

APPENDIX G - 5

COST ESTIMATING

INTRODUCTION

This Cost Engineering Appendix is provided to describe the development of costs for use in the updated NED plan economic analysis. This appendix reflects a 2018 update to the 2010 cost estimating work to bring all costs for the NED plan to 2018 dollars. No updates to the cost estimates for the alternatives analysis has been completed at this point.

2010 COST ESTIMATES

The NED plan was estimated in 2010 using MCACES cost estimating software, version 4.0. The estimate was dated 25 May 2010 (See Attachment A for summary print out of 2010 MCACES Estimate). The total project cost within the MCACES shows a total project cost of \$43,151,846, which does include contingencies. Various contingency percentages were applied across the different feature accounts. Table 1 provides a summary of costs from the 2010 MCACES construction cost estimate. The table presents the primary feature accounts along with the contingency costs and percentages for each account.

Table 1 – Summary of 2010 MCACES Costs by Feature Account

WBS	Feature Account – Item	Contract Cost	Contingency	Contingency %	Project Cost
01	Lands and Damages - Flood Protection	\$7,591,898	\$1,530,700	20.16%	\$9,122,598
01	Lands and Damages - Ecosystem Restoration	\$5,940,226	\$1,342,103	22.59%	\$7,282,329
01	Lands and Damages - Structure Demolition	\$1,631,685	\$407,994	25.00%	\$2,042,612
06	Fish and Wildlife Facilities - Ecosystem Restoration	\$9,483,822	\$2,265,597	23.89%	\$11,749,419
06	Fish and Wildlife Facilities - Monitoring and Adaptive Management	\$856,000	\$-	0.00%	\$856,000
14	Recreation Facilities	\$6,686,648	\$1,315,638	19.68%	\$8,002,286
30	Planning, Engineering and Design	\$1,638,641	\$409,660	25.00%	\$2,048,301
31	Construction Management	\$1,638,641	\$409,660	25.00%	\$2,048,301
Totals:		\$35,467,561	\$7,681,352	21.66%	\$43,151,846

2018 COST UPDATES

The following sections describe the modifications made to the 2010 cost estimate to generate the total costs for use in the economic analysis of the NED plan.

MCACES Cost Estimate

Based on our review of the 2010 cost estimate, a simple update based on importing the new labor, equipment and cost book databases likely would be insufficient. Many items within the estimate likely would not be updated, as names have changed within the software, and cost overrides likely would have been used that would need to be updated independently. Therefore, in lieu of updating these databases, the use of EM 1110-2-1304, Civil Works Construction Cost Index System (CWCCIS) has been used to update all prices from the 2010 MCACES. The CWCCIS provides escalation factors for all USACE feature accounts, and allows for calculation of escalation factors for specific features of the project. These factors are developed to be representative of escalations to labor, equipment and material prices.

Escalation Rates

Based on the escalation factors provided in EM 1110-2-1304, the following escalation factors have been calculated for the construction elements of the cost estimate.

Table 2 – CWCCIS Escalation Factors by Feature Account

WBS	Feature Account	3Q10 Factor	2Q18 Factor	Escalation Multiplier
01*	Lands and Damages	729.23	850.34	1.166
06	Ecosystem Restoration	712.33	839.75	1.179
14	Recreation	728.03	824.96	1.133
* Note: the 01 Account factors were taken from the composite index (weighted average)				

Lands and Damages Updates

The 01 – Lands and Damages account shown in Table 2 accounts for the construction aspects of the 01 Account. The 1.166 multiplier is applied to the structure demolition construction work that is included in the 01 Account. An additional change that has been made for clarification, and proper calculation of the 30 and 31 accounts, is that the structural demolition costs have been moved to the 02 Relocations account for the updated estimate.

For the non-construction elements of the 01 Account, price indices developed by the St. Louis Federal Reserve Bank were used to escalate all non-construction real estate costs (see Appendix D – Real Estate for details of escalation to non-construction real estate costs).

Modifications to Existing NED Recommended Plan

As noted in Appendix A – Economics, the new recommended plan has less structures to be bought out, evacuated, and demolished. This is because some structures have already been removed from the floodplain over the last eight years. Therefore, the updated cost estimate reflects the removal of these structures from the study.

