

Three Forks of Beargrass Creek Ecosystem Restoration Appendix C Cost Engineering

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1 INTRODUCTION

This Appendix presents cost estimates that have been assembled for the proposed Three Forks of the Beargrass Creek Ecosystem Feasibility Study. A discussion regarding cost, schedule and risk is included in this Appendix which contains all appropriate feature accounts. What follows is a discussion regarding the methodology used to develop the first cost for the Recommended Plan.

2 REFERENCES

- ER 1110-1-1300, Cost Engineering Policy & General Requirements, 26 Mar 1993.
- ER 1110-2-1302, Civil Works Cost Engineering, 30 June 2016.
- EI 01D010, Construction Cost Estimates, 1 Sept 1997.
- ER 1110-2-1150, Engineering & Design for Civil Works Projects, 31 Aug 1999.
- ER 37-2-10 Change 89, Accounting And Reporting – Civil Works Activities, 31 Oct 2000.
- EC 11-2-187, Corps of Engineers Civil Works Direct Program: Program Development Guidance – Fiscal Year 2009, 30 Mar 2007.
- EP 1110-1-8 Volume 2, Construction Equipment Ownership and Operating Expense Schedule – Region II, July 2007.
- EC Bulletin No 2007-17, Application of Cost Risk Analysis Methods to develop Contingencies for Civil Works Total Project Costs, 10 Sep 2007.
- EM 1110-2-1304, Civil Works Construction Cost Index System (CWCCIS), 30 Sept 2020.
- EC 1105-2-410, Review of Decision Documents, 22 Aug 2008
- ETL 1110-2-573, Construction Cost Estimating Guide for Civil Works, 30 Sept 2008.

3 METHODOLOGY

3.1 GENERAL

The cost estimate was prepared using the Micro-computer Aided Cost Estimating System (MCASES) Second Generation (MII), version 4.4.2 for all feature accounts associated with construction. Applicable crews and equipment were applied in the estimate to correspond with the work being performed. Material prices were developed using the 2016 MII Cost Book and quotes were obtained from suppliers, when available.

3.2 COST METHODOLOGY

3.2.1 Historical Unit Pricing

In some instances, historical cost information was referenced and documented accordingly. These historical references include past contract bid prices for projects of similar design and magnitude and recent government studies and cost estimates.

3.2.2 Quote-in-Place

In some instances, a quote from a subcontractor may have been received that included overhead and profit. In that case, no additional markups were included for subcontractor's overhead.

3.2.3 Detailed MII Cost Estimate

The MII estimating software was used to develop a construction sequence for each item of work and applying detailed line items and crews to perform the work. Crews were developed in correspondence with the work being performed and estimated productivities. Wage rates were taken from a combination of the local Davis Bacon rates. The latest MII equipment database was also used and adjusted for current fuel and energy costs. Material prices were obtained through telephone solicitations with vendors, Internet suppliers, the MII Cost Book, and RS MEANS. A summary level report of the MII cost estimate for the TSP can be found in Attachment A.

3.3 DIRECT COSTS

Direct costs are based on anticipated equipment, labor, and materials necessary to construct this project. Following formulation of the direct cost, a determination is made as to whether the work would be performed by the prime contractor or a subcontractor.

3.3.1 Labor - Wage Determination

Wage rates were taken from the latest Davis-Bacon wage determination - KY20210038, Highway Construction and KY20210072, Heavy Construction was used for determining wage rates.

3.3.2 Equipment Costs

The 2020 Equipment database, based on EP 1110-1-8, Construction Equipment Ownership and Operation Expense Schedule, Region II, was used and adjusted for current, local fuel and energy costs.

3.3.3 Vendor Quotes

Vendor quotes have been acquired and documented for the anticipated material costs for most features of work.

3.3.4 Crews

Project specific crews have been developed and applied to the detailed line items as appropriate. Crew members consist of selected complements of labor classifications and equipment pieces assembled to perform specific tasks. Productivity has been assigned to each crew reflective of the expected output per unit of measure for the specific activities listed in the cost estimate. In considering the crews and productivities, the engineer typically referenced other, similar work found in national reference manuals such as RS MEANS construction data, the MII Cost book, and other projects developed by USACE.

3.3.5 Quantities

Quantities were developed through close coordination with appropriate PDT members. A heavy reliance on the team member assigned as the biologist and civil engineer is self-evident with this being an ecosystem restoration project. Quantities were checked / verified by the estimator and adjusted to account for construction methodology, shrink, swell, waste, etc. Other associated sub-quantities were also developed by the estimator, as needed.

3.4 INDIRECT COSTS

3.4.1 Contract Acquisition Strategy

Through discussions with the Project Manager (PM) & PDT, one contract is planned for the remaining work. The assumption is that the winning Prime contractor would self-perform a reasonable portion (~30%) of the major civil activities, while the remaining work will be subcontracted out. It is intended that past performance requirements will be written into the project specification during the design phase for contractors to have performed past similar projects.

3.4.2 Prime Contractors

3.4.2.1 Job Office Overhead (FOOH)

Job Office Overhead (JOOH) is estimated by percentage within the estimate for the Prime contractor. The estimate of 15% is based on similar-sized projects and would account for such items as project supervision, contractor quality control, contractor field office supplies, personal protective equipment, field engineering, and other incidental field overhead costs.

3.4.2.2 Home Office Overhead (HOOH)

For Home Office Overhead (HOOH) expense, the cost estimate includes an allowance applied as percentage at 8% of direct cost, plus field overhead. HOOH includes items such as office rental / ownership costs, utilities, office equipment ownership/maintenance, office staff (managers, accountants, clerical, etc.), insurance, and miscellaneous. The range of home office overhead can be quite broad and depends largely on the contractor's annual volume of work and the type of work that is generally performed by the contractor.

3.4.2.3 Profit

Profit was calculated using the Profit Weighted Guidelines (PWG) wizard in MII with a result of 7.66% profit.

3.4.2.4 Bonding

Bond was calculated using the Bond Table wizard in MII. This project would classify as "Class B" and resulted in a bonding rate of 0.66%.

3.4.3 Subcontractors

3.4.3.1 Overhead

All subcontractor overhead costs are set to 10% and 8% of direct cost to account their JOOH and HOOH costs, respectively. The exception is where a subcontractor has provided a quoted price including overhead. In that case, no additional markups have been included for subcontractor's overhead.

3.4.3.2 Profit

Sub Profit was included as a running percentage of 8% based on estimator judgement.

3.4.4 Escalation

The contract was escalated to the mid-point of construction using EM 1110-2-1304, Civil Works Construction Cost Index System (CWCCIS), to account for potential inflation during construction. This is included in the TPCS file, not the cost estimate in MII. The estimated mid-point of construction was identified through the development of a rough order of magnitude (ROM) construction schedule and can be seen in Attachment D, of this Appendix.

3.4.5 Construction Contingency

Contingency was applied to Construction Cost at 27% for all accounts excluding 01 Lands & Damages, based on the results of the Cost & Schedule Risk Analysis (CSRA), conducted March 23rd, 2021. The details, including risk register can be seen in Attachment B of this Appendix.

The major contributor to the Cost Risk includes the potential for construction quantities to increase during design do to realized/discovered information which may not be known at this point in time. This risk can be mitigated by "scoping to budget", meaning the details (quantities) may be altered during design to ensure the project remains with-in budget. This does not mean the portions of the proposed scope would be eliminated, only that we may have do smaller portions if funding became an issue during design.

Post Agency Decision Milestone (ADM), the PDT reevaluated the original CSRA in an effort to determine if any of the originally identified risk items had been mitigated. Due to the changes associated with Real Estate, there was one item from the risk analysis removed as the area was removed from the Recommended Plan. This did not however change the Contingency amount at the 80% confidence interval.

