assumptions and items considered in the development of the cost estimate:

- Estimate has been prepared in accordance with ER 1110 – 2 – 1302.
- The estimate is presented according to the civil works WBS.
- The estimated cost price level for the tentatively selected plan (TSP) is 2024.
- The program year for the project first cost is 2025.
- Fully Funded Project cost has been escalated to the midpoint of construction in 2029.
- A contracting Contract Acquisition Strategy is not known currently. However, to reflect a more conservative approach, the prime contractor is assumed to sub out all work.
- A local sales tax of 6.00% has been used in the estimate.
- A productivity markup of 90% has been applied to the estimate.

- A standard work week of 5 days a week, 8 hours a day has been assumed in the estimate. No overtime is accounted for in the estimate.
- Labor rates are based on the national labor library, which is much more conservative than local Davis-Bacon wage rates.
- Equipment rates are based on the USACE EP-1110-1-8, Region 2. Adjustments are made for fuel and facility capital cost of money (FCCM). Judicious use of owned versus rental rates was considered based on typical contractor usage and local equipment availability. Full FCCM/cost of money rate is the latest available; MII program takes EP-recommended discount; no other adjustments have been made to the FCCM.
- Fuel rates (gasoline, on- and off-road diesel) are based on local market averages for on-road and off-road fuels in Miami-Dade County, Florida. Since fuels fluctuate irrationally, an average was used.
- Job Office Overhead (JOOH) is included at a rate of 15% for the prime contractor and 10% for the subcontractor.
- Home Office Overhead (HOOH) is included at a rate of 10% for the prime contractor and 10% for the subcontractor.
- Profit is included at a rate of 10% for both the prime contractor and the subcontractor.
- Bonding is included at a rate of 1.5% only for the prime contractor.
- Contingency is included in the cost estimate at a rate of 27% for all construction accounts and PED/CM. 20% is included on the O1 Account.

### 3.3 Construction Schedule

The construction schedule for the tentatively selected plan (TSP) was developed using Primavera P6 and is included as attachment 1 to this appendix. The total construction duration is currently assumed to be 12 months. The construction schedule is based on various pieces of data obtained from the PDT and the MII file.

### 3.4 Planning, Engineering & Design (PED)

Costs for PED have been included based on a percentage of the total construction cost. 27.5% has been included based on information and concurrence from the PDT. The TPCS provides a more detailed breakdown of the 27.5%.

### 3.5 Construction Management (CM)

Costs for CM have been included based on a percentage of the total construction cost. 14.5% has been included based on information and concurrence from the PDT. The TPCS provides a more detailed breakdown of the 14.5%.

### 3.6 Contingency

The project contingency determined by the PDT is 27%.

The goal in contingency development is to identify the uncertainties associated with an item of work or task, forecast the cost/risk relationship, and assign a value to this task that would limit the cost risk to an



acceptable degree of confidence. Consideration must be given to the details available at each stage of planning, design, or construction for which a cost estimate is being prepared.

An Abbreviated Risk Analysis (ARA) was conducted in May 2024 in accordance with the procedures outlined in the manual entitled Cost and Schedule Risk Analysis Guidance, dated 17 May 2009. Members of the Norfolk District PDT participated in a cost risk analysis brainstorming session to identify risks associated with the project. The risk analysis used the “LOW RISK” category because the project involves typical construction with possible life safety issues. Assumptions were made to the likelihood and impact of each risk item, as well as the probability of occurrence and magnitude of the impact if it were to occur. Adjustments were made to the analysis upon review by the PDT and the final contingencies were established. The risk register \$ summary is included as attachment 2 to this appendix.

### 3.7 Total Project Cost Summary (TPCS)

The TPCS addresses the inflation through project completion accomplished by escalation to the midpoint of construction. The TPCS includes federal and non-federal costs for all construction features of the project, PED, and CM, along with the appropriate contingencies and escalation associated with each of these activities. The TPCS is formatted according to the Civil Works Work Breakdown Structure. The TPCS was prepared using the MCACES/MII cost estimate, contingencies developed in the ARA, the project design and construction schedule, and estimates of PED and CM prepared by others.

The TPCS for the tentatively selected plan (TSP) can be found as attachment 3 to this appendix.

