

## Appendix A

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Included in this appendix is the detailed concept level cost estimates for each alternative described in the Supplemental Environmental Impact Statement (SEIS) for East Locust Creek Watershed Revised Plan. Unit prices in each detailed estimate include labor, materials, and equipment required to complete the work for each alternative and are described below.

To determine the magnitude of unit and lump sum costs for the various sites, a more detailed cost estimate was completed for the East Locust Creek location, where the North Central Missouri Regional Water Commission has developed additional data and completed preliminary design based on the conclusions in the 2006 Final Environmental Impact Statement (FEIS). For lump sum and quantified items where the estimated cost would be of a similar magnitude across different alternatives (such as a dam spillway), these lump sum items were held consistent across alternatives. Where quantified or lump sum items would be different in different alternatives because of site-specific differences (such as earth fill in a dam), the lump sum and quantity of items was increased or decreased based on the size of the proposed alternative. The list of itemized cost items in each estimate has been simplified to reflect the conceptual nature of the cost estimates. Some values are rounded.

## **Construction**

### **Mobilization, Bonding, and Insurance**

This item shall consist of preparatory work and operations including, but not limited to, costs for bonds, insurance, and permits; those items necessary for the movement of personnel, equipment supplies, and incidentals to the project site; the establishment of all offices, buildings, and other necessary items on the project except as provided in the contract as separate bid items; for all other work on the various items on the project site; for periodic cleanup during construction; and for cleanup upon completion of the work.

The cost for this line item is 8 percent of the total construction costs, excluding contingency and mobilization.

### **Clearing and Grubbing**

This item consists of clearing and grubbing within a 75-foot-wide corridor along the centerline of the raw water main (37.5 feet per side), along the site for each intermediate pump station and along any other site needed for each alternative. For reservoirs, it includes clearing and grubbing for the areas of the dam and areas necessary to complete construction of the dam intake towers, spillways, and related improvements. Clearing and grubbing includes the complete removal and disposal of all buildings, timber, brush, stumps, roots, rubbish, debris, and all other obstructions resting on or protruding through the surface of the existing ground and the surface of excavated areas, and all other structures and obstructions necessary to be removed for which other items do not specify the removal thereof, including building foundations and pipes.

Clearing and grubbing is a measured quantity and is estimated at \$2,500 per acre.

### **Structural Earth Fill**

Structural earth fill consists of the work associated with preparing the foundation of the dam or other embankment by: spreading, harrowing, sprinkling, compacting, removing objectionable materials, and all other incidental work required for the construction, protection, and maintenance of the dam or other embankment. The volume of structural earth fill will be measured in cubic yards by the method of average cross-sectional end areas of in-place material needed for the dam or other embankment.

Structural earth fill is a measured quantity and is estimated at \$6.8 per cubic yard (CY).

### **Slurry Trench / Grout Curtain**

This work consists of furnishing all labor, equipment, materials, and means of performing all operations as required for installing a slurry wall and grout curtain for all new dam/lake alternatives.

Slurry trench / grout curtain is a lump-sum quantity and is estimated at \$878,000.

### **Riprap**

This item includes all labor, materials, and equipment necessary to excavate, prepare subgrade, and install rock riprap for the dam embankment or other locations. The rock riprap will be used to protect the dam embankment from wave erosion or to protect other areas from erosion created by turbulence or other forces in water conveyance.

Riprap is a measured quantity and is estimated at \$80 per CY.

### **Instrumentation**

This item includes all piezometer, settlement gages, movement markers, and other miscellaneous materials and equipment necessary to furnish and install all instrumentation needed for the intake structure.

Instrumentation is a lump-sum quantity and is estimated at \$250,000.

### **Spillway**

This line item includes the excavation, concrete, reinforcing steel, fence, and other miscellaneous materials and equipment necessary for a fully functioning spillway.

The spillway is a lump-sum quantity and is estimated at \$4,451,000.

### **Intake Structure**

This line item includes concrete, reinforcing steel, gates, wall thimbles, pipe, doors, hatches, ladders, controls, trash racks, grating, and all other miscellaneous materials and equipment needed for a fully functioning intake structure

Intake structure is a lump-sum quantity and is estimated at \$1,432,000.

### **Access Bridge**

This item includes a prefabricated access bridge, concrete, reinforcing steel, anchor bolts, and other miscellaneous materials and equipment needed for a fully functioning access bridge.

The access bridge is a lump-sum quantity and is estimated at \$550,000.

### **Outlet Works**

This item includes all concrete, reinforcing steel concrete, steel pipe, and other miscellaneous materials and equipment necessary for a fully functioning outlet works including energy dissipation to the principle spillway and transition to the downstream channel.

The outlet works is a lump-sum quantity and is estimated at \$1,692,000.

### **Contractor Construction Staking**

Contractor construction staking will be used to provide surveying services and to set the right-of-way (ROW) survey monuments consistent with surveying practices.

Contractor construction staking is a lump-sum quantity and is estimated at \$150,000.

### **Erosion Control**

Erosion control must prevent migration of sediment off the construction site throughout the duration of the project. This will include the labor, materials, and equipment necessary to establish and maintain erosion control at the construction site.

Erosion Control is a lump-sum quantity and is estimated at \$150,000.

### **Water Treatment Plant**

This item includes all labor, materials, and equipment necessary for a fully functioning water treatment plant. This cost has shown to be the same whether the water is being purchased from a provider or a new water treatment plant is constructed. The cost for this is based on \$5 per gallon of treated water capacity.

The water treatment plant is a lump-sum quantity and is estimated at \$35,000,000 based on a water treatment plant capacity of 7 million gallons per day (MGD). This item is not part of the project being evaluated, and thus the cost is not included as an explicit cost in the alternative cost analysis. This item is included as a related action in the analysis of alternatives.

### **Intermediate Booster Pump Station**

The intermediate booster pump station is used to transfer water from the source to the Milan Water Treatment Plant for each option. This item includes all labor, materials, and equipment necessary for a fully functioning intermediate pump station. Electrical service and telemetry costs are also included in this line item.

The number of pump stations needed for each alternative was determined by estimating the head loss through the force main used to transfer water from the source to the Milan Treatment Plant. Head loss is a factor of total force main length and elevation difference from the source and Milan Treatment Plant.

Intermediate booster pump stations are a measured quantity and are estimated at \$1,100,000 each for each pump station.

### **30-inch Raw Water Main**

This item includes all excavation, pipe material, bedding, trench checks, placing, fittings, pipe-to-pipe connections, sealing backfilling, compacting, grading, and removal of excess or unsuitable backfill material.

The diameter of the Raw Water Main (30") was chosen because it had the high-flow carrying capability with low friction loss through the pipe wall.

The thirty-inch raw water main is a measured quantity and is estimated at \$200 per linear foot (LF).

### **30-inch Directional Boring**

This item includes all excavation, existing utility line locating, spoil removal, pipe installation, tracer wire, backfilling, compacting, grading, and removal of excess or unsuitable material.

The measurement for this line item is based on the total number of stream crossings for the raw water main. Whether a stream will require boring is based on the stream classification. Stream classifications 1 – 3 will be open cut. Stream classifications 4 – 6 will have an assumed depth of bore of 20 feet, for a total bore assumed length of 1,300 linear feet (LF) per crossing.

Thirty-inch directional boring is a measured quantity and is estimated at \$500 per LF.

### **42-inch Directional Boring**

This item includes all excavation, existing utility line locating, spoil removal, pipe installation, tracer wire, backfilling, compacting, grading, and removal of excess or unsuitable material.

The measurement for this line item is based on the total number of road crossings for the raw water main. If the road crossing is gravel, it is assumed that the road would be open cut and boring would not be necessary. Forty-two-inch boring is only calculated for paved road crossings. The total length of bore for 42-inch borings is assumed to be 200 LF.

Forty-two-inch directional boring is a measured quantity and is estimated at \$600 per LF.

### **42-inch Steel Encasement**

This item includes all excavation, bedding, trench checks, placing, fittings, boring, casing spacers, end seals, backfilling, compacting, grading and removal of excess or unsuitable material.

Steel Encasement is a measured quantity and is estimated at \$300 per LF.

### **30-inch Valves**

This bid item includes all labor and materials, equipment, excavation, backfill, and incidental items to complete the work. This also includes the cost for air release valves for the transmission main. It is assumed that one 30-inch valve will be needed for every mile of the transmission main.

