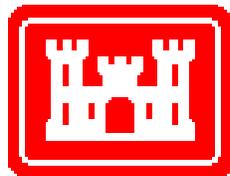


**Savannah Harbor Expansion Project (SHEP), Fish Passage at New  
Savannah Bluff Lock and Dam (NSBLD) Savannah River, Georgia  
and South Carolina Section**

**Post-Authorization Change Report**

**Appendix B:**

**Cost Engineering**



**US Army Corps  
of Engineers®**

**Savannah District**

**September 2018**

# Appendix B – Cost Engineering

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## Introduction/Scope

The scope of work for this sub-project is to construct a fish passage at New Savannah Bluff Lock and Dam located on the Savannah River in Aiken County, SC and Richmond County, GA (Augusta, GA area) in support of the Savannah Harbor Expansion Project (“SHEP”). The design of the fish passage shown in the Recommended Plan of Alternative 2-6D has been developed to the 35% design level (via a set of drawings). Some of the features in the recommended plan include: construction of access roads; excavation and offsite removal of existing bank and channel sediment; and placement of bedding stone, armor stone, and weir stone; temporary cofferdam; removal of the spillways gates; and removal of the locks and dam piers down to EL. 91.29.

This Fish Passage feature is part of the Savannah Harbor Expansion Project (SHEP). The objective is to complete a post-authorization analysis study report and recommendation as required by the Water Infrastructure Improvements for the Nation (WIIN) Act of 2016 that de-authorizes the NSBLD and provides the Secretary of the Army with options to modify the SHEP fish passage mitigation feature as follows:

### 1) Option A/Alternative 1:

- Repair the NSBLD lock wall and modify the structure such that the structure is able to:
  - Maintain the pool for navigation, water supply, and recreational activities
  - Allow safe passage over the structure to historic spawning grounds of shortnose sturgeon, Atlantic sturgeon, and other migratory fish; or

### 2) Option B/Alternative 2: (RECOMMENDED OPTION)

- Construction at an appropriate location across the Savannah River of a structure that is able to maintain the pool for water supply and recreational activities;
- Removal of the New Savannah Bluff Lock and Dam on completion of construction of the fish passage structure.

### **A brief description of each of the features of work follows.**

Alternative 2-6d - 2% Slope (RECOMMENDED PLAN). The original slope of the channel was intended to be 1.3%, but further refinement led to a slope of 2% for the channel bottom. The anticipated work plan/scope/construction sequence is as follows. Access roads will be constructed into the park to get the GA side of the lock & dam, and on the SC side which will wind through the land off of Gum Swamp Rd (Hwy 201), roughly 2 miles. It is assumed that the south (SC) side of the dam will be worked on first. A cofferdam (assumed combi-wall, W40 x 149 with PZC-13 sheets) will be constructed to cut off the south half of the river. Once the cofferdam is up, the area will be dewatered and the channel bottom will be excavated out a few feet down to the appropriate grade. A 12” layer of bedding stone and a 24” layers of rip rap will be placed over the entire area. The weirs will be spaced roughly 60 ft apart and will span the river width (roughly 500 ft) in an arc shape. Cross sections can be found in quantity backup documents and in the engineering appendix. The banks of the river will also be lined with bedding stone and rip rap to prevent erosion. The weir steps are assumed to be constructed with special boulders/river stone. A sheetpile cutoff will be driven across the most upstream weir (the ramp), so that is anticipated to be done early in the process once the cofferdam is in place so that the stone can be placed around it. Concurrently with the stone work will be the removal of spillway gates 3, 4 and 5, and dam piers 3, 4 & 5. The cofferdam is anticipated to tie in somewhere close to pier 2 in order to allow these gates and piers to be demolished. All of the machinery/catwalk/metals on top of the gates will be removed first, then the gates themselves will be removed and hauled off and disposed of. (No salvage value for the steel has been included as a credit in order to be conservative). Then each pier will be wrecked/demolished and hauled off. All concrete assumed to be taken to the Augusta City landfill. Once all the work on the south half of the river is complete, the area will be rewatered, the upstream end of the cofferdam will be pulled and flipped to the north side, and a similar scope of work will be performed. A boat ramp (shown on the plans) will also be constructed

once the cofferdam is in place and the work area is dewatered. The north side of the area will be excavated down to the appropriate floodplain bench levels and the lock walls will be removed down to EL 91.29 also.

## **General Estimate Information**

### **Acquisition Plan**

Due to the size of the job (>\$20M), it is assumed that this will be advertised as a Full and Open/Unrestricted project. Per conversations with PDT members and leadership, typically projects over \$15-20M would be put out as Unrestricted, with all projects smaller than that typically going to MATOCs.