# ATTACHMENT 1 SCHEDULE



# ATTACHMENT 2

## ARA SUMMARY & REGISTER

**Abbreviated Risk Analysis**

Project (less than \$40M): **Alternatives for Middle Peninsula State Park**  
 Project Development Stage/Alternative: **Feasibility (Alternatives)**  
 Risk Category: **Low Risk: Typical Construction, Simple**

Alternative: **Alt 2A**

Meeting Date: **5/9/2024**

Total Estimated Construction Contract Cost = \$ **6,053,325**

	CWWBS	Feature of Work	Estimated Cost	% Contingency	\$ Contingency	Total	
	01 LANDS AND DAMAGES	Real Estate	\$ 58,874	20%	\$ 11,775	\$ 70,649	
1	06 FISH AND WILDLIFE FACILITIES	Vegetated Slope & Marsh Fringe Enhancement	\$ 115,710	25%	\$ 29,050	\$ 144,760	
2	06 FISH AND WILDLIFE FACILITIES	Offshore Reef Habitate *Precast Concrete Structur	\$ 208,765	36%	\$ 75,838	\$ 284,603	
3	16 BANK STABILIZATION	Existing Structures Demolition/Removal	\$ 463,246	20%	\$ 91,261	\$ 554,507	
4	16 BANK STABILIZATION	Rip-Rap for Breakwaters & Toe Protection	\$ 1,970,300	23%	\$ 461,535	\$ 2,431,835	
5	17 BEACH REPLENISHMENT	Sand Fill	\$ 2,259,493	32%	\$ 716,130	\$ 2,975,623	
6	18 CULTURAL RESOURCE PRESERVATION	Cultural Resource Preservation	\$ 850,000	43%	\$ 362,670	\$ 1,212,670	
7	02 RELOCATIONS	Utility Relocations	\$ 185,811	20%	\$ 37,162	\$ 222,973.20	
8			\$ -	0%	\$ -	\$ -	
9			\$ -	0%	\$ -	\$ -	
10			\$ -	0%	\$ -	\$ -	
11			\$ -	0%	\$ -	\$ -	
12	All Other	Remaining Construction Items	\$ -	0.0%	\$ -	\$ -	
13	30 PLANNING, ENGINEERING, AND DESIGN	Planning, Engineering, & Design	\$ 2,232,131	23%	\$ 504,960	\$ 2,737,091	
14	31 CONSTRUCTION MANAGEMENT	Construction Management	\$ 877,732	18%	\$ 155,346	\$ 1,033,078	
XX	FIXED DOLLAR RISK ADD (EQUALLY DISPERSED TO ALL, MUST INCLUDE JUSTIFICATION SEE BELOW)					\$ -	

Totals						
	Real Estate	\$ 58,874	20%	\$ 11,775	\$ 70,648.80	
	Total Construction Estimate	\$ 6,053,325	29%	\$ 1,773,648	\$ 7,826,973	
	Total Planning, Engineering & Design	\$ 2,232,131	23%	\$ 504,960	\$ 2,737,091	
	Total Construction Management	\$ 877,732	18%	\$ 155,346	\$ 1,033,078	
	Total Excluding Real Estate	\$ 9,163,188	27%	\$ 2,433,954	\$ 11,597,142	

Confidence Level Range Estimate (\$000's)	Base	50%	80%
		\$9,163k	\$10,623k

\* 50% based on base is at 5% CL

**Fixed Dollar Risk Add:** (Allows for additional risk to be added to the risk analysis. Must include justification. Does not allocate to Real Estate.)

## Alternatives for Middle Peninsula State Park Alt 2A

Feasibility (Alternatives)

Abbreviated Risk Analysis

Meeting Date: 9-May-24

		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	Moderate	Significant	Critical	