Thirty-inch valves are a measured quantity and are estimated at \$30,000 each.

## **Access Roads**

The measurement for this line item assumes that 0.05 mile of a 20-foot-wide access road is needed for all intermediate pump stations and 30-inch valves. The cost includes all labor, materials, equipment, excavation, backfill, aggregate surfacing, and incidental items to complete the work.

Access roads are a measured quantity and are estimated at \$75,000 per mile.

## **Road Repairs**

The measurement for this line item is based on the amount of road crossings that are to be open cut. It is assumed that all gravel roads that are crossed will be open cut. It is also assumed that each road repair at a gravel crossing will be for a 5-foot-wide and 25-foot-long strip of gravel roadway.

Road repairs are a measured quantity and are estimated at \$75 per square yard.

## **Cleanup, Finish Grading, Seeding, and Mulching**

This item consists of cleanup, finish grading, seeding, and mulching within a 75-foot-wide corridor along the centerline of the raw water main (37.5 feet each side), the site for each intermediate pump station, and any other site needed for each alternative.

Cleanup, finish grading, seeding, and mulching is a measured quantity and is estimated at \$7,500 per acre.

## **Miscellaneous Dam Appurtenances**

This item includes abutment grouting, subsurface anomalies, subgrade stabilization/replacement, isolated French drains or blanket drains, or other isolated mitigation actions necessary to ensure long-term stability and safe operation of the dam.

Miscellaneous dam appurtenances are a lump sum quantity and are estimated at \$2,000,000.

## **Wetland Storage**

This item consists of the cost of all labor, equipment, excavation, and materials necessary for the construction of a wetland storage area.

Wetland storage is a measured quantity based on \$5,000 per acre of land needed.

## **Box Culvert**

This item includes the cost of all labor, materials, equipment, excavation, concrete, restoration, and incidental items needed for the installation of a box culvert.

The box culvert is a measured quantity and is estimated at \$600 per LF of culvert installed.

## **Bridges**

This item includes the cost of all labor, materials, equipment, excavation, steel, concrete, restoration, and miscellaneous items needed for the installation of a bridge.

Bridges are a measured quantity of \$155 for each square foot of bridge installed.

## Utility Relocation

The areas to be inundated for the reservoirs potentially include existing phone, electric, cable, internet, gas, or other utility facilities that may be affected by a static water surface and associated increase in groundwater level. These facilities often run along existing roadway and road ROWs, and they may also be located in a dedicated, private easement. The particular details of the allocation of costs related to relocation are part of agreements negotiated by each utility, and the details of these agreements were not reviewed (and may not be available). This cost item provides an allowance for the cost of relocation for utility facilities, either above ground or below ground, which may be affected by the reservoir. The cost of utility relocation is unknown until further detailed analysis and negotiation is completed with each individual utility company. Preliminary costs and identification of utilities present has been most fully developed on the East Locust Creek alternative, and these costs were used as a baseline to correlate lake size with potential utility relocation costs.

## Reservoir Preparation

The Reservoir Preparation includes the costs and contingencies for identifying and mitigating potential contaminant sources in the reservoir as well as completing other work in the reservoir area to preserve and ensure stability of the new reservoir shoreline and adjacent features. This work includes potential construction of small pond dam structure modifications, sediment and debris basins, property and potential hazardous waste cleanup, building and other demolition, cistern/well capping, lagoon decommissioning, railroad bed cleanup, shoreline protection, road replacement, and other miscellaneous items that are needed to ensure longevity and sustainability of the reservoir area. Preliminary costs and identification of reservoir preparation has been most fully developed on the East Locust Creek alternative, and these costs were used as a baseline to correlate lake size with potential reservoir preparation costs.

## Engineering Services

The engineering service cost for the project is estimated at 10 percent of the total construction cost of the project, including contingency. The engineering costs include survey, geotechnical, design, permitting, bidding, construction administration, materials testing, construction observation, and project close-out.

## Other Professional Services and Miscellaneous

### Appraisal / Descriptions

Appraisal costs are a measured quantity and are estimated at 10 percent of the total land acquisition costs.

### Land Acquisition

This line item is based on the amount of land to be purchased for the project. This includes the land needed for the raw water main, the intermediate booster pump stations, and the reservoir (if needed). It is assumed that 50 feet of permanent easement or ROW will be needed for the entire length of the raw water main, 1 acre per intermediate booster pump station, and 1.5 times the total "normal pool" lake acreage.

Land acquisition is a measured quantity and is estimated at \$3,900 per acre.

## Recreation Cost

### Parking Lot Drive Lane Construction

This line item includes the excavation, subgrade, concrete, asphalt, and other miscellaneous materials needed for the construction of a parking lot drive lane.

Parking lot drive lane construction is a measured quantity and is estimated at \$10 per square foot.

### Parking Lot

This line item includes the excavation, subgrade, concrete, asphalt, and other miscellaneous materials needed for the construction of a parking lot.

The parking lot is a measured quantity by number of parking spaces needed. This is estimated at \$4,710 per parking space.

### Universal Access and Other Amenities

This line item includes improvements related to universal access, piers, docks, ramps, jetties, privies, and other recreational amenities.

The universal access and other amenities are a lump sum item estimated at \$1,000,000,

## Mitigation Cost

Mitigation costs were estimated based on impacts to streams and wetlands. Stream and wetland impacts were determined by National Wetlands Inventory (NWI), Missouri Stream Classification, and National Hydrography Dataset (NHD). A consistent unit value cost was determined for a wetland acre (\$18,000 per acre) and stream foot (\$30 per foot) and multiplied by an alternative stream or wetland impact.

## Project Capital and Operation and Maintenance Cost Estimates

The project capital cost estimate is the sum of construction, engineering services, other professional services, recreation, and mitigation costs needed for the project as shown in the detailed conceptual level cost estimates.

There are two separate items added together to get the present worth of the uniform series of annual operation and maintenance (O&M) value. The first is the annual electrical cost for the booster station(s) to pump the water. This cost is based on \$0.10 per kilowatt hour, with a 1.1 peaking factor. The amount of water pumped was assumed to increase on a yearly basis with the total needed (7MGD) for the system reached after 50 years. The second value is the annual reservoir and transmission line labor, maintenance, and equipment cost. This cost was based on 0.4 percent of the total installation cost, less mitigation, for the alternative. Also included in this calculation was a discount rate. The discount rate that was used was 5.125 percent, consistent with the 2006 FEIS. These costs were totaled on an annual basis up to 75 years.

The cost of the project in 2018 dollars is calculated by summing the project capital cost with the present worth of the 100-year maintenance costs for the project.

## Multipurpose Cost Summary

The costs described in this appendix are for individual or dual-purpose alternatives described in the alternatives section above. The table below summarizes the costs based on the multipurpose alternatives.

Multipurpose Alternative	Water Supply Costs	Water-Based Recreation Costs	Flood Damage Reduction Costs	Total Costs
RW1	\$102,900,000			<b>\$102,900,000</b>
MA2	\$188,300,000		16,800,000	<b>\$205,100,000</b>
MA3	\$163,100,000		16,800,000	<b>\$179,900,000</b>
MA4	\$212,500,000		16,800,000	<b>\$229,300,000</b>
MA5	\$173,300,000		16,800,000	<b>\$190,100,000</b>
MA6	Pipeline = \$260,600,000 Hazel Creek = \$52,100,000 Green City = \$53,700,000 Elmwood = \$46,900,000 Forest = \$85,500,000		16,800,000	<b>\$515,600,000</b>

## Creation of New Online Channel Reservoir – East Locust Creek (RW1)

This alternative is described in Section 2.1.2.6. The construction of the dam would require approximately 3,400 acres of land acquisition, 200 acres of clearing and grubbing, 981,100 CY of structural earth fill, and 15,200 CY of riprap. The dam would also need instrumentation, a slurry trench / grout curtain spillway, an intake structure, an access bridge, outlet works, contractor construction staking, erosion control, and miscellaneous dam appurtenances.

A 24,700-LF raw water main would be constructed from the RW1 dam to transfer water to the water treatment plant at Milan. This will require one intermediate booster station, 200 LF of 42-inch directional boring and 42-inch steel encasement, five 30-inch valves, 0.8 mile of access road, 14 square yards of road repairs, and 42 acres of cleanup, finish grading, seeding, and mulching.

