

Neuse River Basin Flood Risk Management Integrated Feasibility Study and Environmental Assessment

Appendix C. Cost Engineering



**US Army Corps
of Engineers**

April 2022

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Neuse River Basin Feasibility - Flood Risk Management Study

Appendix C - Cost Engineering

DRAFT - Prior to ATR Approval

Introduction

The Tentatively Selected Plan (TSP) for the Neuse River Basin Study will provide flood risk management nonstructural measures for approximately 768 structures throughout the Neuse River Basin. Flood risk management measures include: structural elevations, wet floodproofing, and dry floodproofing. The plan will be implemented on a voluntary basis allowing property owners to choose to participate. The nonstructural measures to be implemented at a location will be determined based on site specific features. The local sponsor, in coordination with USACE, will ensure that eligibility requirements are met at each site, prior to implementation of flood risk management measures.

Project Scope

The Tentatively Selected Plan (TSP) for the Neuse River Basin Study will provide flood proofing measures consistent with the following scope; pending approval of site eligibility and voluntary owner participation. Along Hominy Swamp Creek in the City of Wilson, elevation of 14 structures and floodproofing of 6 structures. Along Crabtree Creek in the City of Raleigh, elevation of 38 structures and floodproofing of 21 structures. Along Big Ditch in the City of Goldsboro, elevation of 2 structures and floodproofing of 7 structures. Along the main stem of the Neuse River between Smithfield and Goldsboro, elevation of 365 structures and floodproofing of 315 structures. Additionally, the plan would include flood warning system enhancements, with the installation of 2 additional stream gages. The plan will also include public outreach and education materials regarding residual flood risk within the Neuse River Basin.

Table 1.0 Floodproofing Measures and Structure Count

Location	Number of structures addressed:	Elevated	Wet Floodproofing	Dry Floodproofing
Hominy Creek	20	14	0	6
Crabtree Creek	59	38	10	11
Big Ditch	9	2	4	3
Main Stem Neuse	680	365	208	107
Total	768	419	222	127

Structural Floodproofing and Structural Elevation Costs

The estimated nonstructural costs for implementing selected floodproofing measures in the Neuse River Basin Project are summarized in the Table 2.0, below. A basis for the unit costs for each type of floodproofing measure was developed using MCACES MII program. Unit costs for labor, materials, and equipment were considered, as well as, profit and overhead for the prime contractors and the sub-contractors. The nonstructural costs in each project area were developed based on the number of structures that were considered for floodproofing, and the measure determined most likely to be economically justified at each site. The structure counts and costs in the table below assume 100% owner participation.

The nonstructural costs in the table below do not include: Contingency, Pre-construction Engineering and Design Costs or Construction Management Costs. Contingencies are included in the total project cost summary, as assessed through a cost schedule risk analysis. At this stage of the project, costs in the table below remain subject to some adjustment based on ATR and public review.

Table 2.0 Floodproofing Measures and Estimated Non-Structural Costs

Location	N.S. Costs with Field Office Allocation	Floodproofed Structure Count	Elevation of Structures	Wet Floodproofing	Dry Floodproofing
Hominy Swamp / Wilson	\$2,669,010	20	14	0	6
Crabtree Creek / Raleigh	\$7,653,510	59	38	10	11
Big Ditch / Goldsboro	\$872,450	9	2	4	3
Main Stem Neuse River	\$82,749,166	680	365	208	107
Total	\$93,944,136	768	419	222	127

Non-Structural Costs are without Contingency, without PED costs, and without CM costs.

Contracting Structure and Project Schedule

The acquisition strategy for contracting out implementation of the floodproofing measures has yet not been determined. It is assumed that the construction work at the sites will begin only after completion of initial site inspection, as well as, confirmation of site eligibility and owner participation. It is assumed that as the project enters the construction phase, the construction work for floodproofing measures will be implemented concurrently at multiple sites. It is assumed that multiple prime contractors will participate by using a MATOC or similar contracting implement. It is assumed that in most cases the performing contractors will be sub-contractors of the prime. An initial project construction schedule was drafted based on the assumption that floodproofing measures could be implemented simultaneously at 4 construction sites within each of the project areas. Construction contractors would relocate their floodproofing implementation efforts to new sites within the project area, as work at the initial sites is completed.

The initial project construction schedule finds that the duration of the construction effort will extend to 12 years and 3 months, based on the following assumptions: The project will complete floodproofing measures at 768 sites, with 100% owner participation. Floodproofing measures will be implemented simultaneously at 4 construction sites within each project area. The duration of the construction work at each site will last for three months. Construction contractors will relocate their floodproofing implementation efforts, and field office, to new sites within the project area, as work at the initial sites is completed.

The total project cost estimate and construction time is still being refined while ATR of the CSRA and draft TPCS is under review and validation by the Cost MCX. The final certified TPCS will be developed after public and ATR review of the draft report and provided in the final report.

