Appendix A
Cost Estimation Procedures
South Central Texas Region

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The cost estimates of this study are expressed in three major categories: (1) construction costs or capital (structural) costs, (2) other (non-structural) project costs, and (3) annual costs. Construction costs are the direct costs incurred in constructing facilities, such as those for materials, labor, and equipment. "Other" project costs include expenses associated with implementation activities of the project, such as costs for engineering, legal counsel, land acquisition, contingencies, environmental studies and mitigation, and interest during construction. Capital costs and other project costs comprise the total project cost. Operation and maintenance (O&M), energy costs, and debt service payments are examples of annual costs. Major components that may be part of a preliminary cost estimate are listed in Table A-1. Cost estimating procedures used in the technical evaluation of water management strategies for the South Central Texas Region are summarized in the following sections.

Table A-1.
Major Project Cost Categories

Cost Elements	
Capital Costs (Structural Costs)	***Other Project Costs (Non-Structural Costs)***
1. Pump Stations 2. Pipelines 3. Water Treatment Plants 4. Water Storage Tanks 5. Off-Channel Reservoirs 6. Well Fields a. Public b. Irrigation c. ASR Wells 7. Dams and Reservoirs 8. Relocations 9. Water Distribution System Improvements 10. Other Items	1. Engineering (Design, Bidding and Construction Phase Services, Geotechnical, Legal, Financing, and Contingencies) 2. Land and Easements 3. Environmental - Studies and Mitigation 4. Interest During Construction ***Annual Project Costs*** 1. Debt Service 2. Operation and Maintenance (excluding pumping energy) 3. Pumping Energy Costs 4. Purchase Water Cost (if applicable)

A.1 Capital Costs

Capital costs for elements of a water management strategy are determined from reliable cost information. Cost tables are a useful method for estimating the construction costs for a project element quickly and efficiently. Cost tables have been created for planning cost estimates and are presented and discussed throughout this section. The cost tables report all-inclusive costs to construct. For example, the pump station cost table values include the building, pumps, control equipment, all other materials, labor, and installation costs.

The costs for a project element are typically computed by applying a unit cost from the cost tables to a specific unit quantity. Estimates are reported to the nearest thousand dollars. If previous cost estimates are used, a ratio of the Engineering News Record's Construction Cost Index (ENR CCI)[1] values is applied to update the cost to September 2008. For example, based on an average of the monthly index value September 2008 the representative index value would be 8557. The ENR CCI values are based on construction costs, including labor and materials, averaged over 20 cities. The index measures how much it would cost to purchase a hypothetical package of goods and services compared to what it was in a base year. The index values are reported monthly from 1977 to present. Average annual index values are reported from 1908 to 1976.

Capital cost data and cost estimating procedures are presented and discussed for pumping stations, pipeline, water treatment plants, storage tanks, off-channel reservoirs, well fields, dams and reservoirs, relocations, water distribution system improvements, and settling basins.

A.1.1 Pumping Stations

Intake and transmission pump station construction costs vary according to the discharge and pumping head requirement, and structural requirements for housing the equipment and providing proper flow conditions at the pump suction intake. The cost tables provided herein are based on the station size (in horsepower) necessary to deliver the peak flow rate. Pump station costs are listed in millions of dollars in Table A-2 for a range of horsepower requirements. The costs include those for pumps, housing, motors, electric control, site work, and all materials needed. The costs in Table A-2 were estimated using generalized cost data related to station horsepower from actual construction costs of equipment installed. The cost for an intake

[1] ENR: Engineering News Record, http://www.enr.com/.