### **Markup Info**

-Assumed the following markups for the Prime, who is at this stage of estimate is assumed to sub out a good portion of the project and self-perform a small portion. Subbed out work includes marine work, mechanical work, weir work. Demo assumed to be covered by Prime. Prime markups assumed to be:

JOOH - 10%

HOOH - 10%

Profit - 10%

Bond - 1.5%

Mob/Demob - 5%; this has been applied to the CWBS account folders in the project item view, rather than trying to break out 5% of each account separately.

-Assumed the following markups for the Subcontractors:

JOOH - 5-8%

HOOH - 8-10%

Profit - 8-10%

-The MII cost estimate does not include any contingency or escalation markups. Escalation will be applied in TPCS sheets.

-The cost estimate includes contingency (as calculated by a Risk Analysis).

### **Labor/Productivity Info**

-Assumed a work schedule of 5 days a week, 10 hours per day. 6 - 10's shown for the cofferdam work in order to expedite the schedule.

- Construction duration of roughly 33 months (1,005 cd)

-LS&H percentage for in-channel contractors increased to 150% to account for work on navigable waterways.

-Davis-Bacon Wage Rates used for the Richmond County, GA area - Combo of GA165 09/08/2017, GA90 07/14/2017, and GA16 10/13/2017, as well as the August Wage Survey rates from 2017 (included in backup).

-Local Augusta/surrounding labor pool assumed to be sufficient to handle the demand for this project (ie., no subsistence/per diem included for craft workers)

### **Miscellaneous items**

-Sales tax of 7% included for all items, unless sales tax is included in price quote (will be noted in either Project Item or CSI task).

-Gas and Diesel prices updated on **19 Oct 18** from: <http://tonto.eia.doe.gov/oog/info/gdu/gasdiesel.asp>. Used Lower Atlantic prices as of 17 Oct for gas and on-road diesel. Subtracted \$0.592/gallon for off-road diesel for GA.

-Price for electricity updated on **19 Oct 18** from: <http://www.eia.gov/fuelelectric.html>. Used GA commercial electric price per Kwh for May 18 (latest one).

-Cost of money updated on **19 Oct 18** from <http://www.fms.treas.gov/prompt/rates.html>

# MII Estimate Summaries

(double-click picture to open in Adobe)

Print Date Thu 20 December 2018  
Eff. Date 10/1/2018

U.S. Army Corps of Engineers  
Project : Savannah Harbor Expansion Project (SHEP) Fish Passage at New Savannah Bluff Lock  
and Dam (NSBLD)  
New Savannah Bluff L&D Summary Report  
Augusta, GA

Time 11:23:11

Title Page

Full & Open/Unrestricted Procurement Assumed  
Design-Bid-Build Solicitation

Scope of work includes construction of a fixed weir with rock ramp at existing dam site with passive flood passage structure through park on Georgia side 'A'; weir length - 500 ft across river 'B' lock and dam removed to include foundation down to elevation 91.29 NAVD88; floodplain benching width - 275 ft; floodplain benching height - 109 ft NAVD88.

Mob/Demob assumed as a 5% direct cost markup on each parent folder of the estimate.

Files Located at <\\irt-fs01\ou\ORG\ED\Public\M\CACES\ED-M\C\NI\Work For Other Districts\SAS - Savannah\FY18 - 2F3594 - NSBL&D PACR>

Estimated by Taylor Canfield, PE, CCC, ED-M-C, (502)  
315-6268  
Designed by SAS  
Prepared by Taylor Canfield, PE, CCC, ED-M-C, (502)  
315-6268  
Preparation Date 11/16/2018  
Effective Date of Pricing 10/1/2018  
Estimated Construction Time 1,005 Days  
Checked by : Elliott Roughen, PE, CCE

This report is not copyrighted, but the information contained herein is For Official Use Only.

