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Appendix F – Cost Summary

Refined Costs

One of the key objectives for updating the evaluations of the Best Alternative Plans was to better define the likely implementation costs for the various alternatives. In addition to the higher resolution of the various plan elements, other items impacting cost such as utility relocations, easement and right-of-way acquisition, and environmental mitigation were identified and incorporated. Unit costs for the various work elements and estimating contingencies were also reviewed and updated as required.

Unit Cost Values

The unit costs used in the development of the cost estimates were generally based on the default values found in the Urban Drainage and Flood Control District’s (District) program, *UD-MP COST Version 1.1*. While this proved to be a useful starting point, the nature of some of the improvements proposed along South Boulder Creek necessitated the modification of some of these values. For example, the cost of property acquisition for various land use types is well defined in Boulder, and the values typically differ from those found in other parts of the District. These values were adjusted based on information provided by the City. Table F-1, Updated Unit Cost Values, presents the values used to estimate overall plan costs in the refined analysis.

Detention Pond Costs

The refined analysis provided a much better understanding of the elements of each of the detention ponds proposed as part of the alternatives. The most significant refinement of the ponds was the development of a more detailed grading plan for each of the ponds proposed in the various alternatives. This improvement provided a much better understanding of the actual amount of material that would be necessary for construction of the ponds. In addition to the overall quantity of material necessary for the pond construction, each of the ponds is assumed to have an impervious core and an impervious key. These were incorporated into the original estimate, but the volumes changed considerably as the actual geometry of the pond embankment became better defined.

Emergency spillways are an important part of the pond design. The earlier layout assumed a fairly consistent geometry for the spillway and that all spillways could be lined with Type VH riprap. However, upon further consideration, it was determined that those embankments that crossed the mainstem of South Boulder Creek would need to have a more substantial spillway due to the site topographic constraints that precluded a side channel spillway cut through native ground. A concrete spillway would probably be required by the State Dam Safety staff in order to assure the stability of the embankment during the spillway design flood.

Other elements necessary to implement the storage options were unchanged from the earlier analysis. Table F-2, Detention Pond Cost Elements, summarizes the various elements that were included in the estimation of the detention pond costs.

TABLE F-1
Updated Unit Cost Values

| Item | Unit Cost | Unit of Measurement |
|--|-----------------------|---------------------|
| Construction Cost | | |
| Earthwork | \$5.00 | CY |
| Imported Impervious Core | \$25.75 | CY |
| Concrete, Cast-in-Place | \$400.00 | CY |
| Type M Riprap | \$56.65 | CY |
| Type VH Riprap | \$82.40 | CY |
| Revegetation | \$1,030.00 | Acre |
| Detention, Complete-in-Place | \$46,968.00 | AF |
| Lateral Pipe (36 to 60-inch RCP) | \$126.81 - \$211.36 | LF |
| Main Pipe (72 to 114-inch RCP) | \$367.83 - \$865.20 | LF |
| Type B Manhole | \$10,300.00 | Each |
| Storm Inlet, Type 13, 3-foot | \$3,000.00 | Each |
| Storm Inlet, Type R/Type 14, 4-foot | \$3,605.00 | Each |
| Concrete Box Culverts | \$473.58 - \$5,276.45 | LF |
| Sloping Drop Structure | \$142,790.74 | Each |
| Wetland Mitigation | \$100,000.00 | Acre |
| Roadway Reconstruction | \$50.00 | SY |
| Open Channel Improvements | \$0.20 | LF/Q |
| Relocation of Trailhead | \$500,000.00 | LS |
| Property Acquisition Cost | | |
| Agricultural | \$0.80 | SF |
| Public | \$19.00 | SF |
| Regional Business | \$180.00 | SF |
| Community Business | \$39.00 | SF |
| High Density Residential and Mobile Home | \$50.00 | SF |
| Medium and Mixed Density Residential | \$36.00 | SF |
| Low Density and Rural Residential | \$22.00 | SF |
| Industrial | \$15.00 | SF |
| Operation and Maintenance (O&M) | | |
| Channel O&M | \$27.60 | LF |
| Detention Pond O&M | \$1,380.00 | AF |

Note: CY = cubic yard, AF = acre-foot, LF = linear foot, SY = square yard, LF/Q = ?, LS = lump sum, SF = square foot

