

5A.20 Interconnecting Regional and Community Water Systems

Interconnections between regional water suppliers and smaller community systems can provide an important water supply to either augment local supplies or supply all water needs of a community. Regional water supply systems typically are a city water utility that has entered in to contracts to supply water on a wholesale basis to smaller neighboring water utilities. Examples of cities that are regional supplies include Abilene, Waco, and Round Rock. However, regional water suppliers may be independent entities formed for the sole purpose of providing water to their customers. Examples of independent regional water suppliers include the Surface Water and Treatment System (SWATS) system owned and operated by the Brazos River Authority, the West Central Texas Municipal Water District, the Upper Leon Water District, the Central Texas Water Supply Corporation and many other water supply corporations.

Cities, water supply districts, and some of the larger water supply corporations have the ability to plan, finance, and build water supply facilities for future needs, whereas smaller entities may have difficulty implementing needed projects. By entering into purchase contracts with the larger entities, the smaller and water-short cities and rural utilities can obtain reliable, high quality water supplies that would not be possible for them to implement individually.

Five circumstances where utilities have planned and invested in their water supply systems and have the ability to provide water to neighboring areas have been studied and are reported in this section. These five systems cover a range of project sizes and can be considered as typical examples for other possible interconnections between utilities. As the Brazos G Regional planning progresses, the information provided in these five studies should be used to consider other regional interconnections regarding cost, implementation issues, and other factors. The five regional systems studied are:

Section 5A.20.1 – Interconnection of Community Systems in Bosque County

Section 5A.20.2 – Use of Oryx/Kerr-McGee Pipeline from Possum Kingdom Reservoir to Rural Systems in Stephens, Shackelford, and Throckmorton Counties

Section 5A.20.3 – Interconnection of City of Abilene System with City of Hamlin

Section 5A.20.4 – Interconnection of City of Waco System with Neighboring Communities

Section 5A.20.5 – Interconnection of Central Texas WSC with Salado WSC

5A.20.1 Interconnection of Regional and Community Water Systems in Bosque County

5A.20.1.1 Description of Option

Several entities in Bosque County are projected to have water shortages in the year 2050. The cities of Meridian, Walnut Springs, and Valley Mills and the County-Other entities are projected to have a total combined shortage of 1,601 acft/yr by the year 2050. One potential solution to meet the supply shortages is for the interconnection of community systems. In Bosque County, several such opportunities exist. One Alternative identified includes the City of Clifton providing service to Childress Creek WSC (CCWSC) and the City of Valley Mills. Clifton is currently implementing a surface water supply project to meet its water supply needs with the ability to serve areas outside its service area. The City of Clifton would sell water on a wholesale basis via interconnection to CCWSC. CCWSC has existing infrastructure near the City of Clifton and the City of Valley Mills. Construction of some additional facilities along with use of existing CCWSC infrastructure would provide service from Clifton to Valley Mills. A second alternative identified includes the City of Clifton providing service to Mustang Valley WSC. MVWSC could buy water from Clifton on a wholesale basis at the City's water treatment plant and construct a pipeline to the City to convey the treated water.

The second opportunity in Bosque County for interconnection of a community system is the construction of a new off-channel reservoir for the City of Meridian, enabling them to sell water on a wholesale basis to neighboring entities. The City of Walnut Springs and Mustang Valley WSC would be potential customers for the City of Meridian, with construction of pipeline systems to serve each entity. The potential new off-channel reservoir is described in more detail in Section 5A.15.1. Figure 5A.20-1 shows the potential interconnected systems.

5A.20.1.2 Available Yield

The yield of the City of Clifton's off-channel storage reservoir and the potential off-channel storage at the City of Meridian are a function of river flow, diversion rate, and reservoir storage. Hydrologic analysis show that the firm yield at the city of Clifton is 720 acft/yr and the firm yield of the potential reservoir at Meridian would be 574 acft/yr.