Pre-Construction Engineering & Design Costs

Preconstruction Engineering and Design costs were assessed to include: contracting costs, costs for initial site inspections to identify conditions such as HTRW materials or pre-existing damage, and costs for design review work. The PED costs were assessed based on preliminary project assumptions, including: the proposed contracting structure, site production rates, and the initial project construction schedule. In estimating the Pre-Construction Engineering & Design Costs, it was assumed that a project participation rate of 100% would be realized. PED costs were estimated at \$10,060K, without contingency.

Construction Management Costs

Construction Management costs were assessed to include staffing and field office costs for oversight of implementation of the floodproofing measures. These costs were based on preliminary project assumptions, including: the proposed contracting structure, site production rates, and the initial project construction schedule. It is assumed that floodproofing measures will be implemented simultaneously at 4 construction sites within each of the project areas. The duration of the construction work at each site will last for three months. Construction contractors will relocate their floodproofing implementation efforts to new sites within the project area, as work at the initial sites completes. It is assumed that two field offices could be adequately staffed to provide construction management oversight, for the duration of the construction effort. Construction Management costs were estimated at \$11,340, without contingency.

Total Project Cost Summary

The total project cost was initially estimated at \$133,000,000, in FY-2022 dollars. Subsequent reviews have resulted in adjustments to some cost elements. The current working estimate of the total project cost is \$151,455,000, as reflected below. The current TPCS may be subject to some further change as more detailed technical analysis are conducted prior to development of the final report/EA.

Both cost estimates include the cost of constructing nonstructural measures, required Lands and Damages (Real Estate), preconstruction engineering and design and construction management support activities.

Lands and Damages (Real Estate) are estimated to be \$7,275,000. Approximately \$5,820,000 of this amount reflects the value of lands, easements, rights-of-way, relocations, and disposal areas (LERRDs). These costs would be the non-Federal sponsor's responsibility. The additional annual cost of operation, maintenance, repair, replacement, and rehabilitation (OMRR&R) for the Recommended Plan is estimated to be \$0 since these costs are considered 'de-minimis' (requiring only periodic surveillance by the non-Federal sponsor).

Total Project Cost Summary – Prior to ATR Approval.

ALTERNATIVE: **Non Structural Floodproofing & Elevation Measures.**

LOCATION: **Neuse River Basin: Main Stem Neuse, Crabtree Creek, Big Ditch, and Harmony Creek.**

POC: **CHIEF, COST ENGINEERING, Stephen Roman, PE**

This Estimate reflects the scope and schedule in report; Neuse River Basin - Flood Risk Management Study

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)					
WBS NUMBER	Civil Works Feature & Sub-Feature Description	Construction Cost			TOTAL (\$K)	ESC (%)	COST (\$K)	CNTG (\$K)	REMAINING COST (\$K)	Program Year (Budget EC): 2023 Effective Price Level Date: 1-Oct-22 Spent Thru: 1-Oct-23	TOTAL FIRST COST (\$K)	MidPoint of Construction: 2033Q1			FULL (\$K)
		COST (\$K)	CNTG (\$K)	CNTG (%)								ESC (%)	COST (\$K)	CNTG (\$K)	
02	RELOCATIONS (Floodproofing & Elevation)	\$93,944	\$23,486	25%	\$117,430	2.6%	\$96,411	\$24,103	\$120,513		\$120,513	28.8%	\$124,165	\$31,041	\$155,206
						-						-			
						-						-			
						-						-			
	CONSTRUCTION ESTIMATE TOTALS:	\$93,944	\$23,486		\$117,430	2.6%	\$96,411	\$24,103	\$120,513		\$120,513	28.8%	\$124,165	\$31,041	\$155,206
01	LANDS AND DAMAGES (Real Estate)	\$5,820	\$1,455	25%	\$7,275	2.6%	\$5,973	\$1,493	\$7,466		\$7,466	28.0%	\$7,643	\$1,911	\$9,554
06	FISH & WILDLIFE FACILITIES (Env Mitigation)														
30	PLANNING, ENGINEERING & DESIGN	\$10,060	\$2,515	25%	\$12,575	2.5%	\$10,311	\$2,578	\$12,889		\$12,889	28.0%	\$13,195	\$3,299	\$16,494
31	CONSTRUCTION MANAGEMENT	\$11,340	\$2,835	25%	\$14,175	2.5%	\$11,624	\$2,906	\$14,529		\$14,529	28.8%	\$14,974	\$3,743	\$18,717
	PROJECT COST TOTALS:	\$121,164	\$30,291	25%	\$151,455		\$124,318	\$31,079	\$155,397		\$155,397	28.7%	\$159,977	\$39,994	\$199,971