This alternative provides a water supply that requires a water treatment plant (7.0 MGD). This alternative also provides recreation and has 224 parking spaces and 9,630 square feet of parking lot construction.

<b>Water Supply, Recreation and Flood Damage Reduction Alternative</b>					
<b>Opinion of Probable Project Cost</b>					
<b>Proposed Action – East Locust Creek Reservoir (RW1)</b>					
<b>1.00</b>	<b>Construction</b>	<b>Quantity</b>	<b>Unit*</b>	<b>Unit Cost</b>	<b>Total</b>
1.01	Mobilization, Bonding, Insurance	1	L.S.	\$ 2,048,000	\$ 2,048,000
1.02	Clearing and Grubbing	200	Acres	\$ 2,500	\$ 500,000
1.03	Structural Earth Fill	922,100	CY	\$ 6.80	\$ 6,270,300
1.04	Chimney and Blanket Drain Aggregate	59,000	CY	\$ 70.00	\$ 4,130,000
1.05	Slurry Trench/Grout Curtain	1	L.S.	\$ 878,000	\$ 878,000
1.06	Riprap	15,200	CY	\$ 80	\$ 1,216,000
1.07	Instrumentation	1	L.S.	\$ 250,000	\$ 250,000
1.08	Spillway	1	L.S.	\$ 4,451,000	\$ 4,451,000
1.09	Intake Structure	1	Each	\$ 1,432,000	\$ 1,432,000
1.10	Access Bridge	1	L.S.	\$ 550,000	\$ 550,000
1.11	Outlet Works	1	L.S.	\$ 1,692,000	\$ 1,692,000
1.12	Contractor Construction Staking	1	L.S.	\$ 150,000	\$ 150,000
1.13	Erosion Control	1	L.S.	\$ 150,000	\$ 150,000
1.14	30-inch Raw Water Main	24,700	LF	\$ 200	\$ 4,940,000
1.15	42-inch Directional Boring	200	LF	\$ 600	\$ 120,000
1.16	42-inch Steel Encasement	200	LF	\$ 300	\$ 60,000
1.17	30-inch Valves	5	Each	\$ 30,000	\$ 150,000
1.18	Access Roads	0.8	Mi	\$ 75,000	\$ 60,000
1.19	Road Repairs	14	Sq. Yd.	\$ 75	\$ 1,100
1.20	Clean Up, Finish Grading, Seeding, Mulch	43	Acres	\$ 7,500	\$ 322,500
1.21	Miscellaneous Dam Appurtenances	1	L.S.	\$ 2,000,000	\$ 2,000,000
<b>Subtotal</b>					<b>\$ 31,370,900</b>
1.22	Contingencies (30%)				\$9,411,300
<b>Construction Subtotal</b>					<b>\$ 40,800,000</b>

<b>2.00</b>	<b>Utility Relocation</b>	<b>2,328</b>	<b>Acres</b>	<b>\$ 2,280</b>	<b>\$ 5,300,000</b>
<b>Utility Relocation Subtotal</b>					<b>\$ 5,300,000</b>
<b>3.00</b>	<b>Reservoir Preparation</b>	<b>2,328</b>	<b>Acres</b>	<b>\$ 7,500</b>	<b>\$ 17,500,000</b>
<b>Reservoir Preparation Subtotal</b>					<b>\$ 17,500,000</b>
<b>4.00</b>	<b>Engineering Services (10% of Items 1, 2, and 3 Subtotals)</b>				<b>\$ 6,400,000</b>
<b>Engineering Subtotal</b>					<b>\$ 6,400,000</b>
<b>5.00</b>	<b>Other Professional Services &amp; Miscellaneous</b>				
5.01	Appraisals / Descriptions				\$ 1,774,500
5.02	Land Acquisition	4,550	Acres	\$ 3,900	\$ 17,745,000
<b>Other Subtotal</b>					<b>\$ 19,500,000</b>
<b>6.00</b>	<b>Recreation Construction Cost</b>				
6.01	Parking Lot Drive Lane Construction	9,630	SF	\$ 10	\$ 96,300
6.02	Parking Lot	224	Spaces	\$ 4,710	\$ 1,055,100
6.03	Universal Access and Other Amenities	1	L.S.	\$ 1,000,000	\$ 1,000,000
<b>Recreation Subtotal</b>					<b>\$ 2,200,000</b>
<b>7.00</b>	<b>Mitigation</b>				<b>\$ 7,300,000</b>
<b>Mitigation Subtotal</b>					<b>\$ 7,300,000</b>
<b>Project Capital Cost</b>					<b>\$ 99,000,000</b>
<b>Project O&amp;M PV</b>					<b>\$ 4,000,000</b>
<b>Project Cost</b>					<b>\$ 102,900,000</b>

L.S. = Lump Sum; CY = Cubic Yards; Sq. Yd. = Square Yards; SF = Square Feet; LF = Linear Feet;  
Mi = Miles

Note: Stream Impacts = 98,208 feet  
Wetland Impacts = 242 acres

## Big Locust Creek Reservoir (DPA 2)

This alternative is described in Section 2. The construction of the dam would require approximately 8,900 acres of land acquisition, 600 acres of clearing and grubbing, 1,340,900 CY of structural earth fill, and 20,800 CY of riprap. The dam would also need instrumentation, a slurry trench / grout curtain spillway, **an intake structure, an access bridge, outlet works, contractor construction staking, erosion control, and miscellaneous dam appurtenances.**

**A 23,500-LF raw water main would be constructed from the DPA 2 dam to transfer water to the water treatment plant at Milan. This will require two intermediate booster stations, 800 LF of 42-inch directional boring and 42-inch steel encasement, five 30-inch valves, 1.1 miles of access roads, 38 square yards (SY) of road repairs, and 41 acres of cleanup, finish grading, seeding, and mulching.**

This alternative provides a water supply that requires a water treatment plant (7.0 MGD). This alternative also provides recreation and has 585 parking spaces and 9,630 square feet of parking lot construction.

Water Supply, Recreation and Flood Damage Reduction Alternative					
Opinion of Probable Project Cost					
Big Locust Creek Reservoir (DPA 2)					
1.00	Construction	Quantity	Unit	Unit Cost	Total
1.01	Mobilization, Bonding, Insurance	1	L.S.	\$ 2,560,000	\$ 2,560,000
1.02	Clearing and Grubbing	600	Acres	\$ 2,500	\$ 1,500,000
1.03	Structural Earth Fill	1,184,300	CY	\$ 6.80	\$ 8,053,300
1.04	Chimney and Blanket Drain Aggregate	76,000	CY	\$ 70.00	\$ 5,320,000
1.05	Slurry Trench/Grout Curtain	1	L.S.	\$ 878,000	\$ 878,000
1.06	Riprap	20,800	CY	\$ 80	\$ 1,664,000
1.07	Instrumentation	1	L.S.	\$ 250,000	\$ 250,000
1.08	Spillway	1	L.S.	\$ 4,451,000	\$ 4,451,000
1.09	Intake Structure	1	Each	\$ 1,432,000	\$ 1,432,000
1.10	Access Bridge	1	L.S.	\$ 550,000	\$ 550,000
1.11	Outlet Works	1	L.S.	\$ 1,692,000	\$ 1,692,000
1.12	Contractor Construction Staking	1	L.S.	\$ 150,000	\$ 150,000
1.13	Erosion Control	1	L.S.	\$ 150,000	\$ 150,000
1.14	Intermediate Booster Pump Station	2	Each	\$ 1,100,000	\$ 2,200,000
1.15	30-inch Raw Water Main	23,500	LF	\$ 200	\$ 4,700,000
1.16	42-inch Directional Boring	800	LF	\$ 600	\$ 480,000
1.17	42-inch Steel Encasement	800	LF	\$ 300	\$ 240,000
1.18	30-inch Valves	5	Each	\$ 30,000	\$ 150,000
1.19	Access Roads	1.1	Mi	\$ 75,000	\$ 82,500
1.20	Road Repairs	38	Sq. Yd.	\$ 75	\$ 2,900
1.21	Clean Up, Finish Grading, Seeding, Mulch	41	Acres	\$ 7,500	\$ 307,500
1.22	Miscellaneous Dam Appurtenances	1	L.S.	\$ 2,000,000	\$ 2,000,000
				<b>Subtotal</b>	<b>\$ 38,813,200</b>