4 DEVELOPMENT & SELECTION OF THE RECOMMENDED PLAN

4.1 DEVELOPMENT OF UNIT COST AND MEASURES/ALTERNATIVES

Once assigned, the cost estimator began to develop unit cost of measures for use by the PDT, to be begin defining what scope of work could/should be performed at each site. The measures were

defined in the document “Beargrass_TSPSummaryReport_2020_08_28.doc”, written by the LRL Planner/PM for the project and other PDT members. From the definitions provided cost were developed using prior estimates developed for similar projects in the Louisville District, as well as by having discussions and receiving MII files from Cost Engineers in the Chicago District (LRC). The Chicago District has constructed many environmental restoration type projects in recent years. In some cases, costs were developed by the estimator, if historical information could not be found.

The PDT defined what measures would be most feasible to achieve the projects objectives in the form of a table, and in this same table assigned the possible measures to various Alternatives. The following table is what was provided as the “All-in Suite of Alternatives”:

	Alternative								
Measure	C	R1	R2	R3	R4	H1	H2	H3	N1
Demolition	X	X	X	X	X	X	X		
Excavation	X				X	X	X	X	
Grading	X		X	X	X	X	X	X	
Water Control Structures								X	
Native Rock Structures	X	X	X	X	X				
Large Woody Debris		X	X	X	X				
Invasive Species Removal									X
Soil Amendments									X
Native Plantings									X
Native Community Establishment									X
Adaptive Management	X	X	X	X	X	X	X	X	X
BMPs	X	X	X	X	X	X	X	X	

It should be noted that Alternatives for this Project differ from the normal definition of Alternatives in other Feasibility Studies. The alternatives as defined for this project are a collection of various measures rolled up into one action. For example, the R1 Alternative could consist of Demolition, Native Rock Structures, Large Woody Debris, Adaptive Management, and BMPs.

4.2 IDENTIFYING THE TENTATIVELY SELECTED PLAN (TSP)

A spreadsheet was developed by the Cost Engineer and can be seen in Attachment E, Unit Cost of Measures. The technical team members and the Non-Federal Sponsor’s third-party consultant (Stantec) then began to assign rough quantities to each site based on field investigations performed by the PDT. The Cost Engineer then entered quantities for each site, based on that input and provided ROM cost for each alternative, at each site to the Economist for their use in the CEICA and screening process. This summary table can be seen in Attachment F.

An effort was made by the Cost Engineer to include cost as a Total Project Cost, at this phase – including rough cost for Real Estate, PED, & CM. Contingency was applied to the construction cost, as a percentage, based on past project experience. The cost of Utility Relocations was assumed to potentially be an important component in this urban environment, but little was known at the point in time which this cost was being developed. A high-level evaluation was performed by H&H between what utilities were known to be in the area against what work was being

proposed in each area. From this evaluation a percentage was applied, as a percent of the construction cost based on a likelihood and impact rating from H&H Engineering.

Using computer software, the economist PDT member was able to evaluate every possible combination of Alternatives and Site was evaluated and 14 “best-buy” plans were identified by the Economist – each plan consisting of several alternatives at any given site. From the 14 best-buys the PDT further screened out 2 of the sites. This remaining collection of 12 sites and alternatives would go on to be the Tentatively Selected Plan (TSP).

4.3 SELECTION OF THE RECOMMENDED PLAN

Since the selection of the TSP the team began to consider ways in which we could “optimize” the plan and work towards selecting the Recommended Plan. On Sept 16th, 2021 the Recommended Plan was presented at the Agency Decision Milestone (ADM) to the vertical team at the Division level with some attendance by individuals from Headquarters USACE. At that time minimal optimizations were still underway, but concurrence was received with the stipulation that an In-progress Review (IPR) be held for final approval.

The optimizations primarily consisted in pulling the work limits at each site so that only real estate acquisition could be simplified and minimized. This resulted in nearly cutting the Real Estate cost in half, compared to the TSP. The scope of the construction stayed relatively the same with very minor adjustments at some sites.

5 PROJECT FEATURE ACCOUNTS AND ASSOCIATED SCOPE

5.1 (01) LANDS & DAMAGES

- This feature account covers all costs associated with Real Estate, including lands, easements, rights of way, etc. The cost estimate for this account was provided by the Real Estate PDT team member and inserted into the MII estimate and TPCS. More information can be found in the RE appendix/tab.

5.2 (02) RELOCATIONS (UTILITIES)

- This account covers the relocations of existing utilities impacted by this project. The types and scope of relocations included in this cost estimate are outlined in the tables below.
- Quantities were provided by the Civil Engineering PDT member and developed by analyzing the proposed footprints/alignments at each site with known utility information. Based on the Design Manual produced by the owner of the majority of the utilities, Metro-Sewers Division (MSD), it was decided that a utility would require relocation when ground cover is reduced to less than 4 feet by the proposed construction activity at the site.

		TOTAL UTILITY IMPACT (LF)	WATER DISTRIBUTION PIPING						
			REMOVE & REPLACE						
			6"	8"					
X34	Cherokee & Seneca	325	217	108					
X35	Muddy Fork & Tribes	100		100					
		425	217	208	-	-	-	-	-
		TOTAL UTILITY IMPACT (LF)	GAS DISTRIBUTION PIPING						
			REMOVE & REPLACE						
			6"	8"					
X21	Arthur Draut	656	656						
X34	Cherokee & Seneca	325	217	108					
X35	Muddy Fork & Tribes	100		100					
		1,081	873	208	-	-	-	-	-
		TOTAL UTILITY IMPACT (LF)	ELECTRICAL DISTRIBUTION						
			REMOVE & REPLACE						
X34	Cherokee & Seneca	138	138						
		138	138	-	-	-	-	-	-

- This account is representative of the construction cost associated with the bulk of the construction its as this is an Environmental Restoration project.
- Measures under this account include features of work such as:
 - Demolition – site specific features (concrete structures, pedestrian bridges, etc.)
 - Excavation – in-stream (channel shaping/channel creation), open site
 - Grading – embankments, open site
 - Native Rock Structures – riffle structures, j-hooks, etc.
 - Large Woody Debris – embedded root wads, clusters
 - Native Planting Community Restoration – planting trees & shrubs (community specific), seeding, plugging, planting establishment (invasive species removal, mowing, tree guards)
 - Best Management Practices (BMP) – coir logs, coir fabric, erosion control blankets, and silt fence
- These measures were compiled under different alternatives in various combinations and were used to identify the Tentatively Selected Plan (TSP) through the Cost Effectiveness and Incremental Cost Analysis (CE/ICA).
- Quantities were developed based on input from the PDT and, as needed, assumptions were made by the estimator to arrive at the necessary level of detail to estimate the cost of a particular activity.

Site	Description		<div>Site Boundary (AC)</div> <div>Connectivity Features (EA)</div> <div>In Stream Habitat Only (LF)</div> <div>In Stream Habitat & Floodplain Connectivity (LF)</div> <div>Sculpted Riverine Establishment</div> <div>Hydrologic Resurgence Via Basins/Swales (AC)</div> <div>Native Plant Community Restoration (AC)</div>					
			C	R1	R2	R4	H2	N1
X2	Confluence	65.3			1,068		37.96	
X10	Alpaca Farm	64.68	3		4,913			36.80
X19	Newburgh Rd	22.65		4,489			11.69	
X20	Brown Park	27.59			628			24.62
X21	Arthur Draut	25.11			1,527			22.73
X22	Concrete Channel	15.11					6.40	
X29	Eastern/Creason Connector	111.54	3			4,549		96.21
X30	Joe Creason Park	103.88	1			3,830		100.69
X33	MSD Basin	5.43					3.13	
X34	Cherokee & Seneca	278.35	4		12,951			231.02
X35	Muddy Fork & Tribs	37.64	4		8,717		7.04	
X38	Cave Hill Corridor	29.03			3,335		5.64	
		786.31	15	4,489	33,139	8,379	71.86	512.07

