

**UPPER GUADALUPE RIVER
FLOOD RISK MANAGEMENT PROJECT**

San José, California

Cost Engineering

Appendix F

**DRAFT INTEGRATED
GENERAL REEVALUATION REPORT
& SUPPLEMENTAL ENVIRONMENTAL ASSESSMENT**

November 2022



**US Army Corps
of Engineers®**
San Francisco District





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Appendix F

Cost Engineering

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October 2022

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1 INTRODUCTION

The purpose of this appendix is to summarize the assumptions and basis of the cost estimate for the different proposed plans and features of the project. This includes the costs of the construction as well as the risk-based contingency.

2 ALTERNATIVES

2.1 Alternatives

Four major Alternatives were considered for this study.

2.1.1 *Alternative 1: No-Action*

The No-Action Alternative is synonymous with no Federal action. This alternative is analyzed as the Future Without Project (FWOP) condition for comparison with the action alternatives.

2.1.2 *Alternative 2: Valley View Plan*

This is the previous NED plan and uses channel widening and bypasses, culvert, and bridge replacements, as well as floodwalls on the tributaries to increase channel capacity and reduce flood damages.

2.1.3 *Alternative 3: Bypass Plan*

This is the previously authorized locally preferred plan. This is the largest structural alternative analyzed and uses channel widening on the eastern bank of the Guadalupe River, with even more bypass features that include alcoves to provide connectivity to the main channel. This plan would include gravel augmentation (rip rap) and fishponds, as well as culvert/bridge replacements throughout the system.

2.1.4 *Alternative 7: Low Scope Plan*

The Low Scope alternative is focused on seeing if there is a lower cost plan that may be justified. It has less bridge and culvert replacements and focuses work in the reaches with breakouts, or at the most constricting pinch points.

2.1.5 *Alternative 8: Combination Plan*

This plan combines engineering with nature features, such as floodplain reconnection/restoration in the constricted portions of the mainstem of the Guadalupe River, with traditional flood risk management features, such as floodwalls on the tributaries where homes abut the creek. The Combination Plan also includes gravel augmentation and alcoves, as well as bridge/culvert replacement at the most restricting pinch points in the system.

3 COST SUMMARY

The following table includes cost summary of the alternatives.