Table A-2.
Pumping Station Construction Costs* (Without Intake Structures)

Pump Station (HP)	Pump Station Cost ($-millions)	Pump Station (HP)	Pump Station Cost ($-millions)
< 300	2.07	6,000	11.29
300	2.07	7,000	12.27
400	2.62	8,000	13.19
1,000	4.29	9,000	14.05
2,000	6.24	10,000	14.87
3,000	7.76	15,000	18.51
4,000	9.07	20,000	21.63
5,000	10.23	> 20,000	See Note

*Values are current as of September 2008.
NOTE: Pump Stations larger than 20,000 HP necessitate an individual cost estimate.

structure is included when pumping from a raw water source, such as a river or reservoir. Based on costs of actual projects, the intake structure cost is estimated as 50 percent of the intake pump station cost. The cost of bringing power to each pump station is estimated as $135/HP, with a minimum cost of $50,000. Power connection costs are calculated for each pump station and for well pumps. Costs for pump stations located at water treatment plants are included in the capital cost table for water treatment plants (Table A-5).

A.1.2 Pipelines

Pipeline construction costs are influenced by pipe materials, bedding requirements, geologic conditions, urbanization, terrain, and special crossings. For technical evaluation of water management strategies, pipeline costs are obtained from Table A-3, which shows unit costs based on the pipe diameters from 12-inches to 120-inches, soil type, and level of urban development. In the case of a high-pressure pipeline (>150 psi), the unit cost is increased by 13 percent for the length of pipe designated as high-pressure class pipe. The unit costs listed in Table A-3 represent the installed cost of the pipeline and appurtenances, such as markers, valves, thrust restraint systems, corrosion monitoring and control equipment, air and vacuum valves, blow-off valves, erosion control, revegetation of right-of-way, fencing, and gates.

Table A-3.
Pipeline Unit Construction Cost within Various Soil Environments*

Pipe Diameter (inches)	Soil		Combination Rock and Soil		Rock	
	Rural ($/ ft)	Urban ($/ ft)	Rural ($/ ft)	Urban ($/ ft)	Rural ($/ ft)	Urban ($/ ft)
12	51	80	62	96	75	113
14	57	91	71	109	86	127
16	64	102	80	123	94	140
18	72	112	89	134	105	153
20	82	119	94	144	112	166
24	110	135	105	162	136	202
27	132	155	119	184	163	240
30	155	173	134	203	190	281
33	179	201	155	239	222	331
36	204	228	178	273	248	372
42	256	291	224	348	315	468
48	312	361	277	433	370	554
54	371	441	336	525	435	654
60	434	521	399	620	500	749
64	478	578	443	688	545	815
66	501	609	469	728	570	852
72	571	700	538	835	645	970
78	645	799	605	954	740	1,107
84	723	905	697	1,079	837	1,251
90	804	1,023	787	1,219	946	1,415
96	888	1,148	885	1,370	1,063	1,566
102	977	1,275	981	1,520	1,175	1,763
108	1,068	1,409	1,085	1,680	1,302	1,952
114	1,164	1,549	1,190	1,849	1,430	2,144
120	1,263	1,698	1,307	2,024	1,568	2,349
132	1,600	2,144	1,648	2,560	1,984	2,960
144	1,900	2,546	1,957	3,040	2,356	3,515

* * Values as of September 2008.

NOTE: Add 13 percent to unit price for length of pipe with pressure class > 150 psi.

Additional costs are included for pipeline installation when crossing roads, streams, or rivers. Some form of trenchless technology will likely be used to install the pipeline when obstructions (e.g., larger streams, major roads, railways, rivers, and structures) are encountered. The two trenchless technologies included herein are: (1) pipe jacking utilizing boring and/or tunnel techniques to excavate the soil, and (2) horizontal directional drilling. Table A-4 shows costs that are used to estimate pipeline borings and tunneling.

Table A-4.
Crossing Costs with Boring or Tunneling Construction*

Pipe Diameter (inches)	*Tunneling Cost ($/inch diameter/ft)*
≤48	23
54	22
60	21
66	20
72	19
78	18
≥84	17

* Values current as of September 2008.