1.23	Contingencies (30%)					\$ 11,644,000
					<b>Construction Subtotal</b>	<b>\$ 50,500,000</b>
2.00	Utility Relocation	5,850	Acres	\$ 2,280		\$ 13,300,000
					<b>Utility Relocation Subtotal</b>	<b>\$ 13,300,000</b>
3.00	Reservoir Preparation	5,850	Acres	\$ 7,500		\$ 43,875,000
					<b>Reservoir Preparation Subtotal</b>	<b>\$ 43,875,000</b>
4.00	Engineering Services (10% of Items 1, 2, and 3 Subtotals)					\$ 10,800,000
					<b>Engineering Subtotal</b>	<b>\$ 10,800,000</b>
5.00	Other Professional Services & Miscellaneous					
5.01	Appraisals / Descriptions					\$ 4,485,000
5.02	Land Acquisition	11,500	Acres	\$ 3,900		\$ 44,850,000
					<b>Other Subtotal</b>	<b>\$ 49,300,000</b>
6.00	Recreation Cost					
6.01	Parking Lot Drive Lane Construction	9,630	SF	\$ 10		\$ 96,300
6.02	Parking Lot	585	Spaces	\$ 4,710		\$ 2,755,400
6.03	Universal Access and Amenities	1	L.S.	\$ 1,000,000		\$ 1,000,000
					<b>Recreation Subtotal</b>	<b>\$ 3,900,000</b>
7.00	Mitigation					\$ 30,600,000
					<b>Mitigation Subtotal</b>	<b>\$ 30,600,000</b>
					<b>Project Capital Cost</b>	<b>\$ 202,300,000</b>
					<b>Project O&amp;M PV</b>	<b>\$ 10,200,000</b>
					<b>Project Cost</b>	<b>\$ 212,500,000</b>

L.S. = Lump Sum; CY = Cubic Yards; Sq. Yd. = Square Yards; SF = Square Feet; LF = Linear Feet;  
Mi = Miles

Note: Stream Impacts = 167,904 feet  
Wetland Impacts = 1,422 acres

### Little East Locust Creek Reservoir (DPA 3)

This alternative is described in Section 2. The construction of the dam would require approximately 5,600 acres of land acquisition, 500 acres of clearing and grubbing, 1,602,300 CY of structural earth fill, and 20,900 CY of riprap. The dam would also need instrumentation, a slurry trench / grout curtain spillway, an intake structure, an access bridge, outlet works, contractor construction staking, erosion control, and miscellaneous dam appurtenances.

A 75,000-LF raw water main would be constructed from the DPA 3 dam to transfer water to the water treatment plant at Milan. This will require two intermediate booster stations, 1,300 LF of 30-inch directional boring, 1,400 LF of 42-inch directional boring with 42-inch steel encasement, 15 30-inch valves, 1.6 miles of access roads, 125 SY of road repairs, and 120 acres of cleanup, finish grading, seeding, and mulching.

This alternative provides a water supply that requires a water treatment plant (7.0 MGD). This alternative also provides recreation and has 365 parking spaces and 9,630 square feet of parking lot construction.

Water Supply, Recreation and Flood Damage Reduction Alternative					
Opinion of Probable Project Cost					
Little East Locust Creek Reservoir (DPA 3)					
1.00	Construction	Quantity	Unit	Unit Cost	Total
1.01	Mobilization, Bonding, Insurance	1	L.S.	\$ 3,683,000	\$ 3,683,000
1.02	Clearing and Grubbing	500	Acres	\$ 2,500	\$ 1,250,000
1.03	Structural Earth Fill	1,415,900	CY	\$ 6.80	\$ 9,628,200
1.04	Chimney and Blanket Drain Aggregate	90,000	CY	\$ 70.00	\$ 6,300,000
1.05	Slurry Trench/Grout Curtain	1	L.S.	\$ 878,000	\$ 878,000
1.06	Riprap	20,900	CY	\$ 80	\$ 1,672,000
1.07	Instrumentation	1	L.S.	\$ 250,000	\$ 250,000
1.08	Spillway	1	L.S.	\$ 4,451,000	\$ 4,451,000
1.09	Intake Structure	1	Each	\$ 1,432,000	\$ 1,432,000
1.10	Access Bridge	1	L.S.	\$ 550,000	\$ 550,000
1.11	Outlet Works	1	L.S.	\$ 1,692,000	\$ 1,692,000
1.12	Contractor Construction Staking	1	L.S.	\$ 150,000	\$ 150,000
1.13	Erosion Control	1	L.S.	\$ 150,000	\$ 150,000
1.14	Intermediate Booster Pump Station	2	Each	\$ 1,100,000	\$ 2,200,000
1.15	30-inch Raw Water Main	75,000	LF	\$ 200	\$ 15,000,000
1.16	30-inch Directional Boring	1,300	LF	\$ 500	\$ 650,000
1.17	42-inch Directional Boring	1,400	LF	\$ 600	\$ 840,000
1.18	42-inch Steel Encasement	1,400	LF	\$ 300	\$ 420,000
1.19	30-inch Valves	15	Each	\$ 30,000	\$ 450,000
1.20	Access Roads	1.6	Mi	\$ 75,000	\$ 120,000
1.21	Road Repairs	125	Sq. Yd.	\$ 75	\$ 9,400
1.22	Clean Up, Finish Grading, Seeding, Mulch	130	Acres	\$ 7,500	\$ 975,000
1.23	Miscellaneous Dam Appurtenances	1	L.S.	\$ 2,000,000	\$ 2,000,000
<b>Subtotal</b>					<b>\$ 54,750,600</b>
1.24	Contingencies (30%)				\$ 16,425,200

<b>Construction Subtotal</b>					<b>\$ 71,200,000</b>
<b>2.00</b>	<b>Utility Relocation</b>	<b>3,650</b>	<b>Acres</b>	<b>\$ 2,280</b>	<b>\$ 8,300,000</b>
<b>Utility Relocation Subtotal</b>					<b>\$ 8,300,000</b>
<b>3.00</b>	<b>Reservoir Preparation</b>	<b>3,650</b>	<b>Acres</b>	<b>\$ 7,500</b>	<b>\$ 27,375,000</b>
<b>Reservoir Preparation Subtotal</b>					<b>\$ 27,375,000</b>
<b>4.00</b>	<b>Engineering Services (10% of Items 1, 2, and 3 Subtotals)</b>				<b>\$ 10,700,000</b>
<b>Engineering Subtotal</b>					<b>\$ 10,700,000</b>
<b>5.00</b>	<b>Other Professional Services &amp; Miscellaneous</b>				
5.01	Appraisals / Descriptions				\$ 2,808,000
5.02	Land Acquisition	7,200	Acres	\$ 3,900	\$ 28,080,000
<b>Other Subtotal</b>					<b>\$ 30,900,000</b>
<b>6.00</b>	<b>Recreation Cost</b>				
6.02	Parking Lot Drive Lane Construction	9,630	SF	\$ 10	\$ 96,300
6.03	Parking Lot	365	Spaces	\$ 4,710	\$ 1,719,200
6.044	Universal Access and Other Amenities	1	L.S.	\$ 1,000,000	\$ 1,000,000
<b>Recreation Subtotal</b>					<b>\$ 2,800,000</b>
<b>7.00</b>	<b>Mitigation</b>				<b>\$ 8,700,000</b>
<b>Mitigation Subtotal</b>					<b>\$ 8,700,000</b>
<b>Project Capital Cost</b>					<b>\$ 160,000,000</b>
<b>Project O&amp;M PV</b>					<b>\$ 13,300,000</b>
<b>Project Cost</b>					<b>\$ 173,300,000</b>

L.S. = Lump Sum; CY = Cubic Yards; Sq. Yd. = Square Yards; SF = Square Feet; LF = Linear Feet; Mi = Miles

Note: Stream Impacts = 127,248 feet  
Wetland Impacts = 269 acres

## West Fork Locust Creek Reservoir (DPA 4)

This alternative is described in Section 2. The construction of the dam would require approximately 5,900 acres of land acquisition, 400 acres of clearing and grubbing, 1,694,5008 CY of structural earth fill, and 13,400 CY of riprap. The dam would also need instrumentation, a slurry trench / grout curtain spillway, an intake structure, an access bridge, outlet works, contractor construction staking, erosion control, and miscellaneous dam appurtenances.