Labor ID: Local D-B EQ ID: EP16R03

Currency in US dollars

TRACES MII Version 4.4

# Risk Analysis Results

(double-click picture to open in Adobe)

SHEP - Fish Passage - Savannah District - SAS Cost & Schedule Risk Analysis													
Risk No.	Risk/Opportunity Event	Concerns	PDT Discussion & Conclusions	Project Cost			Project Schedule			Variance Distribution	Contribution to Overall	Responsibility/POC	Affected Project Component
				Unlikelihood*	Impact*	Risk Level*	Unlikelihood*	Impact*	Risk Level*				
Internal Risks (Internal Risk items are those that are generated, caused, or controlled within the PDT's sphere of influence)													
<b>PROJECT &amp; PROGRAM MGMT</b>													
PPM-1	Dam Demolition	Investigations sufficient to support design assumptions? Potential for scope growth, added features and quantities? Design confidence?	The dam demolition scope is clear at this point, but the potential for growth exists only due to differing site conditions. Since the dam is a rigid structure with known parts (ie, gates), there won't be much additional scope possible, unless the design direction for demolition is changed. Since that is unlikely, this is a low risk.	Unlikely	Marginal	LOW	Unlikely	Marginal	LOW	Triangular		Project Manager	Project Cost
PPM-2	Lock Demolition	Investigations sufficient to support design assumptions? Potential for scope growth, added features and quantities? Design confidence?	The lock demolition scope is clear at this point, but the potential for growth exists only due to differing site conditions. Since the lock is concrete though there won't be much additional scope possible, unless the design direction for demolition is changed. Since that is unlikely, this is a low risk.	Unlikely	Marginal	LOW	Unlikely	Marginal	LOW	Triangular		Project Manager	Project Cost & Schedule
PPM-3	Fish Passage in River (Weir)	Design confidence? Investigations sufficient to support design assumptions?	The layout could change if we were to build this alternative. Since we have another agency involved in the decision-making process, there is a possibility that they could desire a modification to plan. The design is probably conservative even if it were to change (ie, slope would steepen), but in the event of an unforeseen change it is anticipated that the impact could be moderate.	Very Unlikely	Negligible	LOW	Very Unlikely	Critical	LOW	Triangular		Project Manager	Project Cost & Schedule
PPM-4	Deposit of Excavated material	Investigations sufficient to support design assumptions? Potential for scope growth, added features and quantities? Design confidence? Water care and diversion fully understood, planned?	The deposit of excavated material from the channel is currently planned to be deposited of elsewhere on site. There is federal property adjacent that should be able to be used with some coordination. However, in the event that not all of it can be used for disposal, the PDT decided that rather than have the performing contractor take the material to an offsite disposal facility and pay a tipping fee, additional land would be purchased (maybe 20 acres) to allow the material to be dumped and spread there. Assume maybe a 50% chance that this needs to occur, and allow roughly \$10/acre for miscellaneous land to be purchased for this.	Unlikely	Significant	MODERATE	Unlikely	Marginal	LOW	Yes-No		Project Manager	Project Cost & Schedule
PPM-5	Cultural Resources	Investigations sufficient to support design assumptions? Potential for scope growth, added features and quantities?	We do know that impacts to the structure will require mitigation. We don't know if there are cultural resources in the recreation area that will be impacted. Depending on the alternative selected, there will be some requirements for deep trenching to identify whether there are any archaeological deposits. The main variable is the amount of trenching needed, it is very likely to occur but may require more than anticipated. There were investigations done on the South Carolina side and there was nothing found that required mitigation. It is assumed that the findings on the Georgia side would be very similar and that would not require any mitigation either.	Likely	Negligible	LOW	Likely	Negligible	LOW	Triangular		Project Manager	Project Cost & Schedule
PPM-6	Water Supply Issue	Investigations to water supply intake downstream for various alternatives	The estimate from CSM Smith for the recommended alternative is roughly \$238k - applying that to the Prime contractor yields roughly \$128k. That should be sufficient, as the CSM Smith estimate was for the performing contractor to do the work.	Very Unlikely	Negligible	LOW	Very Unlikely	Marginal	LOW	Triangular		Project Manager	Project Cost & Schedule
<b>CONTRACT ACQUISITION RISKS</b>													
CA-1	Numerous Separate Contracts	Currently, the estimate assumes one contract. Breaking into multiple contracts would increase costs.	Due to the size of the work, it would go out Unrestricted/Fill and Open, not to any small business/MATOC. Acquisition will likely be FFS and LPTA, but a tradeoff approach could be used which has the potential to cause a small increase in price. This plan is possible but would cause a marginal impact.	Very Unlikely	Significant	LOW	Very Unlikely	Significant	LOW	Triangular		Project Manager	Project Cost & Schedule
CA-2	Preference to SDB/R(s) Contracts/Productivity	The District is very committed to meeting the SBA goals and attempts to award contracts as much as possible to SDB/R(s) contractors. This risk predominantly captures the risk to overall productivity and effectiveness.	Due to the size of the work, it would go out Unrestricted/Fill and Open, not to any small business/MATOC. Acquisition will likely be FFS and LPTA, but a tradeoff approach could be used which has the potential to cause a small increase in price. This plan is possible but would cause a marginal impact.	Very Unlikely	Significant	LOW	Very Unlikely	Significant	LOW	Triangular		Project Manager	Project Cost & Schedule
CA-3	Procurement Strategy - May Use a Tradeoff Approach	There is a chance that the contract could be negotiated via tradeoff (best value). This could increase the costs over the FTA/FFS process.	Due to the size of the work, it would go out Unrestricted/Fill and Open, not to any small business/MATOC. Acquisition will likely be FFS and LPTA, but a tradeoff approach could be used which has the potential to cause a small increase in price. This plan is possible but would cause a marginal impact.	Unlikely	Marginal	LOW	Unlikely	Significant	MODERATE	Triangular		Project Manager	Project Cost & Schedule