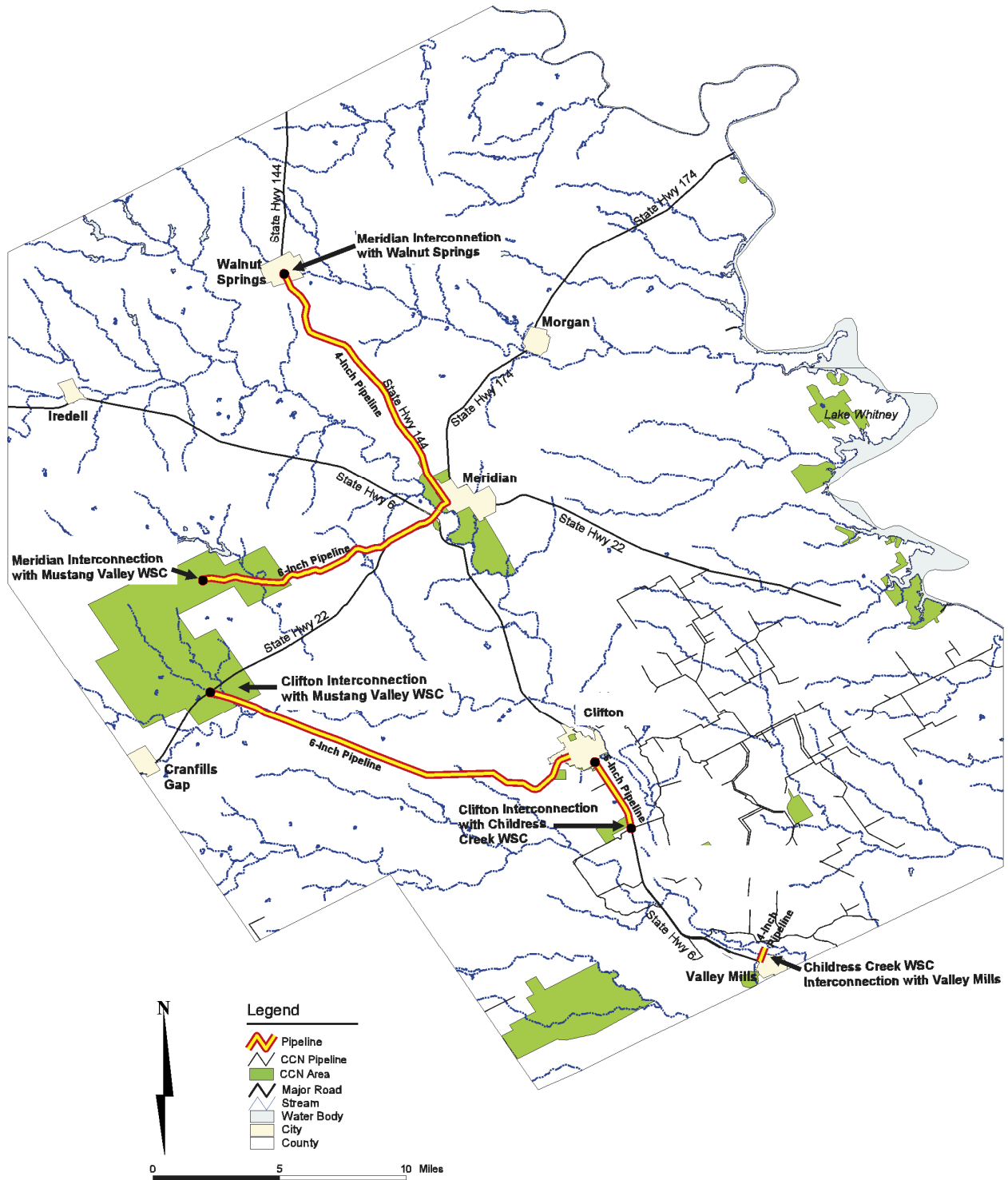


Figure 5A.20-1. Interconnection of Bosque County Systems

5A.20.1.3 Environmental

Environmental impacts could include:

- Possible low to moderate impacts on in-stream flows due to increased diversions.
- Possible moderate impacts on endangered species depending on specific locations of pipelines.
- Possible moderate impacts on riparian corridors depending on specific locations of pipelines.

A summary of environmental issues is presented in Table 5A.20-1.

**Table 5A.20-1
Environmental Issues
Interconnection of City of Clifton System to Surrounding Communities**

Water Management Option	Interconnection of City of Clifton System to Surrounding Communities
Implementation Measures	Construction of pump stations, storage tanks and approximately 40 miles of pipelines between City of Clifton and surrounding communities
Environmental Water Needs / Instream Flows	Possible impacts on in-stream flows but within existing flow regimes allowed by current permits
Bays and Estuaries	Negligible impact
Fish and Wildlife Habitat	Possible moderate impacts on riparian corridors and upland habitats depending on specific locations of pipelines
Cultural Resources	Possible low impact
Threatened and Endangered Species	Possible moderate impacts on endangered species, including Black-capped vireo and Golden-cheeked warbler, depending on specific locations of pipelines
Comments	Assumes institutional transfer agreements with 40 miles of pipeline and construction of associated facilities

5A.20.1.4 Engineering and Costing

The City of Clifton, which is already in the process of developing a new water supply, will be used as an example of interconnecting its system a neighboring system. The following facilities would be needed to connect the City of Clifton to CCWSC:

- Treated Water Pump Station;
- Treated Water Storage Tank for Pump Station; and
- Treated Water Transmission Pipeline;

A channel dam, off-channel reservoir, water treatment facilities, and treated water pipelines are in the process of being constructed for the City of Clifton. The County-Other entity, CCWSC, has existing infrastructure near the City of Clifton and CCWSC also has existing infrastructure near the City of Valley Mills. CCWSC could connect to the City of Clifton’s system by building a storage tank just outside the City of Clifton, which would receive water from the Clifton system. A pump station could then pump water from the storage tank through a pipeline that would connect to the CCWSC system. The City of Valley Mills could then build a pipeline to the CCWSC system to meet their shortages. The pump station and pipeline capacities would be sufficient to meet the peak daily demands.

Similar facilities would also be required to deliver water to MVWSC and from the off-channel reservoir at the City of Clifton or from the new off-channel reservoir at the City of Meridian and from the off-channel reservoir at the City of Meridian to the City of Walnut Springs. Table 5A.20-2 summarizes the major facilities and costs required for each entity’s water supply need to be met.

**Table 5A.20-2
Interconnection of Bosque County Systems**

Option	Major Facilities	Maximum Demand (MGD)	Water Use (acft)	Annual Cost (\$/acft)
Clifton to CCWSC and Valley Mills	Treated Water Pump Station and Storage Tank 23,600 feet of 6-inch diameter treated water transmission pipeline	0.43	242 ¹	\$1,555
Clifton to MVWSC	Treated Water Pump Station and Storage Tank 72,115 feet of 6-inch diameter treated water transmission pipeline	0.27	151 ¹	\$2,521
Meridian to MVWSC	Treated Water Pump Station and Storage Tank 47,656 feet of 6-inch diameter treated water transmission pipeline	0.27	151 ¹	\$2,283
Meridian to Walnut Springs	Treated Water Pump Station and Storage Tank 60,291 feet of 4-inch diameter treated water transmission pipeline	0.08	43	\$4,755
¹ Demand/Supply comparisons for non-municipal utilities have been made. CCWSC and MVWSC’s possible shortages have been prorated based upon the shortage in Bosque County’s County-Other category and the individual entity’s portion of Bosque County’s County-Other category total demand.				