A 38,000-LF raw water main would be constructed from the DPA 3 dam to transfer water to the water treatment plant at Milan. This will require two intermediate booster stations, 2,600 LF of 30-inch directional boring, 1,200 LF of 42-inch directional boring with 42-inch steel encasement, 8 30-inch valves, 0.9 mile of access road, 102 SY of road repairs, and 66 acres of cleanup, finish grading, seeding, and mulching.

This alternative provides a water supply that requires a water treatment plant (7.0 MGD). This alternative also provides recreation and has 386 parking spaces and 9,630 square feet of parking lot construction.

Water Supply, Recreation and Flood Damage Reduction Alternative					
Opinion of Probable Project Cost					
West Fork Locust Creek Reservoir (DPA4)					
1.00	Construction	Quantity	Unit	Unit Cost	Total
1.01	Mobilization, Bonding, Insurance	1	L.S.	\$ 2,964,000	\$ 2,964,000
1.02	Clearing and Grubbing	400	Acres	\$ 2,500	\$ 1,000,000
1.03	Structural Earth Fill	1,496,600	CY	\$ 6.80	\$ 10,176,900
1.04	Chimney and Blanket Drain Aggregate	96,000	CY	\$ 70	\$ 6,720,000
1.05	Slurry Trench/Grout Curtain	1	L.S.	\$ 878,000	\$ 878,000
1.06	Riprap	13,400	CY	\$ 80	\$ 1,072,000
1.07	Instrumentation	1	L.S.	\$ 250,000	\$ 250,000
1.08	Spillway	1	L.S.	\$ 4,451,000	\$ 4,451,000
1.09	Intake Structure	1	Each	\$ 1,432,000	\$ 1,432,000
1.10	Access Bridge	1	L.S.	\$ 550,000	\$ 550,000
1.11	Outlet Works	1	L.S.	\$ 1,692,000	\$ 1,692,000
1.12	Contractor Construction Staking	1	L.S.	\$ 150,000	\$ 150,000
1.13	Erosion Control	1	L.S.	\$ 150,000	\$ 150,000
1.14	Intermediate Booster Pump Station	1	Each	\$ 1,100,000	\$ 1,100,000
1.15	30-inch Raw Water Main	38,000	LF	\$ 200	\$ 7,600,000
1.16	30-inch Directional Boring	2,600	LF	\$ 500	\$ 1,300,000
1.17	42-inch Directional Boring	1,200	LF	\$ 600	\$ 720,000
1.18	42-inch Steel Encasement	1,200	LF	\$ 300	\$ 360,000
1.19	30-inch Valves	8	Each	\$ 30,000	\$ 240,000
1.20	Access Roads	0.9	Mi	\$ 75,000	\$ 67,500
1.21	Road Repairs	102	Sq. Yd.	\$ 75	\$ 7,700
1.22	Clean Up, Finish Grading, Seeding, Mulch	66	Acres	\$ 7,500	\$ 495,000
1.23	Miscellaneous Dam Appurtenances	1	L.S.	\$ 2,000,000	\$ 2,000,000
				<b>Subtotal</b>	<b>\$ 45,376,100</b>
1.24	Contingencies (30%)				\$ 13,612,900
<b>Construction Subtotal</b>					<b>\$ 59,000,000</b>

<b>2.00</b>	<b>Utility Relocation</b>	<b>3,860</b>	<b>Acres</b>	<b>\$ 2,280</b>	<b>\$ 8,800,000</b>
<b>Utility Relocation Subtotal</b>					<b>\$ 8,800,000</b>
<b>3.00</b>	<b>Reservoir Preparation</b>	<b>3,860</b>	<b>Acres</b>	<b>\$ 7,500</b>	<b>\$ 28,950,000</b>
<b>Reservoir Preparation Subtotal</b>					<b>\$ 28,950,000</b>
<b>4.00</b>	<b>Engineering Services (10% of Items 1, 2, and 3 Subtotals)</b>				<b>\$ 9,700,000</b>
<b>Engineering Subtotal</b>					<b>\$ 9,700,000</b>
<b>5.00</b>	<b>Other Professional Services &amp; Miscellaneous</b>				
5.01	Appraisals / Descriptions				\$ 2,964,000
5.02	Land Acquisition	7,600	Acres	\$ 3,900	\$ 29,640,000
<b>Other Subtotal</b>					<b>\$ 32,600,000</b>
<b>6.00</b>	<b>Recreation Cost</b>				
6.01	Parking Lot Drive Lane Construction	9,630	SF	\$ 10	\$ 96,300
6.02	Parking Lot	386	Spaces	\$ 4,710	\$ 1,818,100
6.03	Universal Access and Other Amenities	1	L.S.	\$ 1,000,000	\$ 1,000,000
<b>Recreation Subtotal</b>					<b>\$ 2,900,000</b>
<b>7.00</b>	<b>Mitigation</b>				<b>\$ 10,400,000</b>
<b>Mitigation Subtotal</b>					<b>\$ 10,400,000</b>
<b>Project Capital Cost</b>					<b>\$ 152,400,000</b>
<b>Project O&amp;M PV</b>					<b>\$ 10,700,000</b>
<b>Project Cost</b>					<b>\$ 163,100,000</b>

L.S. = Lump Sum; CY = Cubic Yards; Sq. Yd. = Square Yards; SF = Square Feet; LF = Linear Feet;  
Mi = Miles

Note: Stream Impacts = 124,608 feet  
Wetland Impacts = 372 acres

## Yellow Creek Reservoir (DPA 5)

This alternative is described in Section 2. The construction of the dam would require approximately 5,000 acres of land acquisition, 500 acres of clearing and grubbing, 1,409,100 CY of structural earth fill, and 14,900 CY of riprap. The dam would also need instrumentation, a slurry trench / grout curtain spillway, an intake structure, an access bridge, outlet works, contractor construction staking, erosion control, and miscellaneous dam appurtenances.

A 133,900-LF raw water main would be constructed from the DPA 3 dam to transfer water to the water treatment plant at Milan. This will require two intermediate booster stations, 3,900 LF of 30-inch directional boring, 2,200 LF of 42-inch directional boring with 42-inch steel encasement, 27 30-inch valves, 2.0 miles of access roads, 200 SY of road repairs, and 231 acres of cleanup, finish grading, seeding, and mulching.

This alternative provides a water supply that requires a water treatment plant (7.0 MGD). This alternative also provides recreation and has 321 parking spaces and 9,630 square feet of parking lot construction.

<b>Water Supply, Recreation and Flood Damage Reduction Alternative</b>					
<b>Opinion of Probable Project Cost</b>					
<b>Yellow Creek Reservoir (DPA 5)</b>					
<b>1.00</b>	<b>Construction</b>	<b>Quantity</b>	<b>Unit</b>	<b>Unit Cost</b>	<b>Total</b>
1.01	Mobilization, Bonding, Insurance	1	L.S.	\$ 4,824,000	\$ 4,824,000
1.02	Clearing and Grubbing	500	Acres	\$ 2,500	\$ 1,250,000
1.03	Structural Earth Fill	1,245,400	CY	\$ 6.80	\$ 8,468,800
1.04	Chimney and Blanket Drain Aggregate	79,000	CY	\$ 70	\$ 5,530,000
1.05	Slurry Trench/Grout Curtain	1	L.S.	\$ 878,000	\$ 878,000
1.06	Riprap	14,900	CY	\$ 80	\$ 1,192,000
1.07	Instrumentation	1	L.S.	\$ 250,000	\$ 250,000
1.08	Spillway	1	L.S.	\$ 4,451,000	\$ 4,451,000
1.09	Intake Structure	1	Each	\$ 1,432,000	\$ 1,432,000
1.10	Access Bridge	1	L.S.	\$ 550,000	\$ 550,000
1.11	Outlet Works	1	L.S.	\$ 1,692,000	\$ 1,692,000
1.12	Contractor Construction Staking	1	L.S.	\$ 150,000	\$ 150,000
1.13	Erosion Control	1	L.S.	\$ 150,000	\$ 150,000
1.14	Intermediate Booster Pump Station	3	Each	\$ 1,100,000	\$ 3,300,000
1.15	30-inch Raw Water Main	133,900	LF	\$ 200	\$ 26,780,000
1.16	30-inch Directional Boring	3,900	LF	\$ 500	\$ 1,950,000
1.17	42-inch Directional Boring	2,200	LF	\$ 600	\$ 1,320,000
1.18	42-inch Steel Encasement	2,200	LF	\$ 300	\$ 660,000
1.19	30-inch Valves	27	Each	\$ 30,000	\$ 810,000
1.20	Access Roads	2	Mi	\$ 75,000	\$ 150,000
1.21	Road Repairs	200	Sq. Yd.	\$ 75	\$ 15,000
1.22	Clean Up, Finish Grading, Seeding, Mulch	231	Acres	\$ 7,500	\$ 1,732,500
1.23	Miscellaneous Dam Appurtenances	1	L.S.	\$ 2,000,000	\$ 2,000,000
<b>Subtotal</b>					<b>\$ 69,535,300</b>
1.24	Contingencies (30%)				\$ 20,860,600
					<b>\$ 90,400,000</b>