# TPCS – Recommended Plan (Alternative 2-6d)

(double-click picture to open in Adobe)

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

Printed: 1/11/2019  
Page 1 of 2

PROJECT: SHEP Fish Passage  
PROJECT NO: P2 113066  
LOCATION: Augusta, GA

DISTRICT: Savannah District  
POC: CHIEF, COST ENGINEERING, Bart Smith  
PREPARED: 12/20/2018

This Estimate reflects the scope and schedule in report.

SHEP Fish Passage P&P

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	COST (\$K)	CNTD (%)	CNTD (%)	TOTAL (\$K)	Program Year (Budget FY): 2020 Effective Price Level Date: 1 OCT 19						TOTAL FIRST COST (\$K)	INFLATED			FULL (\$K)
						FISC (%)	COST (\$K)	CNTD (%)	TOTAL (\$K)	Spent Thru 1-Oct-18 (\$K)	L		M	N	O	
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O		
04	DAMS	\$2,935	\$800	27.3%	\$3,735	2.0%	\$2,994	\$816	\$3,809	\$0	\$3,809	5.0%	\$3,162	\$862	\$4,023	
05	LOCKS	\$5,061	\$1,379	27.3%	\$6,440	2.0%	\$5,162	\$1,407	\$6,569	\$0	\$6,569	5.0%	\$5,452	\$1,486	\$6,938	
06	FISH & WILDLIFE FACILITIES	\$52,014	\$14,174	27.3%	\$66,188	2.0%	\$53,054	\$14,437	\$67,512	\$0	\$67,512	5.0%	\$56,032	\$15,289	\$71,300	
13	PUMPING PLANT	\$323	\$88	27.3%	\$411	2.0%	\$329	\$90	\$419	\$0	\$419	5.0%	\$348	\$95	\$443	
18	CULTURAL RESOURCE PRESERVATION	\$494	\$133	27.3%	\$629	2.0%	\$504	\$137	\$641	\$0	\$641	5.0%	\$532	\$145	\$677	
CONSTRUCTION ESTIMATE TOTALS		\$60,827	\$16,575		\$77,402	2.0%	\$62,044	\$16,907	\$78,950	\$0	\$78,950	5.0%	\$65,526	\$17,856	\$83,381	
01	LANDS AND DAMAGES	\$108	\$29	27.3%	\$137	2.0%	\$110	\$30	\$140	\$0	\$140	0.0%	\$110	\$30	\$140	
30	PLANNING, ENGINEERING & DESIGN	\$3,040	\$828	27.3%	\$3,868	4.2%	\$3,167	\$863	\$4,030	\$0	\$4,030	2.3%	\$3,241	\$883	\$4,124	
31	CONSTRUCTION MANAGEMENT	\$3,041	\$829	27.3%	\$3,870	4.2%	\$3,168	\$863	\$4,031	\$0	\$4,031	11.7%	\$3,539	\$964	\$4,503	
PROJECT COST TOTALS		\$67,016	\$18,262	27.3%	\$85,278		\$68,489	\$18,663	\$87,152	\$0	\$87,152	5.3%	\$72,418	\$19,733	\$92,149	

CHIEF, COST ENGINEERING, Bart Smith

PROJECT MANAGER, April Patterson

CHIEF, REAL ESTATE, Ralph Wert

CHIEF, PLANNING, Steven Fischer

CHIEF, ENGINEERING, Tracy Hendren

CHIEF, OPERATIONS, Michael Montone

CHIEF, CONSTRUCTION, Kenneth Gray

CHIEF, CONSULTING, Page Blechinger

CHIEF, KM, Cynthia Powers

CHIEF, DPM, Erik Blechinger

ESTIMATED TOTAL PROJECT COST: \$92,149

Filename: S:\EPP\Fish Passage\_TPCS.xls  
TPCS 2-6d (Rev)

# Construction Schedule

(double-click picture to open in Adobe)