The costs for communities in Bosque County to connect to the City of Clifton's water system have been summarized in Table 5A.20-3. The total capital cost for CCWSC and the City of Valley Mills to connect to the City of Clifton's water supply system is \$745,000. Including engineering, legal costs, contingencies, environmental studies, land acquisition, and surveying,

Table 5A.20-3
Cost Estimate Summary
Interconnection of Clifton, CCWSC, and Valley Mills Systems
Second Quarter 1999 Prices

<i>Item</i>	<i>Cost to Supply Water to CCWSC and Valley Mills</i>	<i>Cost to Supply Water to MVWSC</i>
Capital Costs		
Pump Stations	\$340,000	\$382,000
Pipeline	<u>405,000</u>	<u>1,148,000</u>
Total Capital Cost	\$745,000	\$1,530,000
Engineering, Legal Costs and Contingencies	\$241,000	\$477,000
Environmental & Archaeology Studies and Mitigation	115,000	344,000
Land Acquisition and Surveying	64,000	112,000
Interest During Construction	<u>48,000</u>	<u>99,000</u>
Total Project Cost	\$1,213,000	\$2,562,000
Annual Costs		
Debt Service	\$88,000	\$186,000
Operation and Maintenance:		
Intake, Pipeline, Pump Station	11,000	18,000
Energy Costs	2,000	4,000
Purchase of Water ¹	<u>276,000</u>	<u>172,000</u>
Total Annual Cost	\$377,000	\$380,000
Available Project Yield (acft/yr)	242	151
Annual Cost of Water (\$ per acft)	\$1,558	\$2,517
Annual Cost of Water (\$ per 1,000 gallons)	\$4.78	\$7.72
¹ Cost of buying water on a wholesale basis from the City of Clifton at \$1,140 per acft.		

the total project cost is \$1,213,000. Taking into consideration debt service on a 30-year loan, operation and maintenance costs, and pumping energy costs, this represents a total annual cost of \$377,000 and a unit cost of \$1,558 per acft (\$4.78 per 1,000 gallons). This includes a wholesale cost of water from the City of Clifton of \$1,140 per acft (\$3.50 per 1,000 gallons), which will need to be confirmed by a cost of service study. The unit cost for MVWSC to connect to the City of Clifton is \$2,517 per acft (\$7.72 per 1,000 gallons).

The costs for communities in Bosque County to connect to the City of Meridian's potential off-channel storage reservoir are summarized in Table 5A.20-4. The total capital cost for the County-Other entity MVWSC to connect to the City of Meridian's water supply system would be \$1,131,000. Including engineering, legal costs, contingencies, environmental studies, land acquisition, and surveying, the total project cost would be \$1,867,000. After considering debt service on a 30-year loan, operation and maintenance costs, and pumping energy costs, this represents a total annual cost of \$365,000, and a unit cost of \$2,422 per acft (\$7.43 per 1,000 gallons). This includes a wholesale cost of water from the City of Meridian of \$1,395 per acft (\$4.28 per 1,000 gallons), which will need to be confirmed by a cost of service study. The unit cost for the City of Walnut Springs to connect to the City of Meridian's system is \$4,755 per acft (\$14.59 per 1,000 gallons).

5A.20.1.5 Implementation Issues

This water supply option has been compared to the plan development criteria, as shown in Table 5A.20-5, and the option meets each criterion.

The participating entities must negotiate a water purchase contract and establish a water rate structure for pricing the water. This would probably include the need for a cost of service study.

Regulatory Permits Required

Requirements specific to pipelines needed to link existing sources to users will include:

- U.S. Army Corps of Engineers Section 404 permit(s) for pipeline stream crossings; discharges of fill into wetlands and waters of the U.S. for construction; and other activities;
- NPDES Storm Water Pollution Prevention Plan;
- TPWD Sand, Shell, Gravel and Marl permit for construction in state-owned streambeds.

Table 5A.20-4
Cost Estimate Summary
Interconnection of Meridian, MVWSC, Walnut Springs Systems
Second Quarter 1999 Prices

<i>Item</i>	<i>Cost to Supply Water from Meridian to Walnut Springs</i>	<i>Cost to Supply Water from Meridian to MVWSC</i>
Capital Costs		
Pump Stations	\$305,000	\$360,000
Pipeline	<u>718,000</u>	<u>577,000</u>
Total Capital Cost	\$1,023,000	\$937,000
Engineering, Legal Costs and Contingencies	\$322,000	\$299,000
Environmental & Archaeology Studies and Mitigation	288,000	229,000
Land Acquisition and Surveying	94,000	75,000
Interest During Construction	<u>70,000</u>	<u>70,000</u>
Total Project Cost	\$1,797,000	\$1,610,000
Annual Costs		
Debt Service	\$131,000	\$116,000
Operation and Maintenance:		
Intake, Pipeline, Pump Station	13,000	12,000
Energy Costs	1,000	5,000
Purchase of Water ¹	<u>60,000</u>	<u>211,000</u>
Total Annual Cost	\$205,000	\$344,000
Available Project Yield (acft/yr)	43	151
Annual Cost of Water (\$ per acft)	\$4,767	\$2,278
Annual Cost of Water (\$ per 1,000 gallons)	\$14.63	\$7.00
¹ Cost of building facilities in Meridian, from Section 5A.15, \$1,395/acft/yr of treated water.		

Mitigation Funding and Other

Mitigation requirements would vary depending on impacts, but could include vegetation restoration, wetland creation or enhancement, or additional land acquisition.

**Table 5A.20-5
Comparison of Bosque County Interconnections Option
to Plan Development Criteria**

<i>Impact Category</i>	<i>Comment(s)</i>
A. Water Supply: 1. Quantity 2. Reliability 3. Cost	1. Sufficient to meet needs 2. High reliability 3. Reasonable
B. Environmental factors 1. Environmental Water Needs 2. Habitat 3. Cultural Resources 4. Bays and Estuaries	1. Low impact 2. Low impact 3. Low impact 4. Negligible impact
C. Impact on Other State Water Resources	• No apparent negative impacts on state water resources; no effect on navigation
D. Threats to Agriculture and Natural Resources	• None
E. Equitable Comparison of Strategies Deemed Feasible	• Option is considered to meet municipal and industrial shortages
F. Requirements for Interbasin Transfers	• Not applicable
G. Third Party Social and Economic Impacts from Voluntary Redistribution	• None

5A.20.2 Use of Oryx/Kerr-McGee Pipeline from Possum Kingdom Reservoir to Rural Systems in Stephens, Shackelford, and Throckmorton Counties

5A.20.2.1 Description of Option

The use of the existing Oryx/Kerr-McGee pipeline could meet existing and future water supply shortages of Throckmorton, Stephens, and Shackelford Counties and surrounding areas. The key component in the system is an existing raw water intake, pump station, and 36-inch pipeline that currently is not being utilized to its full capacity. The pipeline was built in 1978 by the Oryx Oil Company to convey water to their oil fields. Kerr-McGee Company now owns the pipeline and related facilities and uses the raw water for water flooding in its oil production operations. Water flooding is a technique used to recover oil by pumping water into strategic locations within the oil reservoir and forcing the oil toward a well.