## Risk Register

Use/View	Risk Element	Feature of Work	Concerns	PDT Discussions & Conclusions (Include logic & justification for choice of Likelihood & Impact)	Impact	Likelihood	Risk Level
<b>Project Management &amp; Scope Growth</b>							<b>40%</b>
Yes	PS-1	Vegetated Slope & Marsh Fringe Enhancement	Current Scope includes purchasing and planting approximately 10,500 plants as specified in the vegetation quantities spreadsheet. Planting is assumed to be done by hand.	Could be a potential for goose protection in the future. Potential for geese to eat plants while planting is ongoing. There may be a need to address this in the future. There is also concern for pedestrians trampling the plants both during planting and beyond. Ongoing adaptive management could be needed up to 10 years from construction completion.	Moderate	Unlikely	1
Yes	PS-2	Offshore Reef Habitat "Precast Concrete Structures	Current Scope includes purchasing and placing approximately 244 precast concrete structures just offshore via pontoon boat. Estimate assumes Bay Ball Module from "reef ball foundation" will be used.	Base estimate assumes bay modules to be used, however a different type or model could be used in construction. This could impact the overall cost. Soil investigations haven't been conducted. This could affect the size of reef balls selected in implementation. Weight of structures were looked at during meeting. bay ball are 550 lbs each. Could potentially use the Oyster Bay Module during implementation. These are 12" tall x 17" base and weight 55 lbs each. Base estimate might need to be updated. Adaptive management costs most likely will be incurred and oysters might be needed for the structures. Base estimate to be updated to include oysters.	Marginal	Likely	2
Yes	PS-3	Existing Structures Demolition/Removal	Current Scope includes the demo/removal and disposal of several existing features. These features include the following: 350 tons of rip-rap, 22,000 SF of wooden bulkhead panels, 200 wooden bulkhead posts, 200 groin pilings and 2,100 SF of gabion cages. All work is assumed to take place from the shore and demo/removed material will be hauled to an appropriate disposal site.	There is a potential that the timber groins could be cut-off at ground level opposed to fully removed. Cutting them could potentially be cheaper than fully removing due to several unknowns such as size of existing piles.	Negligible	Possible	0
Yes	PS-4	Rip-Rap for Breakwaters & Toe Protection	Current Scope includes purchasing and placing approximately 8,432 tons of rip-rap stone for breakwaters and toe protection. Material to be purchased and delivered to site and place from the shore.	Some stone could be available on site for reuse, however total quantities do not take this into account, providing a more conservative estimate. Total quantities are not expected to change, but could potentially change.	Marginal	Unlikely	0
Yes	PS-5	Sand Fill	Current Scope includes purchasing and placing approximately 276,426 CF of sand. Sand is assumed to be purchased locally, and placed/spread using land based equipment.	All sand will need to be purchased. Total quantities are not expected to change, but could potentially change.	Marginal	Unlikely	0
Yes	PS-6	Cultural Resource Preservation	CRP is currently estimated at maximum value of \$1M.	Cultural Resource Preservation Range of \$700k - \$1M provided by CRP team member. Mid-range value of \$850K has been included in the base estimate.	Marginal	Unlikely	0
No	PS-7	Utility Relocations	RE provided their own contingency of 20% for utility Relocations.	None.	Moderate	Possible	N/A
Yes	PS-13	Planning, Engineering, & Design	PED is currently calculated to be 29.5% of total construction costs.	PDT shows no concerns for current assumptions for PED.	Negligible	Unlikely	0

Yes	PS-14	Construction Management	CM is currently calculated to be 14.5% of total construction costs.	PDT shows no concerns for current assumptions for CM.	Negligible	Unlikely	0	
<b>Acquisition Strategy</b>							<b>Maximum Project Growth</b>	<b>30%</b>
Yes	AS-1	Vegetated Slope & Marsh Fringe Enhancement	Baseline estimate assumes that a subcontractor will be performing all of the work, therefore providing an extra layer of markups in the estimate and yielding a more conservative estimate.	PDT has no issues with current conservative approach assumed in base estimate.	Marginal	Possible	1	
Yes	AS-2	Offshore Reef Habitate *Precast Concrete Structures	Baseline estimate assumes that a subcontractor will be performing all of the work, therefore providing an extra layer of markups in the estimate and yielding a more conservative estimate.	PDT has no issues with current conservative approach assumed in base estimate.	Marginal	Possible	1	
Yes	AS-3	Existing Structures Demolition/Removal	Baseline estimate assumes that a subcontractor will be performing all of the work, therefore providing an extra layer of markups in the estimate and yielding a more conservative estimate.	PDT has no issues with current conservative approach assumed in base estimate.	Marginal	Possible	1	
Yes	AS-4	Rip-Rap for Breakwaters & Toe Protection	Baseline estimate assumes that a subcontractor will be performing all of the work, therefore providing an extra layer of markups in the estimate and yielding a more conservative estimate.	PDT has no issues with current conservative approach assumed in base estimate.	Marginal	Possible	1	
Yes	AS-5	Sand Fill	Baseline estimate assumes that a subcontractor will be performing all of the work, therefore providing an extra layer of markups in the estimate and yielding a more conservative estimate.	PDT has no issues with current conservative approach assumed in base estimate.	Marginal	Possible	1	
Yes	AS-6	Cultural Resource Preservation	CRP is currently estimated at maximum value of \$1M.	NFS could potentially award archaeological survey work. Effort would more than likely cost the same, however would probably be awarded quicker if done by the NFS.	Moderate	Very LIKELY	4	
No	AS-7	Utility Relocations	RE provided their own contingency of 20% for utility Relocations.		Negligible	Unlikely	N/A	
Yes	AS-13	Planning, Engineering, & Design	No Concerns.	None.	Negligible	Possible	0	
Yes	AS-14	Construction Management	No Concerns.	Any potential cultural resource mitigation will be required prior to construction begins.	Marginal	Possible	1	
<b>Construction Elements</b>							<b>Maximum Project Growth</b>	<b>15%</b>
Yes	CON-1	Vegetated Slope & Marsh Fringe Enhancement	Current Scope includes purchasing and planting approximately 10,500 plants as specified in the vegetation quantities spreadsheet. Planting is assumed to be done by hand.	Construction approach is not expected to differ from assumptions in base estimate.	Marginal	Possible	1	
Yes	CE-2	Offshore Reef Habitate *Precast Concrete Structures	Current Scope includes purchasing and placing approximately 244 precast concrete structures just offshore via pontoon boat. Estimate assumes Bay Ball Module from "reef ball foundation" will be used.	There is potential that a different size reef ball could be used, however construction methodology/placement would be the same.	Marginal	Possible	1	
Yes	CE-3	Existing Structures Demolition/Removal	Current Scope includes the demo/removal and disposal of several existing features. These features include the following: 350 tons of rip-rap, 22,000 SF of wooden bulkhead panels, 200 wooden bulkead posts, 200 groin pilings and 2,100 SF of gabion cages. All work is assumed to take place from the shore and demo/removed material will be hauled to an appropriate disposal site.	There is a potential that the timber groins could be cut-off at ground level opposed to fully removed. Cutting them could potentially be cheaper than fully removing due to several unknowns such as size of existing piles.	Marginal	Possible	1	
Yes	CE-4	Rip-Rap for Breakwaters & Toe Protection	Current Scope includes purchasing and placing approximately 8,432 tons of rip-rap stone for breakwaters and toe protection. Material to be purchased and delivered to site and place from the shore.	PDT has no issues with current assumptions in base estimate.	Marginal	Possible	1	