5.4 (14) RECREATION FACILITIES

- This account includes cost for recreational components which were added to the project after the TSP selection and the associated cost are reflected in the Total Project Cost Summary (TPCS).
- Cost for each feature were determined using past similar projects or detailed out through discussion and visual representations with the Project Planner.
- Quantities were provided by the Project Planner and are summarized in the table below:

SITE	RECREATION FEATURE	QTY	UOM
X2 - CONFLUENCE	BOAT ACCESS RAMP	150	SF
	PEDESTRIAN BRIDGE	1	EA
X10 - ALPACA FARMS	OUTDOOR CLASSROOM	1	EA
X19 - NEWBURG RD	BIRDING PLATFORM	1	EA
X29 - EASTERN/CREASON CONNECTOR	SOFT SURFACE TRAILS	8,000	LF
	BENCHES	4	EA
X33 - MSD BASIN	BIRDING PLATFORM	2	EA
X38 - CAVE HILL CORRIDOR	MULTI-PURPOSE TRAIL	2000	LF
	BIRDING PLATFORM	1	EA

5.5 (18) CULTURAL RESOURCES PRESERVATION

- This account includes all costs incurred by the government for actions associated with historic preservation, including, but not limited to, the identification and treatment of historic properties, and the mitigation of adverse effects, will be included in construction costs.
- These costs were provided by the Archeological PDT member for \$540,000. Contingency was applied consistent with the results of the CSRA and can be seen in the TPCS, Attachment C.

5.6 (30) PLANNING, ENGINEERING, AND DESIGN

- The work covered under this account includes project management, project planning, preliminary design, final design, geotechnical and HTRW investigations, hydraulic modeling, preparation of plans & specifications, engineering during construction, adaptive management, coordination efforts, contract advertisement, opening of bids, and contract award.
- The cost for this account was estimated with input from the project manager, civil engineer PDT member, civil engineering branch chief, and the PDT for all anticipated tasks for this project.
- As a percentage of the overall construction cost the 30 Account is currently as 16.0% in the TPCS.

5.7 (31) CONSTRUCTION MANAGEMENT (S&A)

- The work covered under this account includes contract supervision, contract administration, construction administration, technical management activities, and District office supervision and administration costs. The cost for this account was estimated with input from the project manager, engineering design branch chief, and historical S&A rates from other similar-sized projects.
- As a percentage of the overall construction cost, the 31 Account is currently set as 7.0% in the TPCS.

6 PROJECT SCHEDULE & DURATION

Given that this Feasibility Study is allowed three years to complete, the Signed Chief's Report Milestone is schedule for September 5th, 2022. Assuming the Project Partnership Agreement is signed within six months, design would begin in April 2023. Allowing 2 years for design, the construction would likely not begin until as early as April 2025.

All phases of the project including Pre-Award, Construction, and Monitoring (Establishment) are currently assumed to take place under one contract. Attachment D of this Appendix shows the approximate construction durations by site and feature of work. The total duration of the contract is currently projected at 2,511 working days, or approximately 10 years 7 months. This duration includes all the construction activities and includes a 5-year establishment period (per site), beginning as soon as construction activities end at the first site.

7 TOTAL PROJECT COST SUMMARY (TPCS)

The feasibility-level cost estimate for the Recommended Plan at the FY22 price level (Project First Cost) is \$121,135,000. This estimate was escalated over the implementation schedule to generate a fully funded cost estimate in the amount of \$142,330,000. These costs can be found in Attachment B of this Appendix.

ATTACHMENT A
MII SUMMARY REPORT

U.S. Army Corps of Engineers
Project : Beargrass Creek Ecosystem Restoration - Recommended Plan
Beargrass Creek Ecosystem Restoration_Recommended Plan - MII Report
Project Location: Louisville, KY (Jefferson County)

Unrestricted/Full & Open Procurement (Assumed)

Bid Opening (Assumed)

Solicitation: N/A

Amendments Acknowledged:

Files located at <O:\ED\Public\MCACES\ED-M-C\0 Civil\FY20\465081 - Beargrass Creek>

Estimated by Neal Ralston, LRL-EDMC

Designed by

Prepared by Neal Ralston, LRL-EDMC

Preparation Date 3/12/2021

Effective Date of Pricing 10/30/2020

Estimated Construction Time 1,539 Days

Checked by: Marcus Kepley, Cost Engineer

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Project Cost Summary Report	1
Recommended Plan	1
Lands and Damages	1
Relocations	1
Fish and Wildlife Facilities	1
Recreation Facilities	1
Cultural Resource Preservation	1
Planning, Engineering and Design	1
Construction Management	1

Description	Quantity	UOM	DirectLabor	DirectEQ	DirectMatl	DirectSubBid	DirectCost	CostToPrime	ContractCost
Project Cost Summary Report			14,404,808	8,418,211	4,311,697	6,018,068	70,952,508	74,990,112	90,448,948
Recommended Plan	1.00	LS	14,404,808	8,418,211	4,311,697	6,018,068	70,952,508	74,990,112	90,448,948
Lands and Damages	1.00	LS	0	0	0	0	24,766,324	24,766,324	24,766,324
Relocations	1.00	LS	2,082,582	1,112,296	793,224	2,913,906	6,902,008	8,855,552	12,515,712
Utilities	1.00	LS	2,082,582	1,112,296	793,224	2,913,906	6,902,008	8,855,552	12,515,712
Fish and Wildlife Facilities	1.00	LS	12,264,764	7,292,005	3,366,456	3,095,253	26,229,879	28,254,599	39,932,736
X2 - Confluence	1.00	LS	639,824	498,771	152,445	195,655	1,487,495	1,590,676	2,248,132
X10 - Alpaca Farm	1.00	LS	855,876	464,341	186,639	252,696	1,769,153	1,917,644	2,710,241
X19 - SF_Newburgh Rd	1.00	LS	499,651	256,551	146,261	136,713	1,054,375	1,088,755	1,538,757
X20 - Brown Park	1.00	LS	214,809	67,392	54,313	59,587	397,701	458,942	648,630
X21 - Arthur Draut	1.00	LS	339,057	212,455	91,721	71,873	716,707	766,544	1,083,370
X22 - Concrete Channel	1.00	LS	127,249	98,260	212,566	28,055	466,129	486,670	687,819
X29 - Eastern/Creason Connector	1.00	LS	2,364,657	1,643,502	608,264	875,667	5,501,690	6,017,623	8,504,816
X30 - Joe Creason Park	1.00	LS	1,929,040	1,255,064	393,025	613,838	4,323,168	4,776,010	6,750,021
X33 - MSD Basin	1.00	LS	40,487	34,808	19,087	12,457	106,839	115,116	162,695
X34 - Cherokee & Seneca	1.00	EA	2,871,687	1,378,179	727,409	538,255	5,528,331	6,086,000	8,601,454
X35 - Muddy Fork & Tribs	1.00	EA	1,714,591	904,665	508,920	183,735	3,335,910	3,356,662	4,744,032
X38 - Cave Hill Corridor	1.00	LS	667,836	478,016	265,806	126,722	1,542,380	1,593,958	2,252,769
Recreation Facilities	1.00	LS	57,462	13,909	152,018	8,908	232,298	291,637	412,176
X2 - Confluence	1.00	LS	13,002	2,383	53,858	3,000	72,244	92,691	131,002
X10 - Alpaca Farms	1.00	LS	8,726	2,100	4,419	65	15,311	15,311	21,639
X19 - Newburg Rd	1.00	EA	2,202	0	4,950	0	7,152	9,176	12,969
X29 - Eastern/Creason Connector	1.00	LS	19,383	3,919	22,568	5,843	51,713	64,273	90,839
X33 - MSD Basin	1.00	LS	4,383	0	9,895	0	14,278	18,319	25,890
X38 - Cave Hill Corridor	1.00	LS	9,766	5,507	56,327	0	71,601	91,867	129,837
Cultural Resource Preservation	1.00	LS	0	0	0	0	540,000	540,000	540,000
Planning, Engineering and Design	1.00	LS	0	0	0	0	8,544,000	8,544,000	8,544,000
Construction Management	1.00	LS	0	0	0	0	3,738,000	3,738,000	3,738,000