A.1.3 Water Treatment Plants

Water treatment plant construction costs shown in Table A-5 are based on plant capacity for seven different types or levels of treatment. It is not the intent of these cost estimating procedures to establish an exact treatment process, but rather to estimate the cost of a general process appropriate for bringing the source water quality to the required standard of the receiving system (i.e., potable water distribution system, a stream in an aquifer recharge zone, or an aquifer injection well). Table A-6 gives a description of the processes involved in each treatment level. The costs in Table A-5 include costs for all processes required, site work, buildings, storage tanks, sludge handling and disposal, clearwell, pumps, and equipment. The costs assume pumping through the plant as follows: Levels 2 through 6 treatment plants include raw water pumping into the plant for a total pumping head of 100 feet, and finished water pumping for 300 feet of total head. Levels 0 and 1 treatments include only finished water pumping at 300 feet of head.

Table A-5.
Water Treatment Plant Construction Costs*

Capacity (MGD)	Level 0 Capital Cost ($)	Level 1 Capital Cost ($)	Level 2 Capital Cost ($)	Level 3 Capital Cost ($)	Level 4 Capital Cost ($)	Level 5 Capital Cost ($)	Level 6 Capital Cost ($)
1	61,901	806,582	4,086,505	5,064,198	8,630,163	3,028,033	4,796,619
10	186,773	3,356,695	10,986,401	19,659,747	33,563,470	16,011,061	24,907,583
50	550,941	9,748,927	27,768,136	66,497,646	103,889,408	59,046,648	91,510,915
75	737,715	14,065,482	35,760,670	95,408,275	143,846,718	84,637,548	133,447,835
100	909,884	17,232,725	42,472,587	115,648,118	191,795,088	111,461,099	173,040,039
150	1,226,889	26,371,758	54,939,241	173,469,377	287,691,962	163,420,005	251,782,301
200	1,519,242	30,367,288	61,333,081	213,945,378	383,590,175	214,695,594	329,224,921

* Values current as of September 2008.

A.1.4 Storage Tanks

Ground storage tanks may be used for stand-alone storage, as part of a distribution system, or as part of a pumping station. The construction costs for storage tanks are listed in Table A-7 as cost per million gallons of capacity. A storage tank should be included at each transmission pump station along a pipeline. It is assumed that storage tanks at these stations will provide storage for 5 percent of the daily flow.

A.1.5 Off-Channel Reservoirs

An off-channel reservoir is a reservoir located away from a main river channel that receives little or no natural inflow. Off-channel reservoirs are built by placing a dam across a minor tributary or by constructing a ring dike that has no associated tributary. The capacity of these reservoirs is typically used for storing water that is pumped from another location, such as a nearby river. Because natural inflow is an insignificant factor, spillway requirements are minimal. The values in Table A-8 are used for a construction cost estimate for an off-channel reservoir. In this regional water plan, the cost of ring dikes is used for all off-channel reservoirs.