TABLE F-2
Detention Pond Cost Elements

| Item | Unit Cost | Unit of Measurement |
|---|----------------------|---------------------|
| Construction Cost | | |
| Earthwork | \$5.00 | CY |
| Imported Impervious Core | \$25.75 | CY |
| Concrete, Cast-in-Place | \$400.00 | CY |
| Type M Riprap | \$56.65 | CY |
| Type VH Riprap | \$82.40 | CY |
| Revegetation | \$1,030.00 | Acre |
| Outlet Structure | \$169.08 - \$5276.45 | LF |
| Property Acquisition Cost | | |
| Acquisition of Open Space Property | \$0.83 | SF |
| Acquisition of CU Property designated for flood control | \$0.83 | SF |

Note: CY = cubic yard, LF = linear foot, SF = square foot

Utility Relocation Costs

The utility relocation costs were handled using a factor applied to the capital cost of all infrastructure. This value was updated slightly as a result of the plan refinements. Locations of City-owned utility infrastructure (e.g., water, sanitary sewer, storm sewer), as well as local phone, cable television, and gas services were obtained or inferred from general development patterns. Unfortunately, the alignment and extent of large natural gas transmission lines and fiber optic cable locations were not provided by the utility owners. However, no major lines denoted by utility delineators were noted during field visits to proposed flood control facility sites for review of possible improvement corridors.

During the refinement process, the alignments of the existing underground utilities were compared to the proposed improvements. It was concluded that the proposed ponds would have very little impact on existing utilities. As such, the utility relocation cost factor applied to these costs was removed. Other major underground infrastructure such as box culverts and outlet pipes associated with the detention ponds continued to have the utility relocation factor applied.

The pipeline improvements impacting City-owned lines were adjusted to minimize potential conflicts. Whenever possible, alignments were moved within the street corridor to avoid large conduits. However, the factor continued to be applied to the proposed improvement costs to reflect the need to deal with utility service lines and small lateral lines along many of the corridors.

Easement Acquisition Costs

As noted earlier, the unit cost of the various easements necessary for the implementation of the refined alternative plans remained unchanged. The extent of the necessary easement and right-of-way acquisition did change as a result of the refinement. In particular, the refined grading of the detention ponds better defined the footprint and therefore the necessary property acquisition. These values have been incorporated into the plan costs.

The alignments of the pipeline elements within the various alternatives were adjusted to try to minimize the impact on properties. In some cases, it was possible to slightly shift the pipeline alignments to better coincide with existing public easements and significantly reduce the property acquisition costs. More commonly, realignment of pipeline corridors was done to avoid impacts to individual single family residential properties. Based on feedback received during the public involvement process, it was determined that the public would prefer to minimize these impacts to individual property owners in favor of the purchase of larger easements from undeveloped or commercial and industrial properties. Pipeline alignments were shifted as necessary and as possible to achieve these objectives.

Environmental Mitigation Costs

The earlier alternatives recognized that there would be impacts to environmentally sensitive areas and anticipated that the cost of this mitigation could reasonably be included in the project contingency. The information provided by OSMP staff gave a far more refined picture of the environmental impacts. After review of this information and discussions with OSMP staff, it was concluded that environmental mitigation should be estimated separately.

The majority of the impacts to environmentally sensitive lands such as City-designated wetlands and habitat areas for endangered species and other species of interest are associated with the detention ponds. These impacts are much better understood, and estimates of the necessary mitigation cost can be better developed. The approach to mitigation is assumed to be compensatory mitigation at a ratio of two to one. That is, for every acre impacted, it is assumed that two acres of comparable area will need to be acquired and established with wetland habitat.

Two costing approaches were investigated: (1) looking at existing banks for similar wetland or habitat areas, and (2) purchasing and recreating a similar type of habitat. Because the cost of acquisition of property and reestablishment of habitat type is generally nested into the cost of credits from a bank, it was concluded that either approach would result in generally the same cost. The team chose to use a per-acre cost based on the purchase of credits from a wetland bank as the basis of environmental mitigation costs.