<b>2.00</b>	<b>Utility Relocation</b>	<b>3,210</b>	<b>Acres</b>	<b>\$ 2,280</b>	<b>\$ 7,300,000</b>
<b>Utility Relocation Subtotal</b>					<b>\$ 7,300,000</b>
<b>3.00</b>	<b>Reservoir Preparation</b>	<b>3,210</b>	<b>Acres</b>	<b>\$ 7,500</b>	<b>\$ 24,075,000</b>
<b>Reservoir Preparation Subtotal</b>					<b>\$ 24,075,000</b>
<b>4.00</b>	<b>Engineering Services (10% of Items 1, 2, and 3 Subtotals)</b>				<b>\$ 12,200,000</b>
<b>Engineering Subtotal</b>					<b>\$ 12,200,000</b>
<b>5.00</b>	<b>Other Professional Services &amp; Miscellaneous</b>				
5.01	Appraisals / Descriptions				\$ 2,457,000
5.02	Land Acquisition	6,300	Acres	\$ 3,900	\$ 24,570,000
<b>Other Subtotal</b>					<b>\$ 27,000,000</b>
<b>6.00</b>	<b>Recreation Cost</b>				
6.01	Parking Lot Drive Lane Construction	9,630	SF	\$ 10	\$ 96,300
6.02	Parking Lot	321	Spaces	\$ 4,710	\$ 1,512,000
6.03	Universal Access and Other Amenities	1	L.S.	\$ 1,000,000	\$ 1,000,000
<b>Recreation Subtotal</b>					<b>\$ 2,600,000</b>
<b>7.00</b>	<b>Mitigation</b>				<b>\$ 7,300,000</b>
<b>Mitigation Subtotal</b>					<b>\$ 7,300,000</b>
<b>Project Capital Cost</b>					<b>\$ 170,900,000</b>
<b>Project O&amp;M PV</b>					<b>\$ 17,400,000</b>
<b>Project Cost</b>					<b>\$ 188,300,000</b>

L.S. = Lump Sum; CY = Cubic Yards; Sq. Yd. = Square yards; SF = Square Feet; LF = Linear Feet;  
Mi = Miles

Note: Stream Impacts = 137,280 feet  
Wetland Impacts = 179.1 acres

## Water Supply Combination Alternative (WA20) and Expand Existing Public Lakes (RA2)

The Water Supply Combination (WA20) and Expand Existing Public Lakes (RA2) alternatives both include replacing the dams for Forest Lake and Green City Lake. These alternatives are combined for a multipurpose alternative and thus their associated costs are included together below. The costs associated with the flood damage reduction alternative are not included.

The Water Supply Combination alternative includes 300 miles of pipeline from the existing water systems to Milan.

### Water Supply Combination Alternative (Pipeline Costs)

	Livingston County PWSD No. 4	MMU	Missouri American Brunswick	Salisbury	Chillicothe Municipal Utilities
Pipe Diameter (inches)	6	6	12	6	12
Unit Cost (miles)	100	100	150	100	150
Pipeline Length (miles)	49.5	68.5	64.5	76.7	39.3
<b>Pipe Costs</b>	<b>\$26,162,137</b>	<b>\$36,171,132</b>	<b>\$51,066,054</b>	<b>\$40,510,840</b>	<b>\$31,123,276</b>
Intermediate Pump Stations	2	3	3	4	2
Unit Pump Station Cost	\$1,100,000	\$1,100,000	\$1,100,000	\$1,100,000	\$1,100,000
<b>Pump Costs</b>	<b>\$2,200,000</b>	<b>\$3,300,000</b>	<b>\$3,300,000</b>	<b>\$4,400,000</b>	<b>\$2,200,000</b>
<b>Subtotal</b>	<b>\$28,362,137</b>	<b>\$39,471,132</b>	<b>\$54,366,054</b>	<b>\$44,910,840</b>	<b>\$33,323,276</b>
Contingency	\$8,508,641	\$11,841,340	\$16,309,816	\$13,473,252	\$9,996,983
<b>Individual Water System Total</b>	<b>\$36,870,778</b>	<b>\$51,312,472</b>	<b>\$70,675,870</b>	<b>\$58,384,092</b>	<b>\$43,320,259</b>
<b>Project Total Pipeline Costs</b>					<b>\$260,600,000</b>

Note: All stream and wetland impacts are temporary and no mitigation is calculated.

## Hazel Creek Lake

1.00	Construction	Quantity	Unit	Unit Cost	Total
1.01	Mobilization, Bonding, Insurance	1	L.S.	\$2,100,000	\$2,100,000
1.02	Clearing and Grubbing	100	Acres	\$2,500	\$250,000
1.03	Dam Decommissioning and Silt Removal	1	L.S.	\$5,000,000	\$5,000,000
1.04	Structural Earth Fill	725,600	CY	\$6.80	\$4,934,100
1.05	Chimney and Blanket Drain Aggregate	49,700	CY	\$70.00	\$3,479,000
1.06	Slurry Trench/Grout Curtain	1	L.S.	\$878,000	\$878,000
1.07	Riprap	12,800	CY	\$80	\$1,024,000
1.08	Instrumentation	1	L.S.	\$250,000	\$250,000
1.09	Spillway	1	L.S.	\$4,451,000	\$4,451,000
1.10	Intake Structure	1	Each	\$1,432,000	\$1,432,000
1.11	Access Bridge	1	L.S.	\$550,000	\$550,000
1.12	Outlet Works	1	L.S.	\$1,692,000	\$1,692,000
1.13	Contractor Construction Staking	1	L.S.	\$150,000	\$150,000
1.14	Erosion Control	1	L.S.	\$150,000	\$150,000
1.20	Access Roads	0.5	Mi	\$75,000	\$37,500
1.23	Miscellaneous Dam Appurtenances	1	L.S.	\$ 2,000,000	\$2,000,000
				<b>Subtotal</b>	<b>\$28,377,600</b>
1.23	Contingencies (30%)				\$8,513,300
				<b>Construction Subtotal</b>	<b>\$36,900,000</b>
2.00	Utility Relocation	427	Acres	\$2,280	\$1,000,000
				<b>Utility Relocation Subtotal</b>	<b>\$1,000,000</b>
3.00	Reservoir Preparation	427	Acres	\$7,500	\$3,202,500
				<b>Reservoir Preparation Subtotal</b>	<b>\$3,202,500</b>
4.00	Engineering Services (10% of Items 1, 2, and 3 Subtotals)				\$4,100,000
				<b>Engineering Subtotal</b>	<b>\$4,100,000</b>
5.00	Other Professional Services & Miscellaneous				
5.01	Appraisals / Descriptions				\$351,000
5.02	Land Acquisition	900	Acres	\$3,900	\$3,510,000
				<b>Other Subtotal</b>	<b>\$3,900,000</b>
6.00	Recreation Cost				
6.01	Parking Lot Drive Lane Construction	9,630	SF	\$10	\$96,300
6.02	Parking Lot	43	Spaces	\$4,710	\$202,600
6.03	Universal Access and Other Amenities	1	L.S.	\$1,000,000	\$1,000,000
				<b>Recreation Subtotal</b>	<b>\$1,300,000</b>
7.00	Mitigation				\$1,210,000

<b>Mitigation Subtotal</b>		<b>\$1,210,000</b>
<b>Project Capital Cost</b>		<b>\$51,600,000</b>
<b>Project O&amp;M PV</b>		<b>\$500,000</b>
<b>Project Cost</b>		<b>\$52,100,000</b>