The 2010 estimate included the demolition of 74 residential structures. The average cost of demolition per structure, without contingency, equaled approximately \$14,850. The updated NED plan now includes the demolition of 60 total residential structures. Therefore, the updated cost estimate for the NED plan uses the average structure demolition price from the 2010 MCACES estimate, and escalates the unit price by the factors shown in Table 2. Based on these assumptions the current structure demolition costs are presented in Table 3.

Table 3 – Escalation and Quantity Update Summary for Structure Demolitions

Item	Quantity	UOM	Unit Price*	Contract Cost
2010 Structure Demo Costs	74	EA	\$14,850	\$1,098,900
2018 Structure Demo Costs	60	EA	\$17,320	\$1,039,200
* Note: Unit price for 2018 cost has been escalated by a factor of 1.166				

All ancillary project work included in the 2010 estimate, such as roadway demolition, overhead power line removals, demo of stormwater systems, and others, have been assumed to remain applicable to the current plan. These costs have all been escalated accordingly based on the factors in Table 2. Table 4 provides the escalated values for the remaining demolition items plus the change to the structure demolition as referenced in Table 3.

Table 4 – Structure Demolition Escalation to 2018 Dollars

Demolition Item	2010 Cost	Escalation Factor	2018 Cost
Structure Demolition*	\$1,098,900	1.166	\$1,039,200
Underground Gas Line	\$44,194		\$51,530
Power Pole and Overhead Power Line Removal	\$50,230		\$58,568
Demo Asphalt Road	\$20,372		\$23,754
Demo Curb & Gutter	\$15,086		\$17,590
Demolition Water Line	\$4,195		\$4,891
Demolition Sanitary Sewer Lines	\$6,494		\$7,572
Asbestos Removal	\$332,473		\$387,664
Demolition of Road and Stormwater System (North of Parcels 66-69)	\$11,919		\$13,898
Demolition of Road and Stormwater System (Mercer Street)	\$7,670		\$8,943
Erosion Control	\$38,465		\$44,850
Curb & Gutters at Mercer Street	\$1,303		\$1,519
Curb & Gutters at South Side of HWY 359	\$2,444		\$2,850
Total Cost	\$1,633,745		\$1,662,829
* Note: 2018 structure demolition costs reflect reduced quantity of structures required to be evacuated			

Recreation Plan Updates

The recreation plan has not changed from the 2010 study. The same quantities and elements that are in the 2010 MCACES have been carried over for these updates. The recreation costs have been escalated based on the factors in Table 2. A summary of the escalation components is presented in Table 5.

Table 5 – Recreation Plan Escalation Summary

Recreation Area	Quantity	UOM	Contract Cost
2010 Costs			
Sub Area 1	1	LS	\$437,925
Sub Area 2	1	LS	\$1,366,259
Sub Area 3	1	LS	\$2,255,082
Sub Area 4	1	LS	\$1,840,827
Hwy 359	1	LS	\$217,872
Mercer Street	1	LS	\$568,683
Totals			\$6,686,648
2018 Costs (Escalated)			
Sub Area 1	1	LS	\$496,169
Sub Area 2	1	LS	\$1,547,971
Sub Area 3	1	LS	\$2,555,008
Sub Area 4	1	LS	\$2,085,657
Hwy 359	1	LS	\$246,849
Mercer Street	1	LS	\$644,318
Totals:			\$7,575,972

NER Plan Costs

The results of the current CE/ICA analysis resulted in the same recommended NER plan that was selected in 2010. Therefore, the quantities in the 2010 MCACES estimate are still applicable since the plan has stayed the same in terms of areas to be restored. Consequently, the only changes to the NER costs is to escalate based on the escalation factors in Table 2. A summary of the 2010 NER plan costs, and the escalated 2018 costs are provided in Table 6.