ATTACHMENT B
COST AND SCHEDULE RISK ANALYSIS (CSRA)

Cost Summary for Risk Register Development

Project: **Three Forks of Beargrass Creek, Ecosystem Restoration**

Project Development Stage/Alternative: **Feasibility Milestone #4 - CWRB**

Risk Category: **Low Risk: Simple Project-No Life Safety**

Meeting Date: **3/23/2021**

Schedule Duration

Apr-2025

Feb-2036

From (Month/Year)

From (Month/Year)

Schedule Duration:

130.2 Months

28%

Schedule Contingency

80% Finish Date

Feb-2039

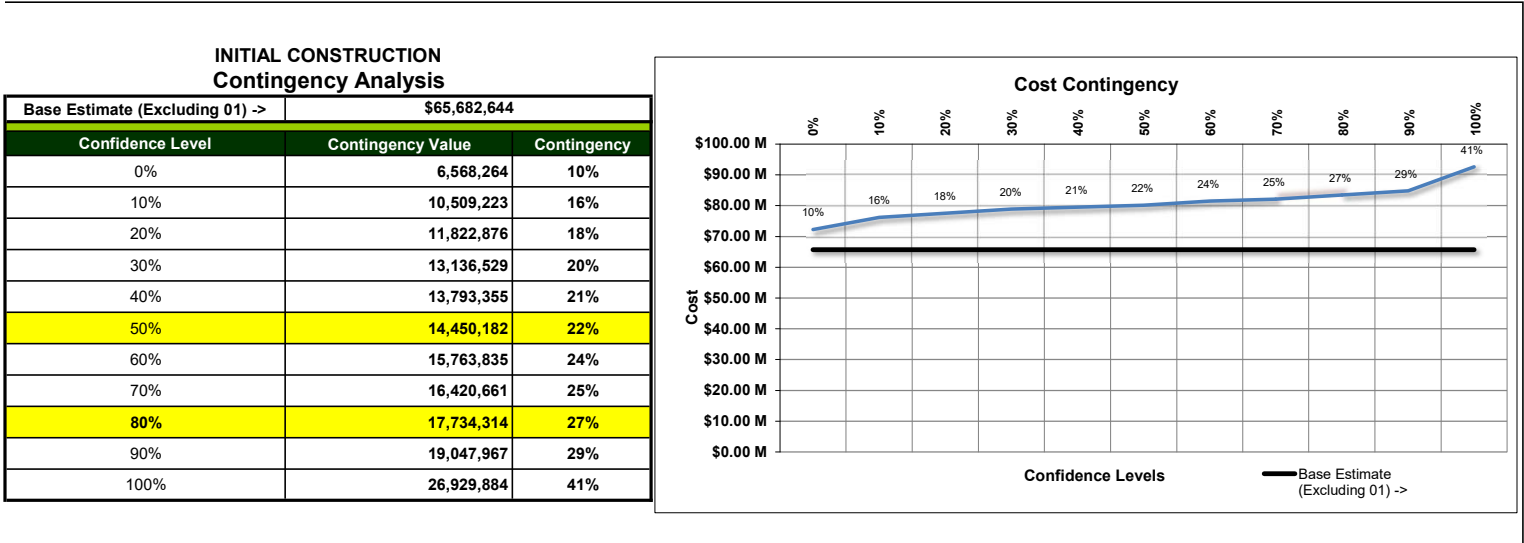
WBS	Feature of Work	Base Cost	80% Confidence	80% Confidence (\$)	80% Total
Risk Not included within CSRA Model					
01	LANDS AND DAMAGES	Real Estate \$ 24,766,324	18.0%	\$ 4,460,177	\$ 29,226,501
Risk included within CSRA Model					
1	02 RELOCATIONS	Utility Relocations \$ 12,515,712	27%	\$ 3,379,242	\$ 15,894,954
2	06 FISH AND WILDLIFE FACILITIES	Ecosystem Restoration Features \$ 39,932,736	27%	\$ 10,781,839	\$ 50,714,575
3	14 RECREATION FACILITIES	Recreation Facilities \$ 412,196	27%	\$ 111,293	\$ 523,489
4	18 CULTURAL RESOURCE PRESERVATION	Cultural Resources \$ 540,000	27%	\$ 145,800	\$ 685,800
23	30 PLANNING, ENGINEERING, AND DESIGN	Planning, Engineering, & Design \$ 8,544,000	27%	\$ 2,306,880	\$ 10,850,880
24	31 CONSTRUCTION MANAGEMENT	Construction Management \$ 3,738,000	27%	\$ 1,009,260	\$ 4,747,260
XX	FIXED DOLLAR RISK ADD (EQUALLY DISPERSED TO ALL, MUST INCLUDE JUSTIFICATION SEE BELOW)				
				\$ -	
Totals					
	Real Estate	\$ 24,766,324	18%	\$ 4,460,177	\$ 29,226,501.00
	Total Construction Estimate	\$ 53,400,644	27%	\$ 14,418,174	\$ 67,818,818
	Total Planning, Engineering & Design	\$ 8,544,000	27%	\$ 2,306,880	\$ 10,850,880
	Total Construction Management	\$ 3,738,000	27%	\$ 1,009,260	\$ 4,747,260
	Total	\$ 65,682,644	34%	\$ 22,194,491	\$ 112,643,459
PROGRAMMED AMOUNT (IF KNOWN)					