Kerr-McGee Company is interested in cooperating in a regional water system to meet area water needs. The regional water system would utilize the existing facilities and would require construction of water treatment facilities, booster pump stations, and at least three new

segments of pipeline. Due to the amount of dissolved minerals in the Possum Kingdom water, demineralization treatment (see Section 5A.11) will be required after conventional treatment to bring the water to potable drinking standards. After the water treatment plant, treated water would continue in the existing pipeline connecting to an existing storage tank in the Shackelford Rural Water Supply Corporation's (SRWSC) system. This pipeline would also contain three interconnections to the Stephen County Rural Water Supply Corporation (SCRWSC). The northern portion of the SCRWSC would be connected to the northern portion of the SRWSC. The City of Throckmorton could then connect to the SRWSC system and receive water from this project.

The initial phase of this regional water system would probably be sized to provide about 1.0 MGD to meet peak demands and provide about 560 acft/yr (0.5 MGD) as an average annual treated water supply to the region. This water supply would meet Throckmorton's, SCRWSC, and SRWSC's needs along with a reserve for other potential participants. The project could be sized larger or later expansion phases brought on-line as additional entities request service. Figure 5A.20-2 contains a map of the project area and shows the possible locations of the treatment plant and new pipelines.

Kerr-McGee is currently using the pipeline and for water flood operations and will continue to do so. However, the amount of water needed for water flood recovery by Kerr-McGee is much less than the capacity of the pipeline and joint use of the pipeline for regional water supply is feasible.

5A.20.2.2 Available Yield

Water available to the project would be provided under an existing contract with between the Brazos River Authority (BRA) and Kerr-McGee Company. This contract allows Kerr-McGee to divert up to 6,000 acft/yr and the contract expires in 2016. After 2016, either Kerr-McGee would need to negotiate a new contract with BRA or the regional water system would negotiate an independent contract to purchase water from BRA.

5A.20.2.3 Environmental

Environmental impacts could include:

- Possible low impacts on endangered species depending on specific locations of pipelines.
- Possible low to moderate impacts on riparian corridors depending on specific locations of pipelines.

A summary of environmental issues is presented in Table 5A.20-6.

**Table 5A.20-6.
Environmental Issues
Use of Oryx/Kerr-McGee Pipeline from Possum Kingdom Reservoir to
Rural Systems in Stephens, Shackelford, and Throckmorton Counties**

Water Management Option	Use of Oryx/Kerr-McGee Pipeline from Possum Kingdom Reservoir to Rural Systems in Stephens, Shackelford, and Throckmorton Counties
Implementation Measures	Construction of 9-mile pipeline from near Breckenridge to near Albany; 12-mile pipeline from southern Throckmorton County to near Throckmorton; and construction of 1.5-mile pipeline in southeastern Throckmorton County; a demineralization plant, two new above-ground water storage tanks, and a pump station
Environmental Water Needs / Instream Flows	Negligible impact
Bays and Estuaries	Negligible impact
Fish and Wildlife Habitat	Possible moderate impacts on riparian corridors where pipelines occur outside existing rights-of-way
Cultural Resources	Possible low impact
Threatened and Endangered Species	Possible impacts on endangered species, including Black-capped vireo and Golden-cheeked warbler, depending on specific locations of pipelines
Comments	Assumes institutional transfer agreements with pipeline, demineralization plant, pump station, and tank construction

5A.20.2.4 Engineering and Costing

The facilities required for this water supply option would be as follows:

- Demineralization plant including conventional pre-treatment facilities;
- Booster pump stations; and
- Treated water pipeline facilities.

The existing segment of the pipeline from Possum Kingdom Lake is 36 inches in diameter. At the site of the 1.0 MGD capacity water treatment facilities, the existing pipeline bifurcates, with

a 27-inch segment going south, a 20-inch segment going west, and a 12-inch segment also going west. The treated water would be transported through the existing 12-inch pipeline to a new storage tank and booster station, just south of the City of Breckinridge. The first interconnection with SCRWSC occurs between the plant and the booster station. From the storage tank and booster station, the treated water would be pumped through a new 9-mile, 12-inch diameter pipeline to an existing storage tank in the SRWSC system. Two more interconnections between the pipeline and SCRWSC are located in the new 9-mile segment of pipeline. A new booster station would pump water from the northern portion of the SRWSC through a 12-mile, 8-inch pipeline to the City of Throckmorton's existing water distribution facilities. The City of Throckmorton could also be served by SCRWSC. This would require a new booster station and a 1.5-mile interconnection with SWSC.

The total capital costs for this water supply option including booster stations and pipelines are \$5,442,000. After considering engineering, legal costs, contingencies, environmental studies, land acquisition, and surveying, a total project cost of \$8,327,000. Annual Costs including debt service, operation and maintenance, annual energy costs, water treatment costs (\$2.09 per 1,000 gallons, see Section 5A.11), raw water purchase from BRA of \$23.00 per acft, and a transport fee from Kerr-McGee of \$91,252 total \$1,147,000. This equates to a unit cost of \$2,048 per acft or \$6.29 per 1,000 gallons of treated water. These costs are for delivering an average annual amount of water of 560 acft (0.5 MGD) with peaking delivery capability of 1.0 MGD. If the regional system capacity were used more fully year round by meet customer's base load demands, the unit cost for delivering an average annual amount of 1,120 acft (1.0 MGD) drops significantly to \$1,473 per acft or \$4.52 per 1,000 gallons. Table 5A.20-7 contains a more detailed cost estimate of the system.