Table 6 – NER Plan Elements Escalation Summary

Ecosystem Restoration Items	Quantity	UOM	Unit Price	Contract Cost
2010 Costs				
Selective Clearing – Salt Cedar Trees	16,000	EA	\$22.77	\$364,394
Re-Forestation	151	ACR	\$58,176.09	\$8,784,589
Weirs and Riffle Structures	1	LS	\$334,839.00	\$334,839
Monitoring	1	LS	\$214,000.00	\$214,000
Adaptive Management	1	LS	\$642,000.00	\$642,000
			Totals:	\$10,339,822
2018 Costs (Escalated)				
Selective Clearing – Salt Cedar Trees	16,000	EA	\$26.85	\$429,621
Re-Forestation	151	ACR	\$68,589.61	\$10,357,030
Weirs and Riffle Structures	1	LS	\$394,775.18	\$394,775
Monitoring	1	LS	\$252,306.00	\$252,306
Adaptive Management	1	LS	\$756,918.00	\$756,918
			Totals:	\$12,190,650

CONTINGENCIES

The 2010 MCACES construction cost estimate contained various contingencies for different aspects of the project. Even within the NER plan, contingencies vary between different activities. Also, in reviewing all documents that had been developed for the 2010 estimate, a Cost and Schedule Risk Analysis (CSRA) had been completed (Attachment B). The analysis completed in the CSRA report developed a contingency of 26.92% for the entire project.

At this stage of the project, a constant contingency of 26.92%, which is calculated with a risk-based assessment, appears reasonable to use for the overall project contingency for all construction activities within the 2018 price level estimate. Therefore, in development of the total project cost for the 2018 price level estimate, a contingency of 26.92% has been used for all feature accounts, excluding the non-construction lands and damages costs.

TOTAL PROJECT COST

A Total Project Cost Summary (TPCS) spreadsheet has been developed for the full recommend plan that includes the costs for both the NED and NER plans (Attachment C). The TPCS uses the escalated contract costs, referenced in the tables above, along with the 26.92% contingency for construction activities, and real estate costs with contingency from the real estate appendix. The TPCS is split into three pages. The first page is the overall summary that reflects the total costs for implementing the NED and NER plans. The second page only reflects the NED plan costs, which include real estate costs, structure demolition (now in 02 Account), recreation components, and resulting PED and CM costs. The third page of the TPCS reflects the total costs for the NER plan. Therefore, this page includes the real estate costs associated with the NER plan, the construction elements for the ecosystem restoration, and the resulting PED and CM.

30 and 31 Feature Accounts

The 2010 estimate contained Planning, Engineering and Design (PED) and Construction Management (CM) costs that approximately equaled 9% of construction costs. Therefore, for the 2018 price level updates, 9% has been used within the TPCS to calculate the PED and CM costs for both the NED and NER costs to be consistent with the previous study.

Escalation and Schedule

The TPCS has built in escalation rates that are based on input dates that allow for the escalation from 2018 costs to the fully funded project cost. There are two stages in the TPCS escalation process. The first escalation is done to escalate costs to the program year, and the resulting values are considered the project “first costs”. These first costs are used in the economic analysis of the NER and NED plan, and the values are in fiscal year 2019 dollars.

The next step of escalation is to the midpoint of construction. To develop new dates for escalation, the 2010 study had input fiscal years for each feature account in the MCACES estimate. These years have been pulled out and the following table illustrates which feature accounts were anticipated to be completed in which year according to the 2010 estimate. The bottom row of Table 7 provides the updated years for use in the current escalation calculations.

Table 7 – Simplified Construction Schedule for Escalation Calculations

WBS	Feature Account (Item)	FY11	FY12	FY13	FY14	FY15	FY16	FY17	FY18
30	Planning Engineering & Design								
01	Lands and Damages (Non-Construction)								
01	Lands and Damages (Structure Demo)								
14	Recreation								
06	Ecosystem Restoration (Salt Cedar Removal)								
06	Ecosystem Restoration (Re-Forestation)								
06	Ecosystem Restoration (Weirs and Riffles)								
31	Construction Management								
06	Adaptive Management								
06	Monitoring								
Updated Fiscal Years		FY19	FY20	FY21	FY22	FY23	FY24	FY25	FY26

ATTACHMENT A

2010 MCACES Summary Report

ATTACHMENT B

2010 Cost and Schedule Risk Analysis Report

ATTACHMENT C

2018 Total Project Cost Summary