Account	Measure	QTY	UOM	Total Direct Cost	Contingency	Total Project Cost
	Valley View Plan			\$ 242,371,543	\$ 82,892,332	\$ 325,263,875
01	Lands and Damages (Real Estate)	1	LS	\$ 103,000,000	\$ 25,750,000	\$ 128,750,000
02	Relocations	1	LS	\$ 1,000,000	\$ 410,000	\$ 1,410,000
06	Environmental Mitigation	1	LS	\$ 8,265,574	\$ 3,388,885	\$ 11,654,459
18	Cultural Mitigation	1	LS	\$ 475,000	\$ 194,750	\$ 669,750
	Construction				\$ -	\$ -
11	Levees and Floodwalls			\$ 21,515,108	\$ 8,821,194	\$ 30,336,302
15	Roads, Railroads, and Bridges			\$ 74,526,179	\$ 30,555,733	\$ 105,081,912
16	Construction Subtotal			\$ 96,041,286	\$ 39,376,927	\$ 135,418,214
30	Engineering and Design	20.5	PCT	\$ 22,212,532	\$ 9,107,138	\$ 31,319,670
31	Supervision and Admin	10.5	PCT	\$ 11,377,150	\$ 4,664,632	\$ 16,041,782
	Bypass Plan			\$ 380,408,625	\$ 130,413,450	\$ 510,822,076
01	Lands and Damages (Real Estate)	1	LS	\$ 145,000,000	\$ 36,250,000	\$ 181,250,000
02	Relocations	1	LS	\$ 1,000,000	\$ 400,000	\$ 1,400,000
06	Environmental Mitigation	1	LS	\$ 11,177,922	\$ 4,471,169	\$ 15,649,091
18	Cultural Mitigation	1	LS	\$ 525,000	\$ 210,000	\$ 735,000
	Construction				\$ -	\$ -
11	Levees and Floodwalls			\$ 28,332,415	\$ 11,332,966	\$ 39,665,380
8	Roads, Railroads, and Bridges			\$ 140,381,479	\$ 56,152,592	\$ 196,534,071
16	Construction Subtotal			\$ 168,713,894	\$ 67,485,558	\$ 236,199,452
30	Engineering and Design	20.5	PCT	\$ 35,704,261	\$ 14,281,704	\$ 49,985,966
31	Supervision and Admin	10.5	PCT	\$ 18,287,548	\$ 7,315,019	\$ 25,602,568
	Lower Scope Plan			\$ 101,077,960	\$ 30,231,184	\$ 131,309,143
01	Lands and Damages (Real Estate)	1	LS	\$ 68,000,000	\$ 17,000,000	\$ 85,000,000
02	Relocations	1	LS	\$ 1,000,000	\$ 400,000	\$ 1,400,000
06	Environmental Mitigation	1	LS	\$ 1,616,150	\$ 646,460	\$ 2,262,610
18	Cultural Mitigation	1	LS	\$ 330,000	\$ 132,000	\$ 462,000
	Construction				\$ -	\$ -
11	Levees and Floodwalls			\$ 22,641,714	\$ 9,056,685	\$ 31,698,399
8	Roads, Railroads, and Bridges				\$ -	\$ -
16	Construction Subtotal			\$ 22,641,714	\$ 9,056,685	\$ 31,698,399
30	Engineering and Design	20.5	PCT	\$ 4,953,128	\$ 1,981,251	\$ 6,934,379
31	Supervision and Admin	10.5	PCT	\$ 2,536,968	\$ 1,014,787	\$ 3,551,755
	Combo Plan			\$ 116,104,552	\$ 36,722,866	\$ 152,827,418
01	Lands and Damages (Real Estate)	1	LS	\$ 68,000,000	\$ 17,000,000	\$ 85,000,000
02	Relocations	1	LS	\$ 1,000,000	\$ 410,000	\$ 1,410,000
06	Environmental Mitigation	1	LS	\$ 1,616,150	\$ 662,621	\$ 2,278,771
18	Cultural Mitigation	1	LS	\$ 330,000	\$ 135,300	\$ 465,300
	Construction				\$ -	\$ -
11	Levees and Floodwalls			\$ 23,109,058	\$ 9,474,714	\$ 32,583,772
8	Roads, Railroads, and Bridges			\$ 11,093,014	\$ 4,548,136	\$ 15,641,150
16	Construction Subtotal			\$ 34,202,072	\$ 14,022,850	\$ 48,224,922
30	Engineering and Design	20.5	PCT	\$ 7,245,315	\$ 2,970,579	\$ 10,215,894
31	Supervision and Admin	10.5	PCT	\$ 3,711,015	\$ 1,521,516	\$ 5,232,531

4 BASIS OF ESTIMATE

4.1 Basis of Design

Due to the level of design for this design (approximately 5-10% level) the estimate falls into a Class 4 category, based on ER 1110-2-1302. There is still substantial lack of technical information and scope clarity resulting in major estimate assumptions in technical information and quantities, heavy reliance on cost engineering judgment, cost book, parametric, historical, and little specific crew-based costs. While certain construction elements can be estimated in detail, there is still a great deal of uncertainty relative to major construction components. The construction cost estimate from the original study was used as a basis for estimating the reformulated alternatives. Typical Contingency Range for this class of estimate could be 30% to 100%.

Costs in this Appendix cover construction of project items with a markup to cover Planning, Engineering, and Design (PED) as well as Construction Management (CM). These items are covered by percentages uniformly applied to the construction costs. Based on historical averages on large multi-year civil works projects, assume 20.5% to cover 6 years of PED + 1 year of EDC as well as reviews (QC, ATR, SAR, etc.) and 10.5% for CM was used based on 1 year of S&A and approximately 6 FTEs to support. These costs are conservative estimates, and a detailed breakdown of the costs for these items will need to be more fully developed during the next phase of design.

Costs for the Real Estate are covered in the Real Estate Appendix.

All items in this cost estimate are presented in 2023 dollars.

Alternative 8: Combination Plan

This alternative includes the combination of floodplain restoration in the constricted portions of the mainstem of the Guadalupe River and floodwalls in Ross Creek and Canoas Creek. The Combination Plan also includes gravel augmentation and alcoves, as well as bridge/culvert replacement at Willow Bridge, Alma Bridge, Reinforced Concrete Boxes in multiple locations of Ross Creek and Canoas Creek.

4.2 Basis of Quantities

Quantities were provided by the technical team.

4.3 Construction Estimate

Work was predominantly estimated utilizing MII Estimating Software with specified input factors. The alternative analysis included unit costs of all project features and contrasted the options in order to scale relative differences. The next phase is having further design definition that is used to refine the project features.

Major Construction Features for the alternatives were estimated as follows.

4.3.1 Mobilization & Demobilization

Mobilization and Demobilization is assumed to be 10% of the direct costs. Labor and equipment is assumed to be available within a 50 mile radius within the construction boundary.