Information						Probability of Occurrence						Cost & Schedule Impacts						Risk Rating									
						Certain	Very Likely	Likely	Possible	Unlikely	Unrated	Negligible			Marginal			Moderate									
						> 90%	70-90%	30-70%	5-30%	< 5%	N/A																
						Negligible			Marginal																		
						< \$328,500			\$328,500 to \$1,314,000			\$1,314,000 to \$1,970,500															
						< 6.75 MO			6.75 MO to 13.25 MO			13.25 MO to 19.75 MO															
								Negligible	Marginal	Moderate	Significant	Critical															
						Certain	RELOOK AT BASIS OF ESTIMATE																				
						Very Likely	Low	Medium	High	High	High																
						Likely	Low	Medium	Medium	High	High																
						Possible	Low	Low	Medium	Medium	High																
						Unlikely	Low	Low	Low	Medium	Medium																
Three Forks of Beargrass Creek, Ecosystem Restoration - Feasibility Milestone #4 - CWRB																											
#####																											
REF	Previous REF	Display(?)	Risk Type	Risk/Opportunity Event	Risk Event Description	PDT Discussions on Impact and Likelihood	Project Cost			Project Schedule			COST		SCHEDULE			Cost From Schedule			TOTAL Cost		TOTAL Schedule		Risk Quantification Discussions	Suggested Risk Reduction Measures (Avoid, Escalate, Exploit, Transfer/Share, Mitigate/Enhance, or Accept)	
							Likelihood (C)	Impact (C)	Risk Level (C)	Likelihood (S)	Impact (S)	Risk Level (S)	Low Variance (Min)	Likely (C)	High Variance (80%/4)	Low Variance (S) (Min)	Likely (S)	High Variance (S) (80%/4)	Low Variance (CS) (Min)	Likely Added Cost (CS)	High Variance (CS) (80%/4)	TWO STEP (Cost)	Simulated Cost (C) + (CS)	TWO STEP (Sch)			Simulated Sched (S)
1	LD1	FALSE	30 - Lands and Damages (LD)	Additional Easements	Additional easement acquisition may be needed to perform work	Acquisition of lands which may be needed for temporary/permanent construction features or utilities not anticipated. Real Estate Division has conducted meetings in order to minimize the number of acquisitions which may be needed and those changes are already captured in the project mapping.	Likely	Marginal	Medium	Possible	Negligible	Low	\$0	\$0	\$619,158	0.00 MO	0.00 MO	4.00 MO	\$0	\$0	\$547,355	100%	\$0	100%	0.00 MO	The base estimate and schedule assumes... LV: Assume No change from base estimate L: No change from base estimate/schedule. HV: Assume... 2.5% increase to 01 Account + add1 time related cost from potential schedule impacts (assumes 2.5% per year for delays) for 4 months	
2	LD2	FALSE	30 - Lands and Damages (LD)	Private Property Interest	If private (mainly residential) parties are not willing to participate, this could alter the footprint of the project	If someone is unwilling to sell or allow access through their property this could impact the projects design/schedule until resolved	Possible	Marginal	Low	Likely	Marginal	Medium				0.00 MO	0.00 MO	6.00 MO	\$0	\$0	\$821,033	100%	\$0	100%	0.00 MO	The base estimate and schedule assumes... LV: Assume No change from base estimate L: No change from base estimate/schedule. HV: Assume... No direct Cost impacts but add1 time related cost from potential schedule impacts (assumes 2.5% per year for delays) for 6 months	
5	PM3	FALSE	01 - Project & Program Management (PM)	Project Implementation Funding Delay	Project could experience some delays if incrementally funded	Estimate already makes some assumptions about the project timeline; Project has many hands to pass through and if the decision is made to partially fund the project this could result in some delays, likely to the project schedule, if realized - though the impact is not expected to be significant	Unlikely	Negligible	Low	Possible	Moderate	Medium				0.00 MO	0.00 MO	12.00 MO	\$0	\$0	\$1,642,066	100%	\$0	100%	0.00 MO	The base estimate and schedule assumes no delays and that the project will be fully funded LV: Assume No change from base estimate L: No change from base estimate/schedule. HV: Assume... No direct Cost impacts but add1 time related cost from potential schedule impacts (assumes 2.5% per year for delays) for worst case of 12 months delay	
6	CA1	FALSE	05 - Contract Acquisition Risks (CA)	Contract Acquisition/Procurement Unknown	Current assumption is for low-bid procurement with a Full & Open solicitation. Possible some other metric could be utilized such as Best Value/Trade off approach	If anything other than Full & Open/Low bid is used there will likely be contract (construct) cost impacts. Not likely to affect the construction schedule.	Possible	Significant	Medium	Unlikely	Negligible	Low	\$1,335,016	\$0	\$2,670,032							100%	\$0	100%	0.00 MO	The base estimate and schedule assumes low bid/full and open environment LV: Assume No change from base estimate L: No change from base estimate/schedule. HV: Assume... risk to the contract price if deviation from baseline assumption - 2.5% to 5% increase in construction cost could be expected - used 3.75%	
7	CA2	FALSE	05 - Contract Acquisition Risks (CA)	Project Split across Multiple Contacts	Project could be split up across several smaller contracts/phases rather than one big contract or design effort	Possible to happen, with impacts to both Project Cost and Schedule as the design would become incremental and drawn out. This "phasing" would stretch out the completion of the overall project due to more Corps process being interjected into the Project schedule than is currently assumed (more reviews, contracting packages, advertisements, etc.)	Possible	Moderate	Medium	Possible	Critical	High	\$0	\$0	\$2,463,099	0.00 MO	0.00 MO	24.00 MO	\$0	\$0	\$3,284,132	100%	\$0	100%	0.00 MO	The base estimate and schedule assumes one single contract LV: Assume No change from base estimate L: No change from base estimate/schedule. HV: Assume... risk to the contract price if deviation from baseline assumption - 2.5% to 5% increase in construction cost could be expected - used 3.75%; Schedule impact would be larger and worst cased assumed at 2 years	
8	TR1	FALSE	13 - Civil/Site Design (CV)	Construction Quantity Issues	Due to large amounts of input data, there could be issues with quantity development	As project moves into design - more refinement to come and therefore better information on which to base quantities. Quantities could be impacted 0-20%. Increased quantities could mean longer construction durations than currently envisioned and, of course, increased construction cost	Likely	Critical	High	Likely	Moderate	Medium	\$0	\$0	\$5,340,064	0.00 MO	0.00 MO	8.00 MO	\$0	\$0	\$1,360,000	100%	\$0	100%	0.00 MO	Estimate attempts to reflect conservative, but not overly conservative, quantities. Lack of thorough investigation will possibly lead to quantity issues. As worst case it is assumed quantity increases could lead to a 20% increase in the construction cost + see a schedule duration increase of 8 months. This increase in schedule would add additional JOOH (approx. \$170k per month per Mill estimate).	Clear communication between estimator and technical team about where quantities are being assumed and what the basis for those assumptions are
10	TR3	FALSE	04 - External Risks (EX)	Beargrass Creek Flooding	Potential risk for flooding caused by the Beargrass Creek causing loss of previously installed work	Risk to installed work or time lost do to flooded areas. Estimate includes higher than average Adaptive Management cost in an effort to conservatively estimate for this. Risk register item is to acknowledge the possibility of exceeding this amount	Likely	Marginal	Medium	Likely	Marginal	Medium	\$0	\$0	\$801,010	0.00 MO	0.00 MO	6.00 MO	\$0	\$0	\$821,033	100%	\$0	100%	0.00 MO	Project schedule spans nearly 6 years and it is assumed there is a 10% chance any given year that we have a rain event large enough to wash out installed work or in-progress work. If this were to happen worst case assumption is a 6 month delay for clean-up and reinstallation totalling 1.5% of the total construction cost	External risk (Act of God) cannot be mitigated. Included Adaptive Management cost may be sufficient to cover an event such as this and in a way is a mitigation measure.
12	X2.2	FALSE	18 - Hazardous Materials (HZ)	Potential for HTRW (Contaminated Soil)	Once demolition/removal begins on site, it could be determined the soil under the impound lot could be contaminated with POLs	Site currently houses repossessed, aquired vehicles which may not be in the best of shape or condition in all instances. At a minimum some soil testing would be needed to confirm.	Unlikely	Significant	Medium	Unlikely	Marginal	Low	\$0	\$0	\$2,475,926							100%	\$0	100%	0.00 MO	Construction cost impacts determined by reviewing previous soil remediation projects - Approx \$1750' (includes excavation, testing, disposal, backfill, and seeding). Total footprint of impound lot = 191,000 SF; Low Cost variance assumes a \$0 scenario, while the high reflects having to remove an additional 2' of material under the entire area	As part of Plan Optimization this risk was nearly removed but decided to keep in the event that runoff from the existing lot has contaminated the nearby soils.
29	X35.1	FALSE	07 - Site Identification & Approval (SI)	Real Estate Acquisition	Private real estate acquisition	Almost 100% privately owned. Could experience push-back or be unable to acquire certain parcels of land	Likely	Negligible	Low	Possible	Moderate	Medium				0.00 MO	0.00 MO	12.00 MO	\$0	\$0	\$1,642,066	100%	\$0	100%	0.00 MO		
34	CO1	FALSE	19 - Estimate and Schedule Risks (ES)	Consideration for Contract Modifications/Claims	There is inherent risk of post-award contract changes due to differing conditions, user directed changes, design deficiencies, and/or claims.	This could impact the overall project cost and schedule. Mods/claims likely would increase due to complexity/additional scope (bump up from % used). Assumed a range of 2% to 5% for mods	Likely	Significant	High	Likely	Moderate	Medium	\$0	\$0	\$2,298,893	0.00 MO	0.00 MO	12.00 MO	\$0	\$0	\$1,642,066	100%	\$0	100%	0.00 MO		
38	EX1	FALSE	04 - External Risks (EX)	Market Conditions	Due to unforeseen market saturation (lots of work in the area or even nationally), the pool of qualified/capable bidders could end up being small	Limited competition or a work force which is spread thin could result in increased bid prices with there being ample work to the contractor without this project. Assumes impact of 3%-5% to construction cost. Schedule impacts not expected to be a factor	Possible	Significant	Medium	Unlikely	Negligible	Low	\$0	\$0	\$2,136,026							100%	\$0	100%	0.00 MO		