Administrative and Contingency Cost Estimates

The costs of various project elements common to all projects are embedded into the District's cost-estimating spreadsheet as factors. These are generally used without modification in this study. However, the overall project contingency applied to all Capital Costs and Property Acquisition Costs has been adjusted. The District's program uses a contingency factor of 25 percent based on a preliminary design level of detail generally found in their Planning Study Phase "B" reports. The early estimates of Best Alternative Plan cost used a 50 percent contingency instead of the District's default value of 25 percent. The higher factor was deemed appropriate because these plans were developed at a level of resolution generally consistent with District Planning Study Phase "A" reports. The refined plans looked at various elements in greater detail, but still lack the resolution of most District Planning Study Phase "B" reports. As such, the project team concluded a value of 35 percent was most appropriate for this study.

This 35 percent contingency has been included as a provision for unforeseeable, additional costs within the general bounds of the project scope, particularly where previous experience has shown that unforeseeable events that will increase costs are likely to occur. The contingency is used as a means to reduce the risk of possible cost overruns. The contingency in these estimates consists of two components: Bid Contingency and Scope Contingency. Bid Contingency covers the unknown costs associated with constructing a given project scope, such as adverse weather conditions, strikes by material suppliers, geotechnical unknowns,

and unfavorable market conditions for a particular project scope. Scope Contingency covers scope changes that invariably occur during final design and implementation.

The cost estimates presented in this study are “order-of-magnitude” (Level 4) estimates, as defined by the American National Standards Institute (ANSI) and the Association for the Advancement of Cost Engineering (AACE) International as “approximate estimates made without detailed engineering data. It is normally expected that estimates of this type will be accurate within plus 50 percent or minus 30 percent.” This range implies that there is a high probability that the final project cost will fall within the range.

Table F-3, Administrative and Contingency Factors, presents the various factors that were applied in the development of the cost estimates.

TABLE F-3
Administrative and Contingency Factors

| Item | Cost |
|--|--|
| Mobilization | 5 percent of Subtotal Capital Improvement Costs |
| Stormwater Management/Erosion Control | 5 percent of Subtotal Capital Improvement Costs |
| Utility Coordination/Relocation | 32 percent of Pipe and Culvert Costs |
| Engineering | 15 percent of Capital Improvement Costs |
| Legal/Administrative | 5 percent of Capital Improvement Costs |
| Contract Admin/Construction Management | 10 percent of Capital Improvement Costs |
| Contingency | 35 percent of Capital Improvement Costs + Land Acquisition Costs |

TABLE F-4
High Hazard Mitigation Plan Cost Summary (\$ million)

| Element | Construction Cost | Mobilization | Stormwater Management/Erosion Control | Utility Relocation | Subtotal | Easement/Right-of-Way | Engineering | Legal/Admin | Contract Admin/Construction Management | Contingency | Total Capital Cost | O&M Cost | Total Implementation Cost |
|----------|-------------------|--------------|---------------------------------------|--------------------|----------|-----------------------|-------------|-------------|--|-------------|--------------------|----------|---------------------------|
| Grading | \$0.02 | \$0.001 | \$0.001 | \$0.00 | \$0.02 | \$0.00 | \$0.003 | \$0.001 | \$0.002 | \$0.01 | \$0.04 | \$0.000 | \$0.04 |
| Concrete | \$0.06 | \$0.003 | \$0.003 | \$0.00 | \$0.06 | \$0.00 | \$0.009 | \$0.003 | \$0.006 | \$0.02 | \$0.10 | \$0.000 | \$0.10 |
| TOTAL | \$0.08 | \$0.004 | \$0.004 | \$0.00 | \$0.08 | \$0.00 | \$0.013 | \$0.004 | \$0.008 | \$0.03 | \$0.14 | \$0.000 | \$0.14 |

Refined Cost Summary by Plan

Each of the alternative cost estimates are summarized to include not only the overall cost of the implementation but also some of the major components of the alternative. These are summarized and presented in Table F-4, High Hazard Mitigation Plan Cost Summary; Table F-5, Regional Detention at US-36 Cost Summary; Table F-6 Distributed Regional Detention Cost Summary; and Table F-7, Bear Canyon Creek Pipeline Cost Summary.

Refined Cost Summary

The cost estimates have been prepared for guidance in project evaluation and implementation from the information available at the time of the estimates and are summarized in Table F-8, Refined Alternative Plans Cost Estimate Summary. The final cost for the project will depend on such criteria as actual labor and material costs, competitive market conditions, actual site conditions, final project scope, and other variables. As a result, the final project cost will vary from this estimate. The proximity to actual costs will depend on how closely the assumptions of this estimate match final project conditions. Because of this, project feasibility and funding needs must be carefully reviewed prior to making specific financial decisions to help assure proper project evaluation and adequate funding.