It should be noted that several entities in the region have an interest in the project and could be served by the regional system and share the costs. Among those entities are Callahan County WSC, Rural Throckmorton Co., Westbound WSC, as well as the cities of Albany, Breckenridge, Cisco, and possibly others.

5A.20.2.5 Implementation Issues

This water supply option has been compared to the plan development criteria, as shown in Table 5A.20-8, and the option meets each criterion.

Table 5A.20-7.
Cost Estimate Summary
Average Annual Use of Oryx/Kerr-McGee Pipeline to
Supply Throckmorton, Shackelford, and Stephens Counties
Second Quarter 1999 Prices

<i>Item</i>	<i>Estimated Costs for Facilities</i>
Capital Costs	
Booster Stations	\$981,000
Pipeline	<u>4,461,000</u>
Total Capital Cost	\$5,442,000
Engineering, Legal Costs and Contingencies	\$1,682,000
Environmental & Archaeology Studies and Mitigation	668,000
Land Acquisition and Surveying	214,000
Interest During Construction	<u>321,000</u>
Total Project Cost	\$8,327,000
Annual Costs	
Debt Service	\$605,000
Operation and Maintenance:	
Pipeline and Storage Tanks	46,000
Booster Station	5,000
Energy Costs	5,000
Water Treatment	381,000
Transport Fee ¹	91,000
Purchase of Raw Water ²	<u>13,000</u>
Total Annual Cost	\$1,147,000
Available Project Yield (acft/yr)	560
Annual Cost of Water (\$ per acft)	\$2,048
Annual Cost of Water (\$ per 1,000 gallons)	\$6.29
¹ Cost for Kerr-McGee to transport water.	
² BRA system rate of \$23.00 per acft	

Table 5A.20-8.
Comparison of Oryx/Kerr-McGee Pipeline Use Option to Plan Development Criteria

<i>Impact Category</i>	<i>Comment(s)</i>
A. Water Supply: 1. Quantity 2. Reliability 3. Cost	1. Substantial quantity available to meet regional needs 2. High reliability 3. Reasonable (moderate to high)
B. Environmental factors 1. Environmental Water Needs 2. Habitat 3. Cultural Resources 4. Bays and Estuaries	1. Negligible impact 2. Low impact 3. Low impact 4. Negligible impact
C. Impact on Other State Water Resources	• No apparent negative impacts on state water resources; no effect on navigation
D. Threats to Agriculture and Natural Resources	• None
E. Equitable Comparison of Strategies Deemed Feasible	• Option is considered to meet municipal and industrial shortages
F. Requirements for Interbasin Transfers	• Not applicable
G. Third Party Social and Economic Impacts from Voluntary Redistribution	• None

This water supply option contains implementation issues including:

- The sale price and or operating arrangement of the facilities between operating entities and Kerr-McGee;
- Disposal of brine discharge from the treatment operations would need to be planned for and possibly could be utilized in the oil production operations; and
- A sponsoring agency such as the Brazos River Authority would need to plan and coordinate the project development, and arrange for project financing.

Regulatory Permits Required

Requirements specific to pipelines needed to link existing sources to users will include:

- U.S. Army Corps of Engineers Section 404 permit(s) for pipeline stream crossings; discharges of fill into wetlands and waters of the U.S. for construction; and other activities;
- Brine disposal permit from the TNRCC;
- NPDES Storm Water Pollution Prevention Plan; and
- TPWD Sand, Shell, Gravel and Marl permit for construction in state-owned streambeds.

Mitigation Funding and Other

Mitigation requirements would vary depending on impacts, but could include vegetation restoration, wetland creation or enhancement, or additional land acquisition.

5A.20.3 Interconnection of City of Abilene System with City of Hamlin

5A.20.3.1 Description of Option

Through a water trading arrangement, the City of Hamlin intends to buy water currently contracted to the City of Anson and then contract with the City of Abilene to treat the water and then deliver it. The City of Abilene would build a pipeline from Abilene's Northeast Water Treatment Plant that would deliver treated water to the existing Hamlin Water Treatment Plant. The Hamlin Water Treatment Plant would be removed from service once the pipeline from Abilene is built. Also, Hamlin's existing 12-inch, 22-mile raw water pipeline from Stamford to the City of Hamlin would be converted to a treated water emergency supply, to be used in times when either city has an unexpected shortage of water supply or a problem in the system. Figure 5A.20-3 shows the major components of the system as well as the pipeline alignment.

5A.20.3.2 Available Yield

The City of Hamlin intends to buy treated water from the City of Anson through the City of Abilene's treatment plant. The contract arrangements allow for delivery of up to 767 acft per year of treated water to Hamlin. The maximum daily amount of water that Abilene will deliver is 1.5 MGD.

5A.20.3.3 Environmental

Environmental impacts could include:

- Possible low impacts on instream flows due to increased diversions;
- Possible low to moderate impacts on riparian corridors depending on specific locations of pipelines;

A summary of environmental issues is presented in Table 5A.20-9.