L.S. = Lump Sum; CY = Cubic Yards; SF = Square Feet; Mi = Miles

Note: Stream Impacts = 26,928 feet  
Wetland Impacts = 22.2 acres

## Green City Lake

1.00	Construction	Quantity	Unit	Unit Cost	Total
1.01	Mobilization, Bonding, Insurance	1	L.S.	\$2,100,000	\$2,100,000
1.02	Clearing and Grubbing	100	Acres	\$2,500	\$250,000
1.03	Dam Decommissioning and Silt Removal	1	L.S.	\$5,000,000	\$5,000,000
1.04	Structural Earth Fill	661,700	CY	\$6.80	\$4,499,600
1.05	Chimney and Blanket Drain Aggregate	45,300	CY	\$70.00	\$3,171,000
1.06	Slurry Trench/Grout Curtain	1	L.S.	\$878,000	\$878,000
1.07	Riprap	11,700	CY	\$80	\$936,000
1.08	Instrumentation	1	L.S.	\$250,000	\$250,000
1.09	Spillway	1	L.S.	\$4,451,000	\$4,451,000
1.10	Intake Structure	1	Each	\$1,432,000	\$1,432,000
1.11	Access Bridge	1	L.S.	\$550,000	\$550,000
1.12	Outlet Works	1	L.S.	\$1,692,000	\$1,692,000
1.13	Contractor Construction Staking	1	L.S.	\$150,000	\$150,000
1.14	Erosion Control	1	L.S.	\$150,000	\$150,000
1.16	6-inch Raw Water Main	61,800	L.F.	\$85	\$5,253,000
1.17	18-inch Directional Boring	1,000	L.F.	\$600	\$400,000
1.18	18-inch Steel Encasement	1,000	L.F.	\$300	\$200,000
1.19	6-inch Valves	12	Each	\$4,000	\$48,000
1.20	Access Roads	1.0	Mi	\$75,000	\$75,000
1.21	Road Repairs	186	Sq. Yd.	\$100	\$18,600
1.22	Clean Up, Finish Grading, Seeding, Mulch	107	Acres	\$7,500	\$802,500
1.23	Miscellaneous Dam Appurtenances	1	L.S.	\$2,000,000	\$2,000,000
				<b>Subtotal</b>	<b>\$34,306,700</b>
1.23	Contingencies (30%)				\$10,292,100
				<b>Construction Subtotal</b>	<b>\$44,600,000</b>
<b>2.00</b>	<b>Utility Relocation</b>	<b>127</b>	<b>Acres</b>	<b>\$2,280</b>	<b>\$300,000</b>
				<b>Utility Relocation Subtotal</b>	<b>\$300,000</b>

<b>3.00</b>	<b>Reservoir Preparation</b>	<b>127</b>	<b>Acres</b>	<b>\$7,500</b>	<b>\$952,500</b>
		<b>Reservoir Preparation Subtotal</b>			<b>\$952,500</b>
<b>4.00</b>	<b>Engineering Services (10% of Items 1, 2, and 3 Subtotals)</b>				<b>\$4,600,000</b>
		<b>Engineering Subtotal</b>			<b>\$4,600,000</b>
<b>5.00</b>	<b>Other Professional Services &amp; Miscellaneous</b>				
5.01	Appraisals / Descriptions				\$117,000
5.02	Land Acquisition	300	Acres	\$3,900	\$1,170,000
		<b>Other Subtotal</b>			<b>\$1,300,000</b>
<b>6.00</b>	<b>Recreation Cost</b>				
6.01	Parking Lot Drive Lane Construction	9,630	SF	\$10	\$96,300
6.02	Parking Lot	13	Spaces	\$4,710	\$61,300
6.03	Universal Access and Other Amenities	1	L.S.	\$1,000,000	\$1,000,000
		<b>Recreation Subtotal</b>			<b>\$1,200,000</b>
<b>7.00</b>	<b>Mitigation</b>				<b>\$270,000</b>
		<b>Mitigation Subtotal</b>			<b>\$270,000</b>
		<b>Project Capital Cost</b>			<b>\$53,200,000</b>
		<b>Project O&amp;M PV</b>			<b>\$500,000</b>
		<b>Project Cost</b>			<b>\$ 53,700,000</b>

L.S. = Lump Sum; CY = Cubic Yards; Sq. Yd. = Square Yards; SF = Square Feet; LF = Linear Feet; Mi = Miles

Note: Stream Impacts = 4,330 feet  
Wetland Impacts = 7.3 acres

## Elmwood Lake

<b>1.00</b>	<b>Construction</b>	<b>Quantity</b>	<b>Unit</b>	<b>Unit Cost</b>	<b>Total</b>
1.01	Mobilization, Bonding, Insurance	1	L.S.	\$1,980,000	\$1,980,000
1.02	Clearing and Grubbing	100	Acres	\$2,500	\$250,000
1.03	Dam Decommissioning and Silt Removal	1	L.S.	\$5,000,000	\$5,000,000
1.04	Structural Earth Fill	607,300	CY	\$6.80	\$4,129,700
1.05	Chimney and Blanket Drain Aggregate	41,600	CY	\$70.00	\$2,912,000
1.06	Slurry Trench/Grout Curtain	1	L.S.	\$878,000	\$878,000
1.07	Riprap	10,700	CY	\$80	\$856,000
1.08	Instrumentation	1	L.S.	\$250,000	\$250,000
1.09	Spillway	1	L.S.	\$4,451,000	\$4,451,000
1.10	Intake Structure	1	Each	\$1,432,000	\$1,432,000
1.11	Access Bridge	1	L.S.	\$550,000	\$550,000
1.12	Outlet Works	1	L.S.	\$1,692,000	\$1,692,000
1.13	Contractor Construction Staking	1	L.S.	\$150,000	\$150,000

1.14	Erosion Control	1	L.S.	\$150,000	\$150,000
1.20	Access Roads	0.4	Mi	\$75,000	\$30,000
1.23	Miscellaneous Dam Appurtenances	1	L.S.	\$2,000,000	\$2,000,000
				<b>Subtotal</b>	<b>\$26,710,700</b>
1.23	Contingencies (30%)				\$8,013,300
				<b>Construction Subtotal</b>	<b>\$34,700,000</b>
2.00	Utility Relocation	294	Acres	\$2,280	\$700,000
				<b>Utility Relocation Subtotal</b>	<b>\$700,000</b>
3.00	Reservoir Preparation	294	Acres	\$7,500	\$2,205,000
				<b>Reservoir Preparation Subtotal</b>	<b>\$2,205,000</b>
4.00	Engineering Services (10% of Items 1, 2, and 3 Subtotals)				\$3,800,000
				<b>Engineering Subtotal</b>	<b>\$3,800,000</b>
5.00	Other Professional Services & Miscellaneous				
5.01	Appraisals / Descriptions				\$234,000
5.02	Land Acquisition	600	Acres	\$3,900	\$2,340,000
				<b>Other Subtotal</b>	<b>\$2,600,000</b>
6.00	Recreation Cost				
6.01	Parking Lot Drive Lane Construction	9,630	SF	\$10	\$96,300
6.02	Parking Lot	30	Spaces	\$4,710	\$141,300
6.03	Universal Access and Other Amenities	1	L.S.	\$1,000,000	\$1,000,000
				<b>Recreation Subtotal</b>	<b>\$1,200,000</b>
7.00	Mitigation				\$1,180,000
				<b>Mitigation Subtotal</b>	<b>\$1,180,000</b>
				<b>Project Capital Cost</b>	<b>\$46,400,000</b>
				<b>Project O&amp;M PV</b>	<b>\$500,000</b>
				<b>Project Cost</b>	<b>\$46,900,000</b>

L.S. = Lump Sum; CY = Cubic Yards; SF = Square Feet; LF = Linear Feet; Mi = Miles