TABLE F-5
Regional Detention at US-36 Cost Summary (\$ million)

| Element | Construction Cost | Mobilization | Stormwater Management/ Erosion Control | Utility Relocation | Subtotal | Easement/ Right-of-Way | Engineering | Legal/Admin | Contract Admin/ Construction Management | Contingency | Total Capital Cost | O&M Cost | Total Implementation Cost |
|--|-------------------|---------------|---|--------------------|----------------|---------------------------|---------------|---------------|--|---------------|--------------------|---------------|---------------------------|
| US-36 Detention Pond | \$5.55 | \$0.28 | \$0.28 | \$0.03 | \$6.14 | \$1.80 | \$0.92 | \$0.31 | \$0.61 | \$2.78 | \$12.56 | \$0.77 | \$13.34 |
| Improvements to the New Anderson Ditch | \$0.66 | \$0.03 | \$0.03 | \$0.12 | \$0.85 | \$0.00 | \$0.13 | \$0.04 | \$0.09 | \$0.30 | \$1.40 | \$0.01 | \$1.41 |
| Dry Creek Ditch No. 2 Pipeline Improvements | \$1.25 | \$0.06 | \$0.06 | \$0.37 | \$1.75 | \$1.06 | \$0.26 | \$0.09 | \$0.18 | \$0.98 | \$4.32 | \$0.00 | \$4.32 |
| Local Detention at Manhattan Middle School | \$1.21 | \$0.06 | \$0.06 | \$0.01 | \$1.34 | \$0.31 | \$0.20 | \$0.07 | \$0.13 | \$0.58 | \$2.63 | \$0.03 | \$2.67 |
| Local Detention at Baseline Road/Foothills Parkway | \$1.10 | \$0.06 | \$0.06 | \$0.02 | \$1.23 | \$0.00 | \$0.19 | \$0.06 | \$0.12 | \$0.43 | \$2.04 | \$0.01 | \$2.05 |
| Wall Enhancements at Baseline Road | \$0.04 | \$0.002 | \$0.002 | \$0.00 | \$0.04 | \$0.22 | \$0.01 | \$0.002 | \$0.004 | \$0.09 | \$0.37 | \$0.00 | \$0.37 |
| Improvements to Wellman Canal | \$0.04 | \$0.002 | \$0.002 | \$0.00 | \$0.05 | \$0.00 | \$0.01 | \$0.002 | \$0.005 | \$0.02 | \$0.08 | \$0.08 | \$0.16 |
| Arapahoe Avenue Detention Pond | \$3.87 | \$0.19 | \$0.19 | \$0.14 | \$4.39 | \$3.37 | \$0.66 | \$0.22 | \$0.44 | \$2.72 | \$11.80 | \$0.10 | \$11.90 |
| TOTAL | \$13.29 | \$0.66 | \$0.66 | \$0.70 | \$15.32 | \$6.76 | \$2.30 | \$0.77 | \$1.53 | \$7.73 | \$34.40 | \$1.00 | \$36.21 |

TABLE F-6
Distributed Regional Detention Cost Summary (\$ million)

| Element | Construction Cost | Mobilization | Stormwater Management/ Erosion Control | Utility Relocation | Subtotal | Easement/ Right-of-Way | Engineering | Legal/Admin | Contract Admin/ Construction Management | Contingency | Total Capital Cost | O&M Cost | Total Implementation Cost |
|---|-------------------|--------------|---|--------------------|----------|---------------------------|-------------|-------------|--|-------------|--------------------|----------|---------------------------|
| US-36 Detention Pond | \$3.21 | \$0.16 | \$0.16 | \$0.00 | \$3.54 | \$0.61 | \$0.53 | \$0.18 | \$0.35 | \$1.45 | \$6.66 | \$0.18 | \$6.84 |
| South Boulder Road Detention Pond | \$4.84 | \$0.24 | \$0.24 | \$0.05 | \$5.38 | \$0.41 | \$0.81 | \$0.27 | \$0.54 | \$2.02 | \$9.42 | \$0.18 | \$9.60 |
| Baseline Road Detention Pond | \$4.83 | \$0.24 | \$0.24 | \$0.10 | \$5.42 | \$0.56 | \$0.81 | \$0.27 | \$0.54 | \$2.09 | \$9.69 | \$0.52 | \$10.20 |
| Dry Creek Ditch No. 2 Pipeline Improvements | \$1.25 | \$0.06 | \$0.06 | \$0.37 | \$1.75 | \$1.06 | \$0.26 | \$0.09 | \$0.18 | \$0.98 | \$4.32 | \$0.00 | \$4.32 |
| Local Detention at Manhattan Middle School | \$1.21 | \$0.06 | \$0.06 | \$0.01 | \$1.34 | \$0.31 | \$0.20 | \$0.07 | \$0.13 | \$0.58 | \$2.63 | \$0.03 | \$2.67 |
| Local Detention at | \$1.10 | \$0.06 | \$0.06 | \$0.02 | \$1.23 | \$0.00 | \$0.19 | \$0.06 | \$0.12 | \$0.43 | \$2.04 | \$0.01 | \$2.05 |