Table A-6.
Water Treatment Level Descriptions

Level 0:	Disinfection Only - This treatment process will be used for groundwater with no contaminants that exceed the regulatory limits. Assumes groundwater does not require treatment for taste and odor reduction and groundwater is stable and requires no treatment for corrosion stabilization. With this treatment, the groundwater is suitable for public water system distribution, aquifer injection, or delivery to the recharge zone.
Level 1:	Groundwater Treatment - This treatment process will be used for groundwater to lower the iron and manganese content and to disinfect. The process includes application of an oxidant and addition of phosphate to sequester iron and manganese. Chlorine disinfection is the final treatment. With this treatment, the groundwater is suitable for public water system distribution, aquifer injection, or delivery to the recharge zone.
Level 2:	Direct Filtration Treatment - This treatment process will be used for treating groundwater from sources where iron, manganese, or other constituent concentrations exceed the regulatory limit and require filtration for solids removal. Assumes turbidity and taste and odor levels are low. In the direct filtration process, low doses of coagulant and polymer are used and settling basins are not required as all suspended solids are removed by filters. The process includes alum and polymer addition, rapid mix, flocculation, filtration, and disinfection. Water treatment with this process is suitable for aquifer injection or for delivery to the recharge zone.
Level 3:	Surface Water Treatment - This treatment process will be used for treating all surface water sources to be delivered to a potable water distribution system. The process includes coagulant and polymer addition, rapid mix, flocculation, settling, filtration, and disinfection with chlorine. This treatment process also applies for difficult to treat groundwater containing high concentrations of iron (greater than 3 mg/l) and manganese requiring settling before filtration.
Level 4:	Reclaimed Water Treatment - This process will be used for treatment where wastewater effluent is to be reclaimed and delivered to a supply system or injected to an aquifer. The concept includes increased treatment of wastewater effluent by phosphorous removal, storage in a reservoir, blending with surface runoff from the reservoir catchment, followed by conventional water treatment. Phosphorous will be removed from the effluent by lime softening including lime feed, rapid mix, flocculation, settling, recarbonation, and filtration. The final treatment assumes ozonation, activated carbon, addition of coagulant and polymer, rapid mix, flocculation, sedimentation, second application of ozone, filtration and disinfection with chlorine. This treatment results in water than can be delivered to a public water system for distribution or injection to the aquifer.
Level 5:	Brackish Groundwater Desalination - Note: This treatment cost does not include pretreatment for solids removal prior to RO membranes. For desalination of a surface water or groundwater containing high solids concentrations, additional solids removal treatment should be included in addition to desalination. (Example: add level 3 treatment costs for a turbid surface water source). This treatment process will be used for treatment of groundwater with total dissolved solids (TDS) exceeding the regulatory limit of 1,000 mg/l. Costs are based on reverse osmosis (RO) membrane desalination of a groundwater with 3,000 mg/l of TDS to lower the treated water TDS below the regulatory limit. The desalination concept includes minimal pretreatment (cartridge filtration, antiscalent addition, acid addition), reverse osmosis membrane system, and disinfection with chlorine. Costs assume desalination concentrate will be discharged to surface water adjacent to treatment plant. With this treatment, the groundwater is suitable for public water system distribution, aquifer injection, and delivery to the recharge zone.
Level 6:	Seawater Desalination - Note: This treatment cost does not include pretreatment for solids removal prior to RO membranes. For desalination of a surface water or groundwater containing high solids concentrations, additional solids removal treatment should be included in addition to desalination. (Example - For desalination of seawater with an intake located on the coast drawing turbid water, cost estimate should include Level 3 treatment plus Level 6). This treatment process will be used for treatment of seawater with total dissolved solids (TDS) exceeding the regulatory limit of 1,000 mg/l. Costs are based on reverse osmosis (RO) membrane desalination of a water with 32,000 mg/l of TDS to lower the treated water TDS below the regulatory limit. The desalination concept includes minimal pretreatment (cartridge filtration, antiscalent addition, acid addition), reverse osmosis membrane system, and disinfection with chlorine. Costs assume desalination concentrate will be discharged to surface water adjacent to treatment plant. With this treatment, the ground water is suitable for public water system distribution, aquifer injection, and delivery to the recharge zone.

Table A-7.
Ground Storage Tank Construction Costs*

Tank Volume (MG)	Cost ($)
0.01	22,777
0.05	79,050
0.10	133,984
0.50	455,545
1.00	777,106
2.00	1,313,041
4.00	2,277,724
6.00	3,081,627
7.50	3,617,562
9.00	4,153,497
* Values current as of September 2008.	