Yes	CE-5	Sand Fill	Current Scope includes purchasing and placing approximately 276,426 CF of sand. Sand is assumed to be purchased locally, and placed/spread using land based equipment.	PDT has no issues with current assumptions in base estimate.	Marginal	Possible	1
Yes	CE-6	Cultural Resource Preservation	None.	None.	Negligible	Possible	0
No	CE-7	Utility Relocations	RE provided their own contingency of 20% for utility Relocations.	None.	Negligible	Unlikely	N/A
Yes	CE-13	Planning, Engineering, & Design	Historical existing structure and associated utility lines could potentially cause issues.	Additional surveys will be needed to locate existing septic tank and utility lines. A house use to existing on the property and it is unsure where it's utilities are located.	Marginal	Very LIKELY	3
Yes	CE-14	Construction Management	Only PDT concerns is possible construction delays tied to funding, archeological/historical efforts, etc....	Potential delays could result in higher construction management costs.	Negligible	Possible	0
<b>Specialty Construction or Fabrication</b>						<b>Maximum Project Growth</b>	<b>50%</b>
Yes	SC-1	Vegetated Slope & Marsh Fringe Enhancement	Current Scope includes purchasing and planting approximately 10,500 plants as specified in the vegetation quantities spreadsheet. Planting is assumed to be done by hand. Quote for plants obtained from Pinelands Nursery. No additional QTYs included in the base estimate.	Could these plants be seasonal? There is a potential concern for plant availability. There couldn't potentially be a designated planting season, but the PDT is unsure at this time.	Marginal	Possible	1
Yes	SC-2	Offshore Reef Habitatte *Precast Concrete Structures	Current Scope includes purchasing and placing approximately 244 precast concrete structures just offshore via pontoon boat. Estimate assumes Bay Ball Module from "reef ball foundation" will be used. Precast reef ball modules are a specialty "MTO" item. Unit costs obtained from company's website. 10% additional quantity is include din the base estimate to allot for damaged material received.	Could material prices vary during implementation? Smaller reef ball could be used moving forward. There could potentially be a need for oyster seeding.	Marginal	Likely	2
Yes	SC-3	Existing Structures Demolition/Removal	Current Scope includes the demo/removal and disposal of several existing features. These features include the following: 350 tons of rip-rap, 22,000 SF of wooden bulkhead panels, 200 wooden bulkhead posts, 200 groin pilings and 2,100 SF of gabion cages. All work is assumed to take place from the shore and demo/removed material will be hauled to an appropriate disposal site.	Could construction crews run into slippage or other issues when removing the existing bulkhead?	Negligible	Likely	1
Yes	SC-4	Rip-Rap for Breakwaters & Toe Protection	Current Scope includes purchasing and placing approximatley 8,432 tons of rip-rap stone for breakwaters and toe protection. Material to be purchased and delivered to site and place from the shore.	Rip-Rap has to be placed, as opposed to dumped in place, so it will be more labor/equipment intensive.	Marginal	Possible	1
Yes	SC-5	Sand Fill	Current Scope includes purchasing and placing approximately 276,426 CF of sand. Sand is assumed to be purchased locally, and placed/spread using land based equipment.	Sand fill will be very sensitive to unit pricing at time of construction. Sand could potentially come from a beneficial use.	Moderate	Likely	3
No	SC-6	Cultural Resource Preservation	None.	None.	Negligible	Unlikely	N/A
No	SC-7	Utility Relocations	RE provided their own contingency of 20% for utility Relocations.	None.	Negligible	Unlikely	N/A
No	SC-13	Planning, Engineering, & Design	None.	None.	Negligible	Unlikely	N/A
No	SC-14	Construction Management	None.	None.	Negligible	Unlikely	N/A
<b>Technical Design &amp; Quantities</b>						<b>Maximum Project Growth</b>	<b>20%</b>
Yes	T-1	Vegetated Slope & Marsh Fringe Enhancement	Current Scope includes purchasing and planting approximately 10,500 plants as specified in the vegetation quantities spreadsheet. Planting is assumed to be done by hand.	Current quantities could change between now and implementation as design improves and unknowns decrease.	Marginal	Likely	2