TABLE F-6
Distributed Regional Detention Cost Summary (\$ million)

| Element | Construction Cost | Mobilization | Stormwater Management/ Erosion Control | Utility Relocation | Subtotal | Easement/ Right-of-Way | Engineering | Legal/Admin | Contract Admin/ Construction Management | Contingency | Total Capital Cost | O&M Cost | Total Implementation Cost |
|------------------------------------|-------------------|---------------|---|--------------------|----------------|---------------------------|---------------|---------------|--|----------------|--------------------|---------------|---------------------------|
| Baseline Road/Foothills Parkway | | | | | | | | | | | | | |
| Wall Enhancements at Baseline Road | \$0.04 | \$0.002 | \$0.002 | \$0.00 | \$0.04 | \$0.22 | \$0.01 | \$0.002 | \$0.00 | \$0.09 | \$0.37 | \$0.00 | \$0.37 |
| Improvements to Wellman Canal | \$0.04 | \$0.002 | \$0.002 | \$0.00 | \$0.05 | \$0.00 | \$0.01 | \$0.002 | \$0.00 | \$0.02 | \$0.08 | \$0.08 | \$0.16 |
| Arapahoe Avenue Detention Pond | \$3.87 | \$0.19 | \$0.19 | \$0.14 | \$4.39 | \$3.37 | \$0.66 | \$0.22 | \$0.44 | \$2.72 | \$11.80 | \$0.10 | \$11.90 |
| TOTAL | \$20.42 | \$1.02 | \$1.02 | \$0.69 | \$23.14 | \$6.54 | \$3.47 | \$1.16 | \$2.31 | \$10.39 | \$47.01 | \$1.10 | \$48.11 |

TABLE F-7
Bear Canyon Creek Pipeline Cost Summary (\$ million)

| Element | Construction Cost | Mobilization | Stormwater Management/ Erosion Control | Utility Relocation | Subtotal | Easement/ Right-of-Way | Engineering | Legal/Admin | Contract Admin/ Construction Management | Contingency | Total Capital Cost | O&M Cost | Total Implementation Cost |
|---|-------------------|---------------|---|--------------------|----------------|---------------------------|---------------|---------------|--|----------------|--------------------|---------------|---------------------------|
| Bear Canyon Creek Pipeline and Inlets | \$9.79 | \$0.49 | \$0.49 | \$2.68 | \$13.45 | \$0.00 | \$2.02 | \$0.67 | \$1.34 | \$4.71 | \$22.19 | \$0.00 | \$22.19 |
| Dry Creek Ditch No. 2 Pipeline Improvements | \$4.17 | \$0.21 | \$0.21 | \$1.25 | \$5.84 | \$1.16 | \$0.88 | \$0.29 | \$0.58 | \$2.45 | \$11.19 | \$0.00 | \$11.19 |
| Improvements to New Anderson Ditch | \$0.66 | \$0.03 | \$0.03 | \$0.12 | \$0.85 | \$0.00 | \$0.13 | \$0.04 | \$0.09 | \$0.30 | \$1.40 | \$0.01 | \$1.41 |
| Improvements to Wellman Canal | \$0.04 | \$0.002 | \$0.002 | \$0.00 | \$0.05 | \$0.00 | \$0.01 | \$0.002 | \$0.005 | \$0.02 | \$0.08 | \$0.08 | \$0.16 |
| Arapahoe Avenue Detention Pond | \$3.87 | \$0.19 | \$0.19 | \$0.14 | \$4.39 | \$3.37 | \$0.66 | \$0.22 | \$0.44 | \$2.72 | \$11.80 | \$0.10 | \$11.90 |
| TOTAL | \$18.54 | \$0.93 | \$0.93 | \$4.18 | \$24.57 | \$4.53 | \$3.69 | \$1.23 | \$2.46 | \$10.19 | \$46.66 | \$0.18 | \$46.84 |