4.3.2 Floodwall

Floodwalls are proposed along both creek banks on Canoas Creek between Almaden Expressway and Nightingale Drive (each floodwall approximately 2800-ft in length), and floodwall is proposed along the left bank for 750 ft upstream of Nightingale, to increase the channel height. The floodwalls heights will vary between 4-ft to 6-ft from existing grade. At Jarvis Avenue Crossing on Ross Creek, the northern floodwalls are 516-ft (upstream) and 334-ft (downstream) and the southern floodwall is approximately 530-ft upstream from Jarvis Avenue. The floodwall heights will be approximately 4-ft from existing grade.

4.3.3 *Channel Improvements, Conveyance*

- Clearing and Grubbing – Dense brush and trees are assumed to be cleared, chipped, and hauled to a disposal site.
- Excavation – All work is assumed to use a medium size hydraulic excavator, material will be hauled using 8 CY trucks to multiple disposal areas on site and spread using a large dozer. Based on the disposal area size, the depth of the placed material will vary but will be approximately 4 feet.
- Rip Rap Channel – 2’ of Limestone RipRap was assumed to be placed on 6” of bedding and geotextile fabric after the excavation.
- Plantings - A 50 to 100-ft wide floodplain bench will include riparian vegetation along the low-flow channel.

4.3.4 *General Conditions, Overhead, and Profit*

- MII 2022 English Cost Book was used for general cost data.
- Equipment rates are based on the Department of the Army EP 1110-1-8 “Construction Equipment Ownership and Expense Schedule”, 2020 Region 7.
- Fuel costs were taken from online sources dated 2022.
- Prime contractor markups include 12% Job Office Overhead, 8% Home Office Overhead, 9.5% profit, and 1% bond.
- Subcontractor markups include 14% Home Office and 12% profit.
- Sales tax of 9.35% is included.
- Planning, Engineering and Design (20.5%) and Construction Management (10.5%) are added in the estimate summary.
- Labor rates were based on the 2022 Davis Bacon Wage Rates for Santa Clara County and include \$15.00/hr for per diem.

4.3.5 *Miscellaneous Markups, Assumptions, & General Notes*

- No escalation has been applied.
- Costs for the 30 & 31 accounts (PED and CM respectively are assumed at 20.5% and 10.5% respectively of the contract total.
- A 10% Overtime rate was applied in MII and assumes 1 shift, 10 HR work days 5 days per week with 1.5 pay for Saturdays and anytime over a typical 40 hour work on certain activities.
- Real Estate, cultural resources and mitigation costs included.

4.3.6 *Construction Schedule*

The construction schedule for this project is based on actual construction beginning FY25 and durations estimated based on the project features contained in the MII estimate.

5 ACQUISITION PLAN

The current acquisition strategy is assumed fully open and competitive though an actual contracting plan has yet to be established.

6 RISK ASSESSMENT

A cost and schedule risk analysis (CSRA) was performed to develop a weighted contingency for the construction cost estimate. The overall Project weighted contingency ranged from 40% to 68% (Excluding Real Estate). The contingency accounts for contractor competition and availability cost uncertainties. The concerns outlined in the CSRA could have an overall impact on the project. Project costs have the potential to increase due to economic conditions and the level of apparent competition during the solicitation process. Due to the level of technical information available, current plan set provided by the PDT, and Moderate Risk level overall the estimate is considered Class 4 (per ER 1110-2-1302).

7 REFERENCES

U.S. Army Corps of Engineers, 1993, *Engineering and Design Cost Engineering Policy and General Requirements, Engineering Regulation 1110-1-1300*, Department of the Army, Washington D.C., 26 March 1993.

U.S. Army Corps of Engineers, 1999, *Engineering and Design for Civil Works Projects, Engineering Regulation 1110-2-1150*, Department of the Army, Washington D.C., 31 August 1999.

U.S. Army Corps of Engineers, 2016, *Civil Works Cost Engineering, Engineering Regulation 1110-2-1302*, Department of the Army, Washington D.C., 30 June 2016.

U.S. Army Corps of Engineers, 2019, *Civil Works Construction Cost Index System (CWCCIS), Engineering Manual 1110-2-1304*, Department of the Army, Washington D.C., 31 March 2020.

Unified Facilities Criteria, 2011, *Handbook: Construction Cost Estimating*, Unified Facilities Criteria (UFC) 3-740-05, Department of Defense, 1 June 2011.

8 ATTACHMENTS

- a. MCACES Estimates
- b. Cost Schedule Risk Analysis