Yes	T-2	Offshore Reef Habitate *Precast Concrete Structures	Current Scope includes purchasing and placing approximately 244 precast concrete structures just offshore via pontoon boat. Estimate assumes Bay Ball Module from "reef ball foundation" will be used.	Current base estimate assumes bay modules to be used, however this will most likely change moving forward. This will directly impact both the design and the overall quantities.	Marginal	Very LIKELY	3	
Yes	T-3	Existing Structures Demolition/Removal	Current Scope includes the demo/removal and disposal of several existing features. These features include the following: 350 tons of rip-rap, 22,000 SF of wooden bulkhead panels, 200 wooden bulkead posts, 200 groin pilings and 2,100 SF of gabion cages. All work is assumed to take place from the shore and demo/removed material will be hauled to an appropriate disposal site.	Overall quantities and design are not expected to change before implementation.	Negligible	Unlikely	0	
Yes	T-4	Rip-Rap for Breakwaters & Toe Protection	Current Scope includes purchasing and placing approximately 8,432 tons of rip-rap stone for breakwaters and toe protection. Material to be purchased and delivered to site and place from the shore.	Overall design could potentially change along with quantities based on future site investigations.	Marginal	Possible	1	
Yes	T-5	Sand Fill	Current Scope includes purchasing and placing approximately 276,426 CF of sand. Sand is assumed to be purchased locally, and placed/spread using land based equipment.	Overall design could potentially change along with quantities based on future site investigations.	Marginal	Possible	1	
No	T-6	Cultural Resource Preservation	None.	None.	Negligible	Unlikely	N/A	
No	T-7	Utility Relocations	RE provided their own contingency of 20% for utility Relocations.	None.	Negligible	Unlikely	N/A	
Yes	T-13	Planning, Engineering, & Design	Guidance/Regulation changes in future could affect design assumptions.	Potential guidance changes could impact designs and result in additional design effort.	Marginal	Possible	1	
No	T-14	Construction Management	None.	None.	Negligible	Unlikely	N/A	
<b>Cost Estimate Assumptions</b>							<b>Maximum Project Growth</b>	<b>25%</b>
Yes	EST-1	Vegetated Slope & Marsh Fringe Enhancement	Current Scope includes purchasing and planting approximately 10,500 plants as specified in the vegetation quantities spreadsheet. Planting is assumed to be done by hand.	PDT shows no concerns with current base estimate assumptions.	Negligible	Possible	0	
Yes	EST-2	Offshore Reef Habitate *Precast Concrete Structures	Current Scope includes purchasing and placing approximately 244 precast concrete structures just offshore via pontoon boat. Estimate assumes Bay Ball Module from "reef ball foundation" will be used.	Base estimate assumes bay modules to be used, however a different type or model could be used in construction. This could impact the overall cost. Soil investigations haven't been conducted. This could affect the size of reef balls selected in implemen	Moderate	Possible	2	
Yes	EST-3	Existing Structures Demolition/Removal	Current Scope includes the demo/removal and disposal of several existing features. These features include the following: 350 tons of rip-rap, 22,000 SF of wooden bulkhead panels, 200 wooden bulkead posts, 200 groin pilings and 2,100 SF of gabion cages. All work is assumed to take place from the shore and demo/removed material will be hauled to an appropriate disposal site.	There is a possibility that timber piles could be cut off as opposed to fully removed during implementation. This should not have any affect on cost.	Negligible	Possible	0	
Yes	EST-4	Rip-Rap for Breakwaters & Toe Protection	Current Scope includes purchasing and placing approximately 8,432 tons of rip-rap stone for breakwaters and toe protection. Material to be purchased and delivered to site and place from the shore.	This feature will be very sensitive to fluctuating market prices and could vary depending on current material prices.	Marginal	Possible	1	