Table A-8.
Off Channel Storage Construction Costs*

Storage Volume (ac-ft)	Off-Channel Reservoir – Ring Dike (Flat) Capital Cost ($)	Off-Channel Reservoir – Rolling Capital Cost ($)	Off-Channel Reservoir – Canyons Capital Cost ($)
500	$3,870,784	$5,416,950	$5,416,950
1,000	$5,419,365	$7,605,944	$7,605,944
2,500	$8,491,988	$11,949,244	$11,949,244
4,000	$10,706,620	$15,079,732	$15,274,239
5,000	$11,954,776	$16,844,061	$17,417,971
10,000	$16,851,907	$23,766,391	$25,188,984
12,500	$18,825,419	$26,556,045	$28,270,633
15,000	$20,609,611	$29,078,085	$31,218,277
17,500	$22,250,345	$31,397,341	$34,031,918
19,000	$23,178,787	$32,709,738	$35,907,752
20,000	$23,777,503	$33,556,052	$36,845,559
22,000	$24,931,611	$35,187,440	$38,855,397
25,000	$26,568,473	$37,501,221	$41,535,034
* Values current as of September 2008.			

A.1.6 Well Fields

The construction costs for public water supply wells are summarized in Table A-9. The costs include well completion, pumps, and other necessary facilities, such as access roads, fencing, and site improvements. The costs for irrigation wells are estimated to be 55 percent of public water supply well costs. Aquifer storage and recovery (ASR) well costs are estimated using the values represented in Table A-10.

Table A-9.
Public and Irrigation Well Construction Costs

Table A-9(a): Public Supply Well Construction Costs*

Well Depth (ft)	Well Capacity (gpm)					
	100	175	350	700	1000	1800
150	$111,207	$168,820	$288,065	$325,581	$405,971	$593,548
300	$150,062	$214,374	$342,998	$392,572	$485,021	$687,337
500	$194,276	$267,968	$407,311	$468,943	$577,470	$799,883
700	$234,472	$316,202	$464,924	$538,615	$660,540	$899,031
1000	$308,163	$404,631	$572,111	$665,899	$814,621	$1,083,929
1500	$431,428	$553,353	$748,969	$878,934	$1,069,190	$1,389,412
2000	$554,693	$700,735	$925,828	$1,091,968	$1,325,099	$1,696,235

* Values current as of September 2008.

Table A-9(b): Irrigation Well Construction Costs*

Well Depth (ft)	Well Capacity (gpm)					
	100	175	350	700	1000	1800
150	$61,633	$95,128	$162,120	$186,237	$235,811	$340,319
300	$81,730	$121,925	$198,296	$234,472	$297,444	$415,350
500	$101,828	$152,741	$237,151	$286,725	$364,436	$502,439
700	$117,906	$175,519	$270,647	$330,940	$423,389	$577,470
1000	$154,081	$226,433	$340,319	$422,049	$539,955	$724,852
1500	$215,714	$313,522	$455,545	$573,451	$732,891	$968,703
2000	$276,007	$397,932	$570,771	$723,512	$927,168	$1,213,893

* Values current as of September 2008.

Table A-10.
ASR Well Construction Costs*

Well Depth (ft)	Well Capacity (gpm)					
	100	175	350	700	1000	1800
150	$123,265	$190,257	$330,940	$373,815	$466,264	$687,337
300	$162,120	$235,811	$385,873	$440,807	$545,314	$782,465
500	$206,335	$290,745	$450,185	$517,177	$639,103	$893,672
700	$247,870	$338,979	$509,138	$586,849	$720,833	$994,160
1000	$320,221	$427,408	$614,986	$714,133	$874,914	$1,177,717
1500	$444,826	$574,790	$791,844	$927,168	$1,129,483	$1,483,200
2000	$566,751	$722,173	$968,703	$1,140,202	$1,385,392	$1,790,023

* Values current as of September 2008.

A.1.7 Dams and Reservoirs

Construction costs for dams and reservoirs are handled individually. Since each reservoir site is unique, costs are based on the specific project requirements. Items included in the estimate consist of the capital (structural) and "other" (non-structural) costs listed in Table A-1. Previous cost estimates are updated to September 2008 prices, using the ENR CCI.