5A.20.3.4 Engineering and Costing

Facilities required for the City of Hamlin to receive treated water from Abilene include:

- Pump Station;
- Transmission Pipeline;
- Surge Tower; and
- SCADA Pump Control System;

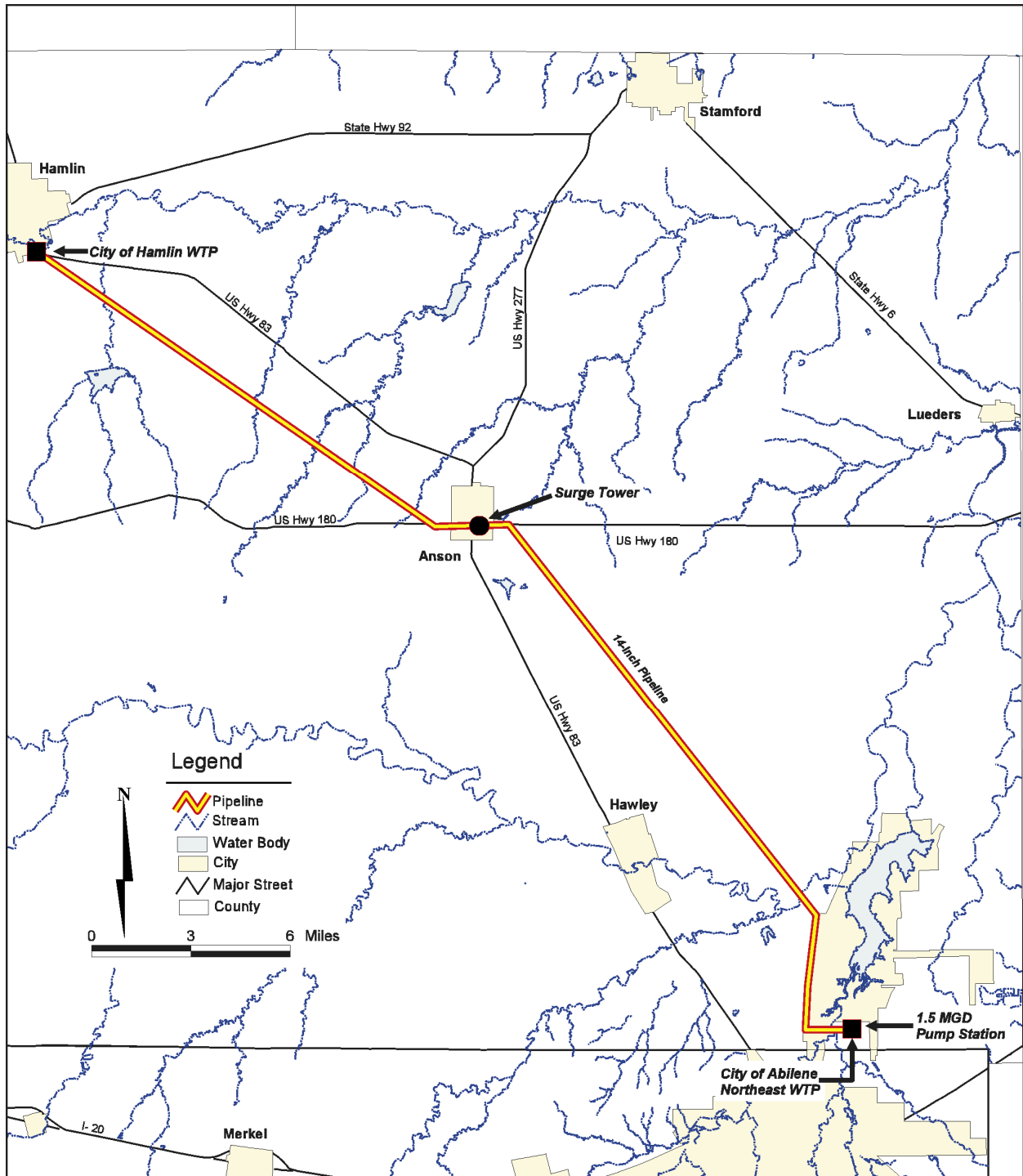


Figure 5A.20-3. Treated Water Pipeline from Abilene to Hamlin

**Table 5A.20-9.
Environmental Issues
Interconnection of City of Abilene System with City of Hamlin**

Water Management Option	Interconnection of City of Abilene System with City of Hamlin
Implementation Measures	Construction of a 39-mile pipeline between City of Abilene System and City of Hamlin
Environmental Water Needs / Instream Flows	Possible low impacts on in-stream flows but within existing flow regimes allowed by current permits
Bays and Estuaries	Negligible impact
Fish and Wildlife Habitat	Possible moderate impacts on riparian corridors if pipeline does not occur within existing rights-of-way
Cultural Resources	Possible low impact
Threatened and Endangered Species	Negligible impact
Comments	Assumes institutional transfer agreements for sale of water

The system facilities include a 1.5-MGD pump station located nearby Abilene's Northeast Water Treatment Plant. From this pump station, a 14-inch, approximately 39-mile pipeline transports water to Hamlin's existing water treatment plant. A surge protection tower will be located near the middle of the pipeline, southwest of the City of Anson. If demands increase in time, the City of Hamlin could increase their 1.5-MGD pump station to a 2.0-MGD pump station. A 2.0-MGD in-line booster station could also be located at the surge tank southwest of Anson.

The total capital costs including, pump station, pipeline, valves, encasements, surge tower, and a SCADA pump control system are \$4,135,000. Including the project costs of engineering, legal costs, contingencies, environmental studies, land acquisition, surveying, and interest during construction, the total project cost comes to \$5,500,000. After taking into consideration annual costs including debt service at 6 percent for 30 years, operation and maintenance, energy costs, and purchase of water on a wholesale basis at \$460 per acft, the total annual cost of the project is \$711,000. This is a unit cost of \$927 per acft (\$2.84 per 1,000 gallons) for treated water. Table 5A.20-10 summarizes more completely the cost estimate.

**Table 5A.20-10.
Cost Estimate Summary
Interconnection of Abilene and Hamlin Systems
Second Quarter 1999 Prices**

<i>Item</i>	<i>Estimated Costs for Facilities</i>
Capital Costs	
Pump Station	\$ 243,000
Treated Water Pipeline	<u>3,770,000</u>
Total Capital Cost	\$4,135,000
Engineering, Legal Costs and Contingencies	\$1,004,000
Environmental & Archaeology Studies and Mitigation	incl. above
Land Acquisition and Surveying	200,000
TWDB Loan Origination Fee	<u>161,000</u>
Total Project Cost	\$5,500,000
Annual Costs	
Debt Service	\$397,000
Operation and Maintenance:	
Pipeline and Tank	34,000
Pump Station	12,000
Energy Costs	40,000
Purchase of Water ¹	<u>228,000</u>
Total Annual Cost	\$711,000
Available Project Yield (acft/yr)	767
Annual Cost of Water (\$ per acft)	\$927
Annual Cost of Water (\$ per 1,000 gallons)	\$2.84
¹ Based upon a wholesale rate of \$1.52 per 1,000 gallons of treated water. The actual rate would be negotiated.	