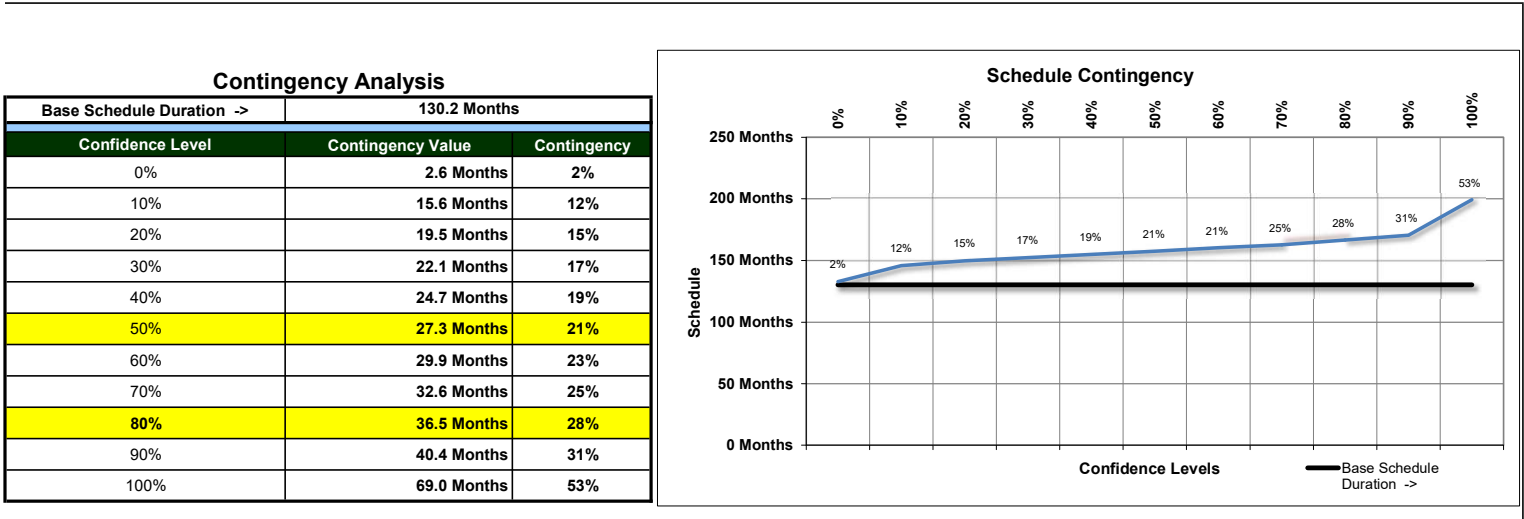
Contingency on Base Estimate		80% Confidence Project Cost
Base Estimate (Excluding 01) ->		\$65,682,644
Estimate Contingency ->		\$17,734,314 27%
Base Estimate w/ Contingency (80% Confidence) ->		\$83,416,958

Contingency on Base Schedule		80% Confidence Project Schedule
Base Schedule Start Date ->		April 2, 2025
Base Schedule Finish Date ->		February 7, 2036
Base Schedule Duration ->		130.2 Months
Schedule Contingency Duration ->		36.5 Months 28%
Base Schedule w/ Contingency (80% Confidence) ->		166.7 Months
Base Finish Date w/ Contingency (80% Confidence)->		February 20, 2039

- PROJECT CONTINGENCY DEVELOPMENT -



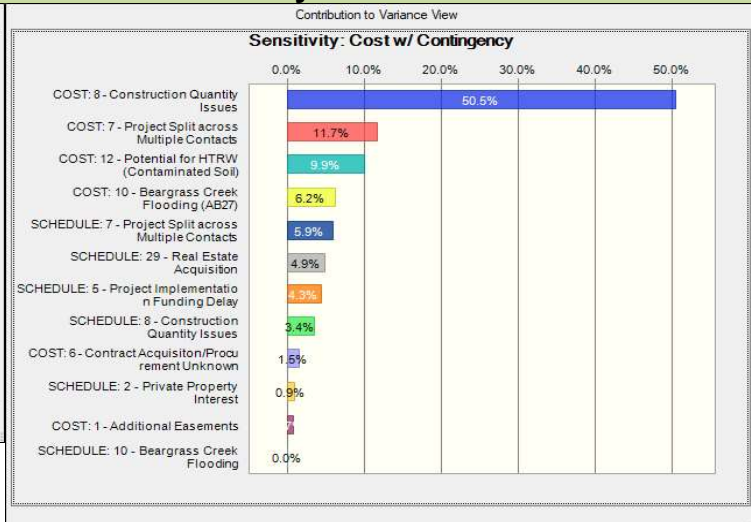
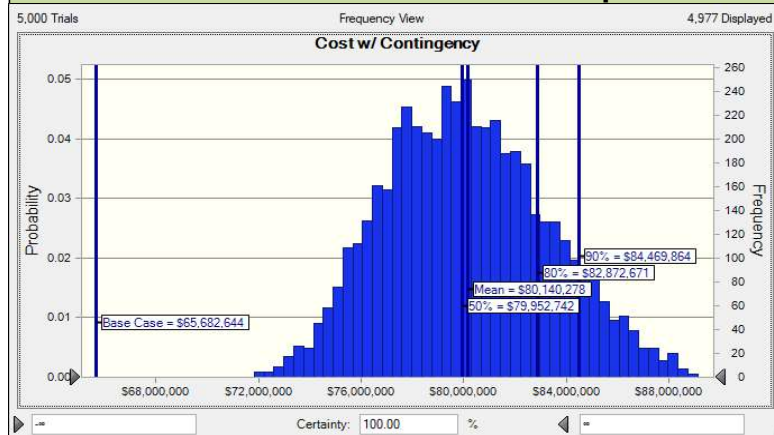
- SCHEDULE CONTINGENCY (DURATION) DEVELOPMENT -



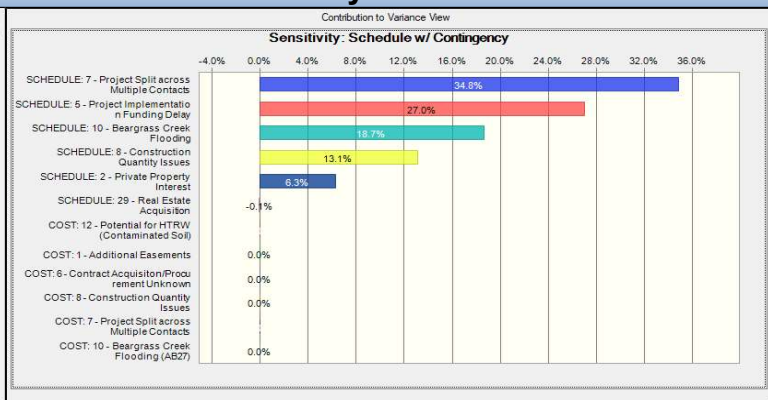
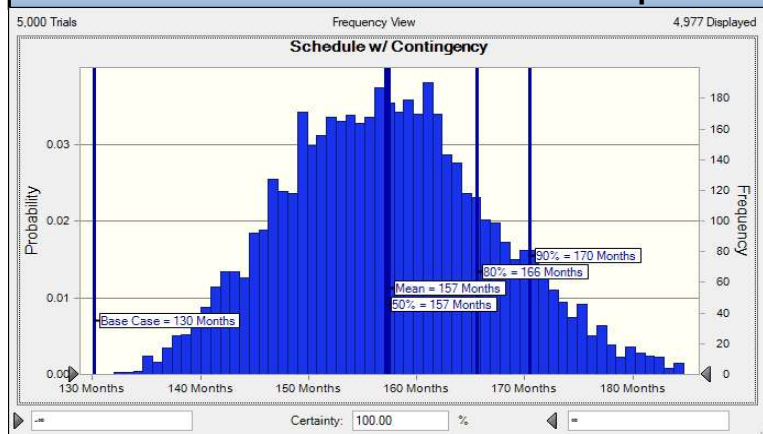
Contingency on Base Estimate		80% Confidence Project Cost	
Base Estimate (Excluding 01) ->		\$65,682,644	27%
Estimate Contingency ->		\$17,734,314	
Base Estimate w/ Contingency (80% Confidence) ->		\$83,416,958	