Yes	EST-5	Sand Fill	Current Scope includes purchasing and placing approximately 276,426 CF of sand. Sand is assumed to be purchased locally, and placed/spread using land based equipment.	This feature will be very sensitive to fluctuating market prices and could vary depending on current material prices	Marginal	Possible	1	
Yes	EST-6	Cultural Resource Preservation	CRP is currently estimated at maximum value of \$1M.	Cultural Resource Preservation Range of \$700k - \$1M provided by CRP team member. Maximum value of \$1M has been included in the base estimate.	Marginal	Possible	1	
No	EST-7	Utility Relocations	RE provided their own contingency of 20% for utility Relocations.	None.	Negligible	Unlikely	N/A	
Yes	EST-13	Planning, Engineering, & Design	PED is currently calculated to be 29.5% of total construction costs.	PDT shows no concerns for current assumptions for PED.	Marginal	Possible	1	
Yes	EST-14	Construction Management	CM is currently calculated to be 14.5% of total construction costs.	PDT shows no concerns for current assumptions for CM.	Marginal	Possible	1	
<b>External Project Risks</b>						<b>Maximum Project Growth</b>		<b>20%</b>
Yes	EX-1	Vegetated Slope & Marsh Fringe Enhancement	Could there be funding or timeline issues? Current midpoint of construction is assumed to be 2026Q2. Midpoint shifting beyond that will result in increased costs. Could any severe or adverse weather or site conditions between now and implementation affect the current assumptions/designs/quantities?	NFS may or may not want to execute the project. This is still yet to be determined. Expected timeline for PPA could be up to a year, with a target date of 6 months to a year post study. Funding is not expected to be an issue. Adverse weather is not expected to cause any project difficulties prior to construction, but could cause delays during construction. Environmental permitting from VMRC could take up to a year to be approved.	Marginal	Possible	1	
Yes	EX-2	Offshore Reef Habitate *Precast Concrete Structures	Could there be funding or timeline issues? Current midpoint of construction is assumed to be 2026Q2. Midpoint shifting beyond that will result in increased costs. Could any severe or adverse weather or site conditions between now and implementation affect the current assumptions/designs/quantities?	NFS may or may not want to execute the project. This is still yet to be determined. Expected timeline for PPA could be up to a year, with a target date of 6 months to a year post study. Funding is not expected to be an issue. Adverse weather is not expected to cause any project difficulties prior to construction, but could cause delays during construction. Environmental permitting from VMRC could take up to a year to be approved.	Marginal	Possible	1	
Yes	EX-3	Existing Structures Demolition/Removal	Could there be funding or timeline issues? Current midpoint of construction is assumed to be 2026Q2. Midpoint shifting beyond that will result in increased costs. Could any severe or adverse weather or site conditions between now and implementation affect the current assumptions/designs/quantities?	NFS may or may not want to execute the project. This is still yet to be determined. Expected timeline for PPA could be up to a year, with a target date of 6 months to a year post study. Funding is not expected to be an issue. Adverse weather is not expected to cause any project difficulties prior to construction, but could cause delays during construction. Environmental permitting from VMRC could take up to a year to be approved.	Marginal	Possible	1	
Yes	EX-4	Rip-Rap for Breakwaters & Toe Protection	Could there be funding or timeline issues? Current midpoint of construction is assumed to be 2026Q2. Midpoint shifting beyond that will result in increased costs. Could any severe or adverse weather or site conditions between now and implementation affect the current assumptions/designs/quantities?	NFS may or may not want to execute the project. This is still yet to be determined. Expected timeline for PPA could be up to a year, with a target date of 6 months to a year post study. Funding is not expected to be an issue. Adverse weather is not expected to cause any project difficulties prior to construction, but could cause delays during construction. Environmental permitting from VMRC could take up to a year to be approved.	Marginal	Possible	1	
Yes	EX-5	Sand Fill	Could there be funding or timeline issues? Current midpoint of construction is assumed to be 2026Q2. Midpoint shifting beyond that will result in increased costs. Could any severe or adverse weather or site conditions between now and implementation affect the current assumptions/designs/quantities?	NFS may or may not want to execute the project. This is still yet to be determined. Expected timeline for PPA could be up to a year, with a target date of 6 months to a year post study. Funding is not expected to be an issue. Adverse weather is not expected to cause any project difficulties prior to construction, but could cause delays during construction. Environmental permitting from VMRC could take up to a year to be approved.	Marginal	Possible	1	
No	EX-6	Cultural Resource Preservation	None.	None.	Negligible	Unlikely	N/A	