Source: Jacob and Martin, Engineering, Inc, Abilene, Texas, Preliminary Design and Cost Estimate, March 2000. (The cost estimate has been indexed to Second Quarter, 1999 costs for Senate Bill 1 Cost Estimating procedures.)

5A.20.3.5 Implementation Issues

This water supply option has been compared to the plan development criteria, as shown in Table 5A.20-11, and the option meets each criterion.

**Table 5A.20-11.
Comparison of Interconnecting Abilene System with Hamlin Option
to Plan Development Criteria**

Impact Category	Comment(s)
A. Water Supply: 1. Quantity 2. Reliability 3. Cost	1. Sufficient to meet needs 2. High reliability 3. Reasonable (moderate to high)
B. Environmental factors 1. Environmental Water Needs 2. Habitat 3. Cultural Resources 4. Bays and Estuaries	1. Low impact 2. Low impact 3. Low impact 4. Negligible impact
C. Impact on Other State Water Resources	• No apparent negative impacts on state water resources; no effect on navigation
D. Threats to Agriculture and Natural Resources	• None
E. Equitable Comparison of Strategies Deemed Feasible	• Option is considered to meet municipal and industrial shortages
F. Requirements for Interbasin Transfers	• Not applicable
G. Third Party Social and Economic Impacts from Voluntary Redistribution	• Water supply being redistributed is not needed by seller; no third party impact

Regulatory Permits Required

Requirements specific to pipelines needed to link existing sources to users will include:

- U.S. Army Corps of Engineers Section 404 permit(s) for pipeline stream crossings; discharges of fill into wetlands and waters of the U.S. for construction; and other activities;
- NPDES Storm Water Pollution Prevention Plan;
- TPWD Sand, Shell, Gravel and Marl permit for construction in state-owned streambeds.

Mitigation Funding and Other

Mitigation requirements would vary depending on impacts, but could include vegetation restoration, wetland creation or enhancement, or additional land acquisition.

5A.20.4 Interconnection of City of Waco System with Neighboring Communities

5A.20.4.1 Description of Option

Several entities in McLennan County are projected to have water shortages in the year 2050. The City of McGregor is projected to have a shortage of 283 acft/yr by the year 2050. In addition County-Other entities are projected to have a total shortage of 949 acft/yr. One potential solution to meet the supply shortages involves the City of Waco providing surplus water to the City of McGregor and County-Other entities via pipelines. The City of Waco would sell water on a wholesale basis to the municipalities involved. Construction of some additional facilities along with the use of existing City of McGregor infrastructure would provide service from Waco to neighboring communities.

5A.20.4.2 Available Yield

The City of Waco relies on groundwater from the Trinity Aquifer and surface water from Lake Waco. The City of Waco's projected water surplus for 2050 is 19,194 acft/yr. According to the proposed Water Supply and Management Plan, 283 acft/yr would be available for the City of McGregor and 949 acft/yr would be available for County-Other entities.

5A.20.4.3 Environmental

Environmental impacts could include:

- Possible low impacts on in-stream flows due to increased diversions.
- Possible moderate impacts on endangered species depending on specific locations of pipelines.

A summary of environmental issues is presented in Table 5A.20-12.

5A.20.4.4 Engineering and Costing

The following facilities would be needed to connect the City of Waco to McLennan County municipalities:

- Treated Water Pump Station;
- Treated Water Storage Tank for Pump Station; and
- Treated Water Transmission Pipeline;

Table 5A.20-12.
Environmental Issues
Interconnection of City of Waco System to Surrounding Communities

Water Management Option	Interconnection of City of Waco System to Surrounding Communities
Implementation Measures	Construction of pump stations, storage tanks and approximately 38 miles of pipelines between City of Waco and surrounding communities
Environmental Water Needs / Instream Flows	Possible low to moderate impacts on in-stream flows below diversion points if interconnection leads to significantly greater diversions
Bays and Estuaries	Negligible impact
Fish and Wildlife Habitat	Possible moderate impacts on riparian corridors and upland habitats depending on specific locations of pipelines
Cultural Resources	Possible low impact
Threatened and Endangered Species	Possible moderate impacts on endangered species, including Black-capped vireo and Golden-cheeked warbler, depending on specific locations of pipelines
Comments	Assumes institutional transfer agreements with 38 miles of pipeline and construction of associated facilities

The costs for the City of McGregor to connect to the City of Waco's water system have been summarized in Table 5A.20-14. For McGregor to meet their projected shortage of 283 acft/yr a 6-inch diameter pipeline would be needed. Alternatively, a larger 12-inch pipeline has also been costed which would deliver up to 1,417 acft/yr. Although this is more than McGregor's projected shortage, this alternative would greatly reduce the unit cost of water when fully utilized. The estimated total capital cost for the City of McGregor to connect to the City of Waco's water supply system would be \$1,608,000 for a 6-inch pipeline or \$2,205,000 for a 12-inch pipeline. Including engineering, legal costs, contingencies, environmental studies, land acquisition, and surveying, the total project cost would be \$3,309,000 for a 6-inch pipeline or \$4,465,000 for a 12-inch pipeline. After considering debt service on a 30-year loan, operation and maintenance costs, and pumping energy costs, this represents a total annual cost of \$537,000 or \$1,464,000 for 6-inch or 12-inch pipelines, respectively. This represents a unit cost of \$1,898 per acft (\$5.82 per 1,000 gallons) or \$1,033 per acft (\$3.17 per 1,000 gallons) for 6-inch or 12-inch pipelines. This includes a wholesale cost of water from the City of Waco of \$652 per acft (\$2.00 per 1,000 gallons), which may need to be confirmed by a cost of service study.