Contingency on Base Schedule		80% Confidence Project Schedule	
Base Schedule Start Date ->		April 2, 2025	28%
Base Schedule Finish Date ->		February 7, 2036	
Base Schedule Duration ->		130.2 Months	
Schedule Contingency Duration ->		36.5 Months	
Base Schedule w/ Contingency (80% Confidence) ->		166.7 Months	
Base Finish Date w/ Contingency (80% Confidence) ->		February 20, 2039	

- Cost Outputs Distribution and Sensitivity -



- Schedule Outputs Distribution and Sensitivity -



ATTACHMENT C
TOTAL PROJECT COST SUMMARY SHEET (TPCS)

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

Printed:11/22/2021
Page 1 of 11

PROJECT: Beargrass Creek Ecosystem Restoration, GI
PROJECT NO: P2 465081
LOCATION: Louisville, KY

DISTRICT: Louisville District (LRL)
POC: CHIEF, COST ENGINEERING, Jim Vermillion

PREPARED: 11/17/2021

This Estimate reflects the scope and schedule in report; Three Forks of Beargrass Creek Ecosystem Restoration Feasibility Study.pdf

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)						TOTAL PROJECT COST (FULLY FUNDED)			
						Program Year (Budget EC): Effective Price Level Date: 2022 1 OCT 21									
WBS NUMBER A	Civil Works Feature & Sub-Feature Description B	COST (\$K) C	CNTG (\$K) D	CNTG (%) E	TOTAL (\$K) F	ESC (%) G	COST (\$K) H	CNTG (\$K) I	TOTAL (\$K) J	Spent Thru: 1-Oct-20 (\$K)	TOTAL FIRST COST (\$K) K	INFLATED (%) L	COST (\$K) M	CNTG (\$K) N	FULL (\$K) O
02	RELOCATIONS	\$12,516	\$3,379	27.0%	\$15,895	7.1%	\$13,402	\$3,619	\$17,021	\$0	\$17,021	14.0%	\$15,272	\$4,124	\$19,396
06	FISH & WILDLIFE FACILITIES	\$39,933	\$10,782	27.0%	\$50,715	8.6%	\$43,383	\$11,713	\$55,096	\$0	\$55,096	24.9%	\$54,178	\$14,628	\$68,806
14	RECREATION FACILITIES	\$412	\$111	27.0%	\$523	13.3%	\$467	\$126	\$593	\$0	\$593	24.9%	\$583	\$157	\$740
18	CULTURAL RESOURCE PRESERVATION	\$540	\$146	27.0%	\$686	13.3%	\$612	\$165	\$777	\$0	\$777	8.9%	\$666	\$180	\$846
CONSTRUCTION ESTIMATE TOTALS:		\$53,401	\$14,418	27.0%	\$67,819	8.4%	\$57,863	\$15,623	\$73,486	\$0	\$73,486	22.2%	\$70,699	\$19,089	\$89,788
01	LANDS AND DAMAGES	\$24,766	\$4,460	18.0%	\$29,227	8.4%	\$26,845	\$4,835	\$31,680	\$0	\$31,680	8.9%	\$29,227	\$5,263	\$34,490
30	PLANNING, ENGINEERING & DESIGN	\$8,544	\$2,307	27.0%	\$10,851	2.4%	\$8,747	\$2,362	\$11,109	\$0	\$11,109	10.1%	\$9,633	\$2,601	\$12,233
31	CONSTRUCTION MANAGEMENT	\$3,738	\$1,009	27.0%	\$4,747	2.4%	\$3,827	\$1,033	\$4,860	\$0	\$4,860	19.7%	\$4,581	\$1,237	\$5,818
PROJECT COST TOTALS:		\$90,450	\$22,195	24.5%	\$112,644		\$97,283	\$23,853	\$121,135	\$0	\$121,135	17.5%	\$114,140	\$28,190	\$142,330

CHIEF, COST ENGINEERING, Jim Vermillion

ESTIMATED TOTAL PROJECT COST: \$142,330

PROJECT MANAGER, Laura Mattingly

CHIEF, REAL ESTATE, Veronica Hiriams

CHIEF, PLANNING, Amy Babey

CHIEF, ENGINEERING, John Bock

CHIEF, OPERATIONS, Tim Fudge

CHIEF, CONSTRUCTION, Kurt Daily

CHIEF, CONTRACTING, Denise Bush

CHIEF, PM-PB, Vicki Vasquez

CHIEF, DPM, Linda Murphy

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

Printed:11/22/2021
Page 2 of 11

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

PROJECT: Beargrass Creek Ecosystem Restoration, GI
LOCATION: Louisville, KY








DISTRICT: Louisville District (LRL)
POC: CHIEF, COST ENGINEERING, Jim Vermillion

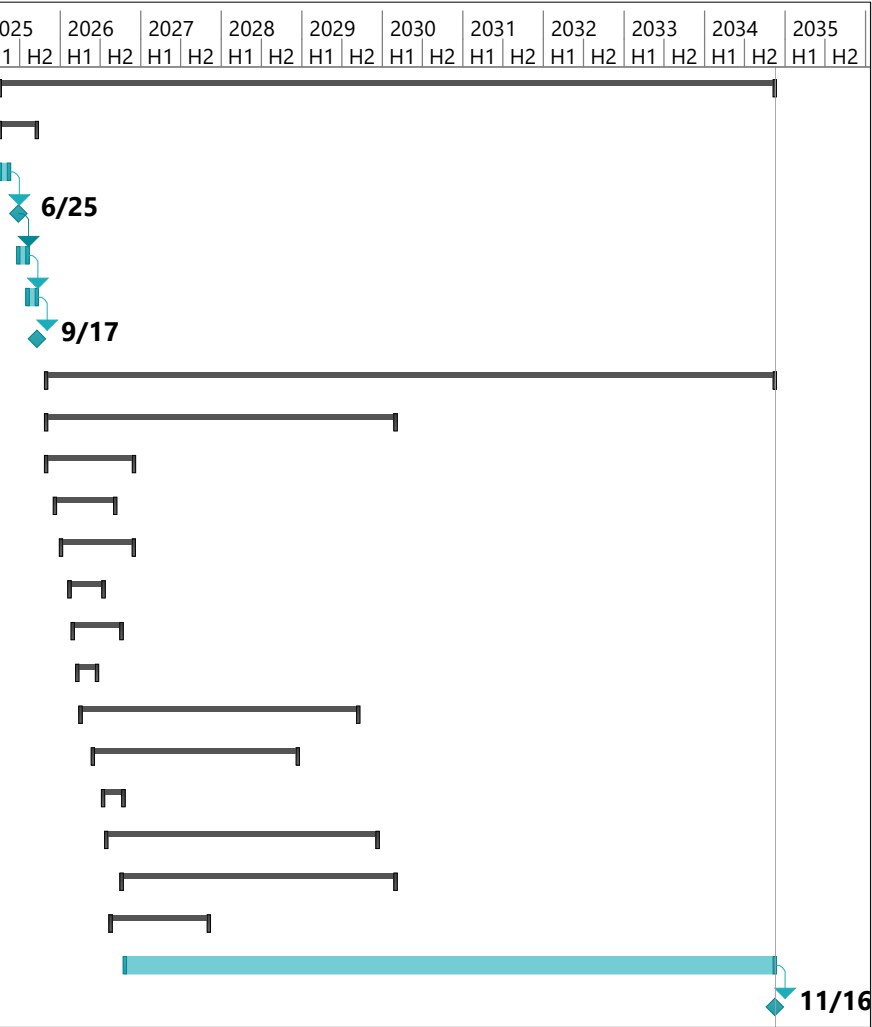
PREPARED: 11/17/2021

This Estimate reflects the scope and schedule in report; Three Forks of Beargrass Creek Ecosystem Restoration Feasibility Study.pdf