TABLE F-8
Refined Alternative Plans Cost Summary (\$ million)

| Plan | Construction Cost | Mobilization | Stormwater Management/ Erosion Control | Utility Relocation | Subtotal | Easement/ Right-of-Way | Engineering | Legal/Admin | Contract Admin/ Construction Management | Contingency | Total Capital Cost | O&M Cost | Total Implementation Cost |
|--------------------------------|-------------------|--------------|---|--------------------|----------|---------------------------|-------------|-------------|--|-------------|--------------------|----------|---------------------------|
| Status Quo | \$0.00 | \$0.00 | \$0.00 | \$0.00 | \$0.00 | \$0.00 | \$0.00 | \$0.00 | \$0.00 | \$0.00 | \$0.00 | \$0.00 | \$0.00 |
| High Hazard Mitigation | \$0.08 | \$0.004 | \$0.004 | \$0.00 | \$0.08 | \$0.00 | \$0.01 | \$0.004 | \$0.01 | \$0.03 | \$0.14 | \$0.00 | \$0.14 |
| Regional Detention at US-36 | \$13.73 | \$0.69 | \$0.69 | \$0.70 | \$15.81 | \$6.76 | \$2.37 | \$0.79 | \$1.58 | \$7.90 | \$35.21 | \$1.00 | \$36.21 |
| Distributed Regional Detention | \$20.42 | \$1.02 | \$1.02 | \$0.69 | \$23.14 | \$6.54 | \$3.47 | \$1.16 | \$2.31 | \$10.39 | \$47.01 | \$1.10 | \$48.11 |
| Bear Canyon Creek Pipeline | \$18.54 | \$0.93 | \$0.93 | \$4.18 | \$24.57 | \$4.53 | \$3.69 | \$1.23 | \$2.46 | \$10.19 | \$46.66 | \$0.18 | \$46.84 |

Refinements to Benefit-Cost Analysis

The project benefits and costs were updated as described. The benefits were largely unchanged except for the High Hazard Zone Mitigation alternative, which no longer includes benefits associated with the floodproofing activities. The estimated benefits for the other alternative plans were not changed and continue to be based on the 8-meter grid MIKE FLOOD model results.

Costs for the alternative plans reflect the refinements in both the design and the cost-estimating process. The costs have changed for all the alternative plans. The resulting benefit-cost summary is presented in Table F-9, Refined Alternative Plans Benefit-Cost Summary.

TABLE F-9
Refined Alternative Plans Benefit-Cost Summary (\$ million)

| Alternative | Total Implementation Cost | Present Worth of Benefits | Benefit-to-Cost Ratio |
|--------------------------------|---------------------------|---------------------------|-----------------------|
| Status Quo | \$0.0 | \$0.0 | 0.00 |
| High Hazard Mitigation | \$0.14 | \$0.0 | 0.00 |
| Regional Detention at US-36 | \$36.2 | \$77.3 | 2.14 |
| Distributed Regional Detention | \$48.1 | \$75.9 | 1.58 |
| Bear Canyon Creek Pipeline | \$46.8 | \$58.0 | 1.24 |

Potential Funding Sources

Projects of this nature are generally funded by local communities using a variety of resources such as a Stormwater Utility Fee, General Funds, or bond sales. In addition, cities such as Boulder lie within the District, which collects tax revenues that are used to fund the study, design, and implementation of drainage improvements along major drainageways within its constituent communities. It is quite likely the District would be a financial participant in any forthcoming improvement projects along South Boulder Creek.

Because many of the indentified projects have benefit-cost ratios in excess of 1.0, it may be possible to secure additional funds from other sources such as the Federal Emergency Management Agency's Pre-Disaster Flood Mitigation Grant program or USACE's 905b Program. While application for these grants is beyond the current scope, much of the information provided in this study can be used to support application if the Selected Alternative meets program objectives.