A.1.8 Relocations

Large-scale projects, such as reservoirs, may require the use of lands that contain existing improvements or facilities such as utilities, roads, homes, businesses, and cemeteries. The cost estimating procedures account for either the cost of relocation or outright purchase of these types of improvements and facilities. Because the type of improvements and facilities needing relocation vary significantly from project to project, estimating the costs for relocation items is addressed on an individual project basis.

A.1.9 Water Distribution System Improvements

Introducing treated water to a city or other entity may require improvements to the entity's water distribution system, which is comprised of piping, valves, storage tanks, pump stations, and other equipment used to distribute water throughout the entity's service area.

Cost estimate guidelines were developed specifically for distribution system improvements for the City of San Antonio during the Trans-Texas Water Program, which was completed in 1996. These costs were obtained from a 1991 Black and Veatch report to the San

Antonio City Water Board entitled *"Report on Master Plan for Water Works Improvements"* and include estimated costs for improvements to San Antonio's distribution system to convey treated water from the proposed Applewhite project. For strategies producing up to 50-MGD the annual costs were estimated at $1,327,000 per MGD of capacity (September 2008). Above 50-MGD capacity, the unit cost is estimated at $819,915 per MGD (September 2008).

A.1.10 Stilling Basins

If a water management strategy involves discharging into a water body or perhaps into a recharge structure, it may require a stilling basin. Stilling basin costs, when applicable, were estimated as $3,025 per cfs discharge.

A.2 Other Project Costs

As previously mentioned, "other" (non-structural) project costs are costs incurred in order to implement a project. These include costs for engineering, legal counsel, financing, contingencies, land, easements, surveying and legal fees for land acquisition, environmental and archaeology studies, permitting, mitigation, and interest during construction. These costs are added to the capital costs to obtain the total project cost. The major components of these costs are described below.

A.2.1 Engineering, Legal, Financing, and Contingencies

A percentage applied to the capital costs is used to calculate a combined cost that includes engineering, financial, legal services, and contingencies. The contingency allowance accounts for unforeseen costs and for variances in design elements. In accordance with TWDB guidelines, the percentages used are 30 percent of the total construction costs for pipelines and 35 percent for all other facilities.

A.2.2 Land Acquisition

Land-related costs for a project can typically be divided into two categories: (1) land purchase costs and (2) easement costs. Land areas acquired for various facility types are considered based upon previous project experience. Two types of easements are usually acquired for pipeline construction – temporary and permanent. Permanent easements are those in which the pipeline will reside once constructed. These permanent easements provide access for maintenance and protection from other parallel underground utilities. Temporary easements provide extra working space during construction for equipment movement, material storage, and related construction activities. Pipeline easement costs are estimated using a value of $8,712 per acre ($0.20 per sq-ft), based in large part on recent experience with the Mary Rhodes Pipeline extending from Lake Texana to Corpus Christi. The pipeline area considered in the acquisition cost includes a permanent easement width of 30 to 40 feet, depending upon the pipe size. This value includes costs for the temporary easement.

Land costs vary significantly with location and economic factors. Land costs in Texas are estimated using *"Rural Land Values in the Southwest"*, by Charles E. Gilliland, published biannually by the Real Estate Center at Texas A&M University, College Station, Texas. Other sources of land values, such as county appraisal district records, are also utilized. The land acquisition area estimated for reservoirs includes the acreage inundated by the 100-year or standard project flood.

A.2.3 Surveying and Legal Fees

Ten percent (10 percent) is added to the total land and easement costs to account for surveying and legal fees associated with land acquisition, except for reservoirs and large well fields. The surveying cost for reservoirs is estimated at $50 per acre of inundation.

A.2.4 Environmental and Archaeology Studies, Permitting, and Mitigation

Costs for environmental studies, permitting, and mitigation, as well as archaeological recovery are project-dependent and are estimated on an individual basis using information available and the judgment of qualified professionals. In the case of reservoir strategies, environmental studies and mitigation costs were generally based on 100 percent of the land value for the acreage purchased. The environmental studies and mitigation costs for pipelines were estimated at $25,000 per mile of pipeline.