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
		Estimate Prepared: Effective Price Level:		17-Nov-21 1-Oct-20		Program Year (Budget EC): Effective Price Level Date:		2022 1 OCT 21						
		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	INFLATED (%)	COST (\$K)	CNTG (\$K)	FULL (\$K)
A	B	C	D	E	F	G	H	I	J	P	L	M	N	O
02	PHASE 1 or CONTRACT 1													
	RELOCATIONS	\$12,516	\$3,379	27.0%	\$15,895	7.1%	\$13,402	\$3,619	\$17,021	2026Q2	14.0%	\$15,272	\$4,124	\$19,396
06	FISH & WILDLIFE FACILITIES	\$39,933	\$10,782	27.0%	\$50,715	8.6%	\$43,383	\$11,713	\$55,096	2029Q2	24.9%	\$54,178	\$14,628	\$68,806
14	RECREATION FACILITIES	\$412	\$111	27.0%	\$523	13.3%	\$467	\$126	\$593	2029Q2	24.9%	\$583	\$157	\$740
18	CULTURAL RESOURCE PRESERVATION	\$540	\$146	27.0%	\$686	13.3%	\$612	\$165	\$777	2024Q4	8.9%	\$666	\$180	\$846
CONSTRUCTION ESTIMATE TOTALS:		\$53,401	\$14,418	27.0%	\$67,819		\$57,863	\$15,623	\$73,486			\$70,699	\$19,089	\$89,788
01	LANDS AND DAMAGES	\$24,766	\$4,460	18.0%	\$29,227	8.4%	\$26,845	\$4,835	\$31,680	2024Q4	8.9%	\$29,227	\$5,263	\$34,490
30	PLANNING, ENGINEERING & DESIGN													
1.5%	Project Management	\$801	\$216	27.0%	\$1,017	2.4%	\$820	\$221	\$1,041	2024Q3	6.4%	\$872	\$236	\$1,108
0.5%	Planning & Environmental Compliance	\$267	\$72	27.0%	\$339	2.4%	\$273	\$74	\$347	2024Q3	6.4%	\$291	\$79	\$369
7.5%	Engineering & Design	\$4,005	\$1,081	27.0%	\$5,086	2.4%	\$4,100	\$1,107	\$5,207	2024Q3	6.4%	\$4,361	\$1,178	\$5,539
0.5%	Reviews, ATRs, IEPs, VE	\$267	\$72	27.0%	\$339	2.4%	\$273	\$74	\$347	2024Q3	6.4%	\$291	\$79	\$369
0.5%	Life Cycle Updates (cost, schedule, risks)	\$267	\$72	27.0%	\$339	2.4%	\$273	\$74	\$347	2024Q3	6.4%	\$291	\$79	\$369
0.5%	Contracting & Reprographics	\$267	\$72	27.0%	\$339	2.4%	\$273	\$74	\$347	2024Q3	6.4%	\$291	\$79	\$369
1.5%	Engineering During Construction	\$801	\$216	27.0%	\$1,017	2.4%	\$820	\$221	\$1,041	2029Q2	19.7%	\$982	\$265	\$1,247
1.0%	Planning During Construction	\$534	\$144	27.0%	\$678	2.4%	\$547	\$148	\$694	2029Q2	19.7%	\$654	\$177	\$831
2.0%	Adaptive Management & Monitoring	\$1,068	\$288	27.0%	\$1,356	2.4%	\$1,093	\$295	\$1,389	2029Q2	19.7%	\$1,309	\$353	\$1,662
0.5%	Project Operations	\$267	\$72	27.0%	\$339	2.4%	\$273	\$74	\$347	2024Q3	6.4%	\$291	\$79	\$369
31	CONSTRUCTION MANAGEMENT													
5.0%	Construction Management	\$2,670	\$721	27.0%	\$3,391	2.4%	\$2,734	\$738	\$3,472	2029Q2	19.7%	\$3,272	\$884	\$4,156
1.0%	Project Operation:	\$534	\$144	27.0%	\$678	2.4%	\$547	\$148	\$694	2029Q2	19.7%	\$654	\$177	\$831
1.0%	Project Management	\$534	\$144	27.0%	\$678	2.4%	\$547	\$148	\$694	2029Q2	19.7%	\$654	\$177	\$831
CONTRACT COST TOTALS:		\$90,450	\$22,195		\$112,644		\$97,283	\$23,853	\$121,135			\$114,140	\$28,190	\$142,330

ATTACHMENT D
CONSTRUCTION SCHEDULE

ID		Task Mode	Task Name	Duration	Start	Finish	Predecessors	4 H2	2025 H1	2026 H1	2027 H1	2028 H1	2029 H1	2030 H1	2031 H1	2032 H1	2033 H1	2034 H1	2035 H1
1			Construction Schedule	2511 days	Wed 4/2/25	Thu 11/16/34													
2			Pre-Construction Period	120 days	Wed 4/2/25	Wed 9/17/25													
3			Solicitation	30 days	Wed 4/2/25	Tue 5/13/25													
4			Project Award	0 days	Wed 6/25/25	Wed 6/25/25	3FS+30 days												
5			Generate Contractor Submittals	30 days	Wed 6/25/25	Tue 8/5/25	4												
6			Review/Approve Submittals	30 days	Wed 8/6/25	Tue 9/16/25	5												
7			NTP	0 days	Wed 9/17/25	Wed 9/17/25	6												
8			Construction Period	2361 days	Wed 10/29/25	Wed 11/15/34													
9			Main Contract	1133 days	Wed 10/29/25	Fri 3/1/30													
10			X2 - Confluence	285 days	Wed 10/29/25	Tue 12/1/26													
21			X10 - Alpaca Farm	196 days	Mon 12/8/25	Mon 9/7/26													
31			X19 - SF_Newburgh Rd	236 days	Mon 1/5/26	Mon 11/30/26													
40			X20 - Brown Park	111 days	Thu 2/12/26	Thu 7/16/26													
50			X21 - Arthur Draut	157 days	Fri 2/27/26	Mon 10/5/26													
59			X22 - Concrete Channel	63 days	Fri 3/20/26	Tue 6/16/26													
65			X29 - Eastern/Creason Connector	900 days	Fri 4/3/26	Thu 9/13/29													
75			X30 - Joe Creason Park	664 days	Fri 5/29/26	Wed 12/13/28													
85			X33 - MSD Basin	66 days	Wed 7/15/26	Wed 10/14/26													
91			X34 - Cherokee & Seneca	879 days	Wed 7/29/26	Mon 12/10/29													
101			X35 - Muddy Fork & Tribs	888 days	Wed 10/7/26	Fri 3/1/30													
112			X38 - Cave Hill Corridor	319 days	Tue 8/18/26	Fri 11/5/27													
122			Establishment/Monitoring Period - 5 year after plantings	2106 days	Wed 10/21/26	Wed 11/15/34	16												
123			Contract Closeout	0 days	Thu 11/16/34	Thu 11/16/34	122												




Project: Beargrass Creek
Date: Thu 10/28/21


Task


Split


Milestone

Summary











Project Summary


Inactive Task


Inactive Milestone

Inactive Summary









Inactive Task

Inactive Milestone


Inactive Summary


Manual Task


Duration-only


Manual Summary Rollup

Manual Summary











Start-only


Finish-only

External Tasks

External Milestone







Deadline

Progress

Manual Progress