CHIEF, COST ENGINEERING, Stephen Roman, PE

PROJECT MANAGER, Jim Medlock

CHIEF, REAL ESTATE, Ralph Werthmann SAS

CHIEF, PLANNING, Elden Gatwood

CHIEF, ENGINEERING, Greg Williams, PE

CHIEF, OPERATIONS, Daniel Brown, PE

CHIEF, CONSTRUCTION, Dennis Lynch, PE

CHIEF, CONTRACTING, Jon Mayo

CHIEF, PM-PB, Sam Colella

CHIEF, DPM, Christine Brayman

ESTIMATED TOTAL PROJECT COST:	\$199,971
ESTIMATED FEDERAL COST:	65% \$129,981
ESTIMATED NON-FEDERAL COST:	35% \$69,990

22 - FEASIBILITY STUDY (CAP studies):	\$3,000
ESTIMATED FEDERAL COST:	\$3,000
ESTIMATED NON-FEDERAL COST:	

ESTIMATED FEDERAL COST OF PROJECT	\$132,981
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Cost & Schedule Risk Analysis (CSRA) – Draft Prior to ATR Approval.

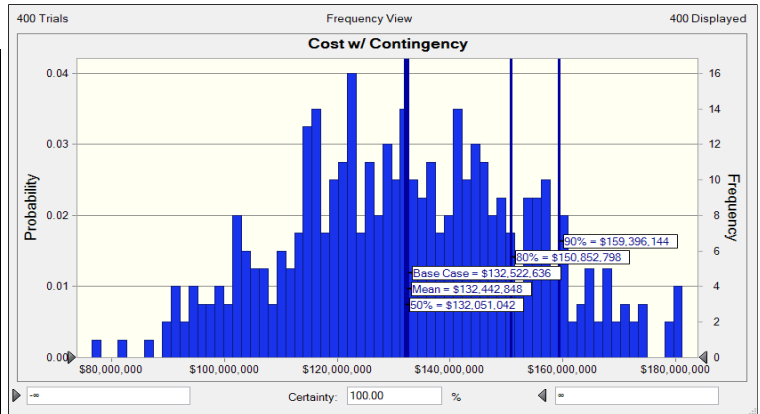
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Contingency on Base Estimate		80% Confidence Project Cost	
Base Estimate ->		\$121,164,136	
Estimate Contingency ->		\$30,291,034	25%
Base Estimate w/ Contingency (80% Confidence) ->		\$151,455,170	

Contingency on Base Schedule		80% Confidence Project Schedule	
Base Schedule Start Date ->		August 8, 2026	
Base Schedule Finish Date ->		November 8, 2038	
Base Schedule Duration ->		147.0 Months	
Schedule Contingency Duration ->		42.6 Months	29%
Base Schedule w/ Contingency (80% Confidence) ->		189.7 Months	
Base Finish Date w/ Contingency (80% Confidence) ->		May 28, 2042	

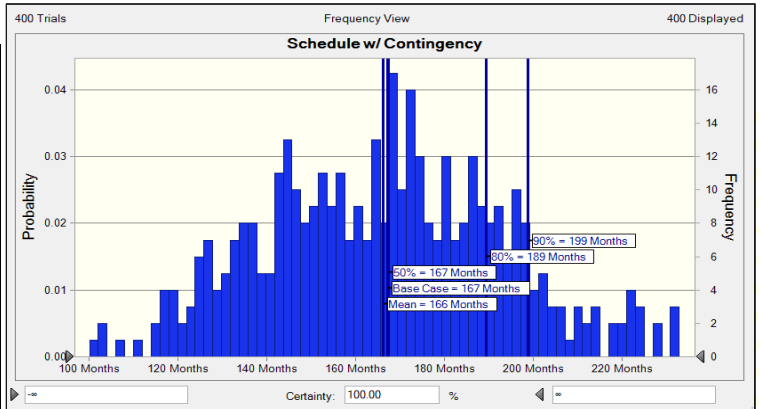
- PROJECT CONTINGENCY DEVELOPMENT -

INITIAL CONSTRUCTION Contingency Analysis		
Base Estimate ->	\$121,164,136	
Confidence Level	Contingency Value	Contingency
0%	-44,830,730	-37%
10%	-16,962,979	-14%
20%	-7,269,848	-6%
30%	-1,211,641	-1%
40%	6,058,207	5%
50%	10,904,772	9%
60%	16,962,979	14%
70%	24,232,827	20%
80%	30,291,034	25%
90%	38,772,523	32%
100%	60,582,068	50%



- SCHEDULE CONTINGENCY (DURATION) DEVELOPMENT -

Contingency Analysis		
Base Schedule Duration ->	147.0 Months	
Confidence Level	Contingency Value	Contingency
0%	-47.0 Months	-32%
10%	-16.2 Months	-11%
20%	-5.9 Months	-4%
30%	4.4 Months	3%
40%	11.8 Months	8%
50%	20.6 Months	14%
60%	26.5 Months	18%
70%	33.8 Months	23%
80%	42.6 Months	29%
90%	52.9 Months	36%
100%	86.7 Months	59%



ATR / Cost Certification