Note: Stream Impacts = 22,704 feet  
Wetland Impacts = 27.5 acres

## Forest Lake

1.00	Construction	Quantity	Unit	Unit Cost	Total
1.01	Mobilization, Bonding, Insurance	1	L.S.	\$2,100,000	\$2,100,000
1.02	Clearing and Grubbing	300	Acres	\$2,500	\$750,000
1.03	Dam Decommissioning and Silt Removal	1	L.S.	\$5,000,000	\$5,000,000
1.04	Structural Earth Fill	716,100	CY	\$6.80	\$4,869,500
1.05	Chimney and Blanket Drain Aggregate	49,000	CY	\$70.00	\$3,430,000
1.06	Slurry Trench/Grout Curtain	1	L.S.	\$878,000	\$878,000
1.07	Riprap	12,700	CY	\$80	\$1,016,000
1.08	Instrumentation	1	L.S.	\$250,000	\$250,000
1.09	Spillway	1	L.S.	\$4,451,000	\$4,451,000
1.10	Intake Structure	1	Each	\$1,432,000	\$1,432,000
1.11	Access Bridge	1	L.S.	\$550,000	\$550,000
1.12	Outlet Works	1	L.S.	\$1,692,000	\$1,692,000
1.13	Contractor Construction Staking	1	L.S.	\$150,000	\$150,000
1.14	Erosion Control	1	L.S.	\$150,000	\$150,000
1.15	Intermediate Booster Pump Station	1	Each	\$1,100,000	\$1,100,000
1.16	12-inch Raw Water Main	153,200	L.F.	\$125	\$19,150,000
1.17	24-inch Directional Boring	2,600	L.F.	\$500	\$1,300,000
1.18	24-inch Steel Encasement	2,600	L.F.	\$250	\$650,000
1.19	12-inch Valves	30	Each	\$5,000	\$150,000
1.20	Access Roads	2.0	Mi	\$75,000	\$150,000
1.21	Road Repairs	510	Sq. Yd.	\$100	\$51,000
1.22	Clean Up, Finish Grading, Seeding, Mulch	265	Acres	\$7,500	\$1,987,500
1.23	Miscellaneous Dam Appurtenances	1	L.S.	\$2,000,000	\$2,000,000
				<b>Subtotal</b>	<b>\$53,257,000</b>
1.23	Contingencies (30%)				\$15,977,100
				<b>Construction Subtotal</b>	<b>\$69,200,000</b>
<b>2.00</b>	<b>Utility Relocation</b>	<b>349</b>	<b>Acres</b>	<b>\$2,280</b>	<b>\$800,000</b>
				<b>Utility Relocation Subtotal</b>	<b>\$800,000</b>
<b>3.00</b>	<b>Reservoir Preparation</b>	<b>349</b>	<b>Acres</b>	<b>\$7,500</b>	<b>\$2,617,500</b>
				<b>Reservoir Preparation Subtotal</b>	<b>\$2,617,500</b>
<b>4.00</b>	<b>Engineering Services (10% of Items 1, 2, and 3 Subtotals)</b>				<b>\$7,300,000</b>
				<b>Engineering Subtotal</b>	<b>\$7,300,000</b>
<b>5.00</b>	<b>Other Professional Services &amp; Miscellaneous</b>				
5.01	Appraisals / Descriptions				\$273,000
5.02	Land Acquisition	700	Acres	\$3,900	\$2,730,000
				<b>Other Subtotal</b>	<b>\$3,000,000</b>
<b>6.00</b>	<b>Recreation Cost</b>				
6.01	Parking Lot Drive Lane Construction	9,630	SF	\$10	\$96,300
6.02	Parking Lot	35	Spaces	\$4,710	\$164,900

6.03	Universal Access and Other Amenities	1	L.S.	\$1,000,000	\$1,000,000
<b>Recreation Subtotal</b>					<b>\$1,300,000</b>
<b>7.00</b>	<b>Mitigation</b>				<b>\$780,000</b>
<b>Mitigation Subtotal</b>					<b>\$780,000</b>
<b>Project Capital Cost</b>					<b>\$85,000,000</b>
<b>Project O&amp;M PV</b>					<b>\$500,000</b>
<b>Project Cost</b>					<b>\$85,500,000</b>

L.S. = Lump Sum; CY = Cubic Yards; Sq. Yd. = Square Yards; SF = Square Feet; LF = Linear Feet;  
Mi = Miles

Note: Stream Impacts = 19,536 feet  
Wetland Impacts = 10.5 acres

## Floodplain Acquisition (FA 2)

This alternative is described in Section 2. This alternative will require land acquisition of approximately 3,700 acres.

<b>Flood Damage Reduction Alternative</b>					
<b>Opinion of Probable Project Cost</b>					
<b>Floodplain Acquisition (FA 2)</b>					
<b>1.00</b>	<b>Other Professional Services &amp; Miscellaneous</b>				
1.01	Appraisals / Descriptions				\$ 1,443,000
1.02	Land Acquisition	3,700	Acres	\$ 3,900	\$ 14,430,000
<b>Subtotal</b>					<b>\$ 15,900,000</b>
<b>Project Capital Cost</b>					<b>\$ 15,900,000</b>
<b>Project O&amp;M Cost</b>					<b>\$ 900,000</b>
<b>Project Cost</b>					<b>\$ 16,800,000</b>

Note: Stream Impacts = 0 feet  
Wetland Impacts = 0 acres

## Wetland Storage Areas (FA 6)

This alternative is described in Section 2 of this report. This alternative will require 6,141 acres of wetland storage and 9,212 acres of land acquisition.

<b>1.00</b>	<b>Other Professional Services &amp; Miscellaneous</b>				
1.01	Appraisals / Descriptions				\$ 3,592,700
1.02	Wetland Storage	6,141	Acres	\$ 5,000	\$ 30,705,000
1.03	Land Acquisition	9,212	Acres	\$ 3,900	\$ 35,926,800
<b>Other Subtotal</b>					<b>\$ 70,200,000</b>
<b>4.00</b>	<b>Mitigation</b>				<b>\$ 6,870,000</b>
<b>Mitigation Subtotal</b>					<b>\$ 6,870,000</b>
<b>Project Capital Cost</b>					<b>\$ 77,100,000</b>
<b>Project O&amp;M Cost</b>					<b>\$ 4,600,000</b>
<b>Project Cost</b>					<b>\$ 81,700,000</b>

Note: Stream Impacts = 229,152 feet  
Wetland Impacts = 0 acres

## Large Dry Dam – 100-year (FA 7)

This alternative is described in Section 2 of this report. This alternative will require clearing and grubbing of 16 acres, 133,300 CY of structural earth fill, 1,700 CY of riprap, 550 LF of box culvert, and 9 acres of cleanup, finish grading, seeding and mulching. This alternative will also require land acquisition of 1,060 acres.

<b>Flood Damage Reduction Alternative</b>					
<b>Opinion of Probable Project Cost</b>					
<b>Large Dry Dam – 100-year Storage (FA 7)</b>					
<b>1.00</b>	<b>Construction</b>	<b>Quantity</b>	<b>Unit</b>	<b>Unit Cost</b>	<b>Total</b>
1.01	Mobilization, Bonding, Insurance	1	L.S.	\$ 119,000	\$ 119,000
1.02	Clearing and Grubbing	16	CY	\$ 2,500	\$ 40,000
1.03	Structural Earth Fill	133,300	CY	\$ 6.8	\$ 906,500
1.04	Riprap	1,700	CY	\$ 80	\$ 136,000
1.05	Box Culvert (5 feet x 5 feet)	550	LF	\$ 600	\$ 330,000
1.06	Seeding, Fertilizer, Mulch	9	Acres	\$ 7,500	\$ 67,500
				<b>Subtotal</b>	<b>\$ 1,599,000</b>
1.07	Contingencies (30% of Construction Total)				\$ 479,700
<b>Construction Subtotal</b>					<b>\$ 2,100,000</b>

<b>2.00</b>	<b>Engineering Services (20% of Construction Subtotal)</b>			<b>Subtotal</b>	<b>\$ 200,000</b>
<b>Engineering Subtotal</b>					<b>\$ 200,000</b>
<b>3.00</b>	<b>Other Professional Services &amp; Miscellaneous</b>				
3.01	Appraisals / Descriptions				\$ 413,400
3.02	Land Acquisition	1,060	Acres	\$ 3,900.00	\$ 4,134,000
<b>Other Subtotal</b>					<b>\$ 4,500,000</b>
<b>4.00</b>	<b>Mitigation</b>				<b>\$ 50,000</b>
<b>Mitigation Subtotal</b>					<b>\$ 50,000</b>
<b>Project Capital Cost</b>					<b>\$ 6,900,000</b>
<b>Project O&amp;M Cost</b>					<b>\$ 400,000</b>
<b>Project Cost</b>					<b>\$ 7,300,000</b>

L.S. = Lump Sum; CY = Cubic Yards; LF = Linear Feet

Note: Stream Impacts = 211 feet  
 Wetland Impacts = 4 acres