No	EX-7	Utility Relocations	RE provided their own contingency of 20% for utility Relocations.	None.	Negligible	Unlikely	N/A
Yes	EX-13	Planning, Engineering, & Design	VMRC permitting delays could result in delayed or additional PED efforts.	VMRC permitting delays could result in delayed or additional PED efforts.	Marginal	Possible	1
Yes	EX-14	Construction Management	Potential adverse weather or weather delays could result in construction delays during implementation.	Potential adverse weather or weather delays could result in construction delays during implementation.	Marginal	Possible	1

# ATTACHMENT 3

## TPCS

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

PROJECT: Middle Peninsula State Park Feasibility Study  
PROJECT NO: 492804  
LOCATION: Gloucester County, Virginia

DISTRICT: Norfolk District

PREPARED: 10/16/2024

POC: CHIEF, COST ENGINEERING, NAO

This Estimate reflects the scope and schedule in report; NOV2024 Feasibility Report

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)					TOTAL PROJECT COST (FUNDED)				
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST (\$K)	CNTG (\$K)	CNTG (%)	TOTAL (\$K)	ESC (%)	COST (\$K)	CNTG (\$K)	REMAINING COST (\$K)	2025 1-Oct-24 Spent Thru:	TOTAL FIRST COST (\$K)	ESC (%)	COST (\$K)	CNTG (\$K)	FULL (\$K)
										1-Oct-24 (\$K)					
<b>Alternative 2A</b>															
02	RELOCATIONS	\$186	\$37	20%	\$223		\$186	\$37	\$223		\$223	13.8%	\$211	\$42	\$254
06	FISH & WILDLIFE FACILITIES	\$325	\$88	27%	\$413		\$325	\$88	\$413		\$413	13.8%	\$370	\$100	\$470
16	BANK STABILIZATION	\$2,434	\$657	27%	\$3,091		\$2,434	\$657	\$3,091		\$3,091	13.8%	\$2,770	\$748	\$3,517
17	BEACH REPLENISHMENT	\$2,259	\$610	27%	\$2,870		\$2,259	\$610	\$2,870		\$2,870	13.8%	\$2,572	\$694	\$3,266
18	CULTURAL RESOURCE PRESERVATION	\$850	\$230	27%	\$1,080		\$850	\$230	\$1,080		\$1,080	13.8%	\$967	\$261	\$1,229
	<b>CONSTRUCTION ESTIMATE TOTALS:</b>	\$6,054	\$1,622		\$7,675		\$6,054	\$1,622	\$7,675		\$7,675	13.8%	\$6,890	\$1,845	\$8,735
01	LANDS AND DAMAGES	\$59	\$12	20%	\$71		\$59	\$12	\$71		\$71	9.5%	\$64	\$13	\$77
30	PLANNING, ENGINEERING & DESIGN	\$2,234	\$601	27%	\$2,835		\$2,234	\$601	\$2,835		\$2,835	9.6%	\$2,449	\$659	\$3,108
31	CONSTRUCTION MANAGEMENT	\$877	\$237	27%	\$1,114		\$877	\$237	\$1,114		\$1,114	16.5%	\$1,022	\$276	\$1,297
	<b>PROJECT COST TOTALS:</b>	\$9,224	\$2,471	27%	\$11,695		\$9,224	\$2,471	\$11,695		\$11,695	13.0%	\$10,425	\$2,793	\$13,218

- \_\_\_\_\_ CHIEF, COST ENGINEERING, NAO
- \_\_\_\_\_ PROJECT MANAGER, NAO
- \_\_\_\_\_ CHIEF, REAL ESTATE, NAO
- \_\_\_\_\_ CHIEF, PLANNING, NAO
- \_\_\_\_\_ CHIEF, ENGINEERING, NAO
- \_\_\_\_\_ CHIEF, OPERATIONS, NAO
- \_\_\_\_\_ CHIEF, CONSTRUCTION, NAO
- \_\_\_\_\_ CHIEF, CONTRACTING, NAO
- \_\_\_\_\_ CHIEF, PM-PB, NAO
- \_\_\_\_\_ CHIEF, DPM, NAO

**ESTIMATED TOTAL PROJECT COST: \$13,218**  
ESTIMATED FEDERAL COST: 75% \$9,914  
ESTIMATED NON-FEDERAL COST: 25% \$3,305