A.2.5 Interest During Construction

Interest during construction (IDC) is calculated as the cost of interest on the borrowed amount less the return on the proportion of borrowed money invested during construction. In accordance with TWDB guidelines, IDC is calculated as the total of interest accrued at the end of the construction period using a 6 percent annual interest rate on total borrowed funds, less a 4 percent rate of return on investment of unspent funds.

A.3 Annual Costs

Annual costs are those that the project owner can expect to incur if the project is implemented. These costs include repayment of borrowed funds (debt service), operation and maintenance costs of the project facilities, pumping power costs, and water purchase costs, when applicable.

A.3.1 Debt Service

Debt service is the estimated annual payment that can be expected for repayment of borrowed funds based on the total project cost (present worth), an assumed finance rate, and the finance period in years. As specified in TWDB Exhibit B, Section 1.71, debt service for all projects was calculated assuming an annual interest rate of 6 percent and a repayment period of 40 years for reservoir projects and 30 years for all other projects. The debt service factor of 0.06646 or 0.07265 for 40- or 30-year repayment periods is applied, respectively, to the total estimated project costs.

A.3.2 Operation and Maintenance

Operation and maintenance (O&M) costs for dams, pump stations, pipelines, and well fields (excluding pumping power costs) include labor and materials required to operate the facilities and provide for regular repair and/or replacement of equipment. In accordance with TWDB guidelines, O&M costs are calculated at 1 percent of the total estimated construction costs for pipelines, distribution, facilities, tanks and wells, at 1.5 percent of the total estimated construction costs for dams and reservoirs, and at 2.5 percent for intake and pump stations.

Water treatment plant O&M is estimated using Table A-11. The O&M costs listed in Table A-11 include labor, materials, replacement of equipment, process energy, building energy, chemicals, and pumping energy.

Table A-11.
Operation and Maintenance Costs for Water Treatment Plants*

Capacity (MGD)	Level 0 O&M Cost ($)	Level 1 O&M Cost ($)	Level 2 O&M Cost ($)	Level 3 O&M Cost ($)	Level 4 O&M Cost ($)	Level 5 O&M Cost ($)	Level 6 O&M Cost ($)
1	28,137	160,513	287,663	396,016	559,382	340,319	797,203
10	83,472	894,878	1,198,351	1,547,218	4,156,043	2,639,480	6,993,953
50	313,522	3,356,695	5,114,428	6,328,737	18,380,564	12,339,905	33,804,105
75	453,401	5,114,428	7,671,643	9,846,159	28,769,933	18,328,980	50,418,093
100	591,806	6,312,779	9,748,927	12,306,115	38,358,482	24,412,784	66,485,310
150	865,267	10,228,857	14,384,900	17,580,627	57,538,392	36,324,401	97,825,323
200	1,136,048	11,986,724	19,179,911	22,854,992	76,718,303	48,169,023	128,937,554

* Values current as of September 2008..

A.3.3 Pumping Energy Costs

In accordance with TWDB guidelines, power costs are calculated on an annual basis using the appropriate calculated power load and a power rate of $0.06 per kWh. The amount of energy consumed is based on the pumping horsepower required.

A.3.4 Purchase of Water

The purchase cost, if applicable, is included if the water management strategy involves purchase of raw or treated water from an entity or a landowner. This cost varies by source.

A.4 Cost Estimate Presentation

For each individual water management strategy total capital costs, total project costs, and total annual costs are presented. The level of detail is dependent on the characteristics of the water management strategy. Additionally, a summary is calculated, showing the cost per unit of water provided by the management strategy, reported as costs per acft and cost per 1,000 gallons of water developed. The individual management strategy cost tables specify the point within the region at which the cost applies (e.g., raw water at the lake, treated water at the municipal and industrial demand center, or elsewhere as appropriate).