**Table 5A.20-13.
Interconnection of McLennan County Systems**

Option	Major Facilities	Maximum Demand (MGD)	Water Use (acft)	Annual Cost (\$/acft)
1 Waco to McGregor, 6-inch pipe	Treated Water Pump Station and Storage Tank 63,360 feet of 10-inch diameter treated water transmission pipeline	0.63	238	\$1,898
2 Waco to McGregor, 12-inch pipe	Treated Water Pump Station and Storage Tank 63,360 feet of 12-inch diameter treated water transmission pipeline	2.60	1,417	\$1,033
3 Waco to County-Other Entities, 10-inch pipe	Treated Water Pump Station and Storage Tank 34,320 feet of 10-inch diameter treated water transmission pipeline	1.76	949	\$1,014
4 Waco to County-Other Entities, 12-inch pipe	Treated Water Pump Station and Storage Tank 34,320 feet of 12-inch diameter treated water transmission pipeline	2.53	1,417	\$978

The costs for County-Other entities in McLennan County to connect to the City of Waco's water system have been summarized in Table 5A.20-15. For County-Other entities to meet their projected shortage of 949 acft/yr, a 10-inch diameter pipeline would be needed. Alternatively, a larger 12-inch diameter pipeline has also been costed which would deliver up to 1,417 acft/yr. Although this amount is greater than the projected shortage for the County-Other entities, this alternative would reduce the unit cost when fully utilized. The estimated total capital cost for County-Other entities to connect to the City of Waco's water supply system is \$1,354,000 for a 10-inch pipeline and \$1,465,000 for a 12-inch pipeline. Including engineering, legal costs, contingencies, environmental studies, land acquisition, and surveying, the estimated total project cost is \$2,724,000 and \$3,300,000 for 10-inch and 12-inch pipelines, respectively. Taking into consideration debt service on a 30-year loan, operation and maintenance costs, and pumping energy costs, this represents a total annual cost of \$963,000 for a 10-inch pipeline and \$1,387,000 for a 12-inch pipeline. This represents unit costs of \$1,014 per acft (\$3.11 per 1,000 gallons) for a 10-inch pipeline or \$978.15 per acft (\$3.00 per 1,000 gallons) for a 12-inch pipeline. This includes an estimated wholesale cost of treated water from the City of Waco of \$652 per acft (\$2.00 per 1,000 gallons), which may need to be confirmed by a cost of service study.

Table 5A.20-14.
Cost Estimate Summary
Interconnection of Waco and McGregor
Second Quarter 1999 Prices

<i>Item</i>	<i>Cost to Supply Water to McGregor, 6-inch pipe</i>	<i>Cost to Supply Water to McGregor, 12-inch pipe</i>
Capital Costs		
Pump Station	\$563,000	\$579,000
Pipeline (11 miles)	<u>1,045,000</u>	<u>1,626,000</u>
Total Capital Cost	\$1,608,000	\$2,205,000
Engineering, Legal Costs and Contingencies	\$748,000	\$1,086,000
Environmental & Archaeology Studies and Mitigation	9,000	9,000
Land Acquisition and Surveying	393,000	393,000
Interest During Construction	<u>551,000</u>	<u>772,000</u>
Total Project Cost	\$3,309,000	\$4,465,000
Annual Costs		
Debt Service (6 percent for 30 years)	\$290,000	\$407,000
Operation and Maintenance:		
Pipeline & Pump Station	31,000	42,000
Energy Costs (\$0.06 per kWh)	16,000	92,000
Purchase of Water ¹	<u>184,000</u>	<u>923,000</u>
Total Annual Cost	\$521,000	\$1,464,000
Available Project Yield (acft/yr)	283	1,417
Annual Cost of Water (\$ per acft)	\$1,841	\$1,033
Annual Cost of Water (\$ per 1,000 gallons)	\$5.66	\$3.17
¹ Estimated cost of buying water on a wholesale basis from the City of Waco at \$652 per acft.		

**Table 5A.20-15.
Cost Estimate Summary
Interconnection of Waco and County-Other Entities
Second Quarter 1999 Prices**

<i>Item</i>	<i>Cost to Supply Water from Waco to County-Other Entities, 10-inch pipe</i>	<i>Cost to Supply Water from Waco to County-Other Entities, 12-inch pipe</i>
Capital Costs		
Pump Station	\$572,000	\$578,000
Pipeline (6 miles)	<u>782,000</u>	<u>887,000</u>
Total Capital Cost	\$1,354,000	\$1,465,000
Engineering, Legal Costs and Contingencies	\$672,000	\$953,000
Environmental & Archaeology Studies and Mitigation	9,000	9,000
Land Acquisition and Surveying	219,000	219,000
Interest During Construction	<u>470,000</u>	<u>645,000</u>
Total Project Cost	\$2,724,000	\$3,300,000
Annual Costs		
Debt Service (6 percent for 30 years)	\$248,000	\$340,000
Operation and Maintenance:		
Pipeline & Pump Station	29,000	37,000
Energy Costs (\$0.06 per kWh)	68,000	87,000
Purchase of Water ¹	<u>618,000</u>	<u>923,000</u>
Total Annual Cost	\$963,000	\$1,387,000
Available Project Yield (acft/yr)	949	1,417
Annual Cost of Water (\$ per acft)	\$1013.76	\$978.15
Annual Cost of Water (\$ per 1,000 gallons)	\$3.11	\$3.00
¹ Estimated cost of wholesale treated water purchase from City of Waco at \$652/acft		

5A.20.4.5 Implementation Issues

This water supply option has been compared to the plan development criteria, as shown in Table 5A.20-16, and the option meets each criterion.

**Table 5A.20-16.
Comparison of Waco Systems Interconnections Option
to Plan Development Criteria**

Impact Category	Comment(s)
A. Water Supply: 1. Quantity 2. Reliability 3. Cost	1. Sufficient to meet needs 2. High reliability 3. Reasonable (moderate to high)
B