**22 - FEASIBILITY STUDY (CAP studies):**  
ESTIMATED FEDERAL COST: 50%  
ESTIMATED NON-FEDERAL COST: 50%

**ESTIMATED FEDERAL COST OF PROJECT \$9,914**

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

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

PROJECT: Middle Peninsula State Park Feasibility Study  
 LOCATION: Gloucester County, Virginia  
 This Estimate reflects the scope and schedule in report; NOV2024 Feasibility Report

DISTRICT: Norfolk District  
 POC: CHIEF, COST ENGINEERING, NAO

PREPARED: 10/16/2024

WBS Structure		ESTIMATED COST				PROJECT FIRST COST Dollar Basis				TOTAL PROJECT COST (FULLY FUNDED)				
		Estimate Prepared: <b>16-Oct-24</b> Estimate Price Level: 1-Oct-24				Program Year (Budget EC): 2025 Effective Price Level Date: 1-Oct-24								
		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
<b>Alternative 2A</b>														
02	RELOCATIONS	\$186	\$37	20.0%	\$223		\$186	\$37	\$223	2030Q1	13.8%	\$211	\$42	\$254
06	FISH & WILDLIFE FACILITIES	\$325	\$88	27.0%	\$413		\$325	\$88	\$413	2030Q1	13.8%	\$370	\$100	\$470
16	BANK STABILIZATION	\$2,434	\$657	27.0%	\$3,091		\$2,434	\$657	\$3,091	2030Q1	13.8%	\$2,770	\$748	\$3,517
17	BEACH REPLENISHMENT	\$2,259	\$610	27.0%	\$2,870		\$2,259	\$610	\$2,870	2030Q1	13.8%	\$2,572	\$694	\$3,266
18	CULTURAL RESOURCE PRESERVATION	\$850	\$230	27.0%	\$1,080		\$850	\$230	\$1,080	2030Q1	13.8%	\$967	\$261	\$1,229
<b>CONSTRUCTION ESTIMATE TOTALS:</b>		\$6,054	\$1,622	26.8%	\$7,675		\$6,054	\$1,622	\$7,675			\$6,890	\$1,845	\$8,735
01	LANDS AND DAMAGES	\$59	\$12	20.0%	\$71		\$59	\$12	\$71	2028Q3	9.5%	\$64	\$13	\$77
30	PLANNING, ENGINEERING & DESIGN													
2.5%	Project Management	\$151	\$41	27.0%	\$192		\$151	\$41	\$192	2027Q2	7.1%	\$162	\$44	\$205
1.0%	Planning & Environmental Compliance	\$61	\$16	27.0%	\$77		\$61	\$16	\$77	2027Q2	7.1%	\$65	\$18	\$83
15.0%	Engineering & Design	\$1,158	\$313	27.0%	\$1,471		\$1,158	\$313	\$1,471	2027Q2	7.1%	\$1,240	\$335	\$1,575
1.0%	Reviews, ATRs, IEPRs, VE	\$61	\$16	27.0%	\$77		\$61	\$16	\$77	2027Q2	7.1%	\$65	\$18	\$83
1.0%	Life Cycle Updates (cost, schedule, risks)	\$61	\$16	27.0%	\$77		\$61	\$16	\$77	2027Q2	7.1%	\$65	\$18	\$83
1.0%	Contracting & Reprographics	\$61	\$16	27.0%	\$77		\$61	\$16	\$77	2030Q1	16.5%	\$71	\$19	\$90
3.0%	Engineering During Construction	\$182	\$49	27.0%	\$231		\$182	\$49	\$231	2030Q1	16.5%	\$212	\$57	\$269
2.0%	Planning During Construction	\$121	\$33	27.0%	\$154		\$121	\$33	\$154	2027Q2	7.1%	\$130	\$35	\$165
	Adaptive Management & Monitoring	\$346	\$93	27.0%	\$439		\$346	\$93	\$439	2030Q1	16.5%	\$403	\$109	\$512
1.0%	Project Operations			27.0%										
	Real Estate (All Federal Labor)	\$32	\$6	20.0%	\$38		\$32	\$6	\$38	2028Q3	11.3%	\$36	\$7	\$43
31	CONSTRUCTION MANAGEMENT													
10.0%	Construction Management	\$605	\$163	27.0%	\$768		\$605	\$163	\$768	2030Q1	16.5%	\$705	\$190	\$895
2.0%	Project Operation:	\$121	\$33	27.0%	\$154		\$121	\$33	\$154	2030Q1	16.5%	\$141	\$38	\$179
2.5%	Project Management	\$151	\$41	27.0%	\$192		\$151	\$41	\$192	2030Q1	16.5%	\$176	\$47	\$223
<b>CONTRACT COST TOTALS:</b>		\$9,224	\$2,471		\$11,695		\$9,224	\$2,471	\$11,695			\$10,425	\$2,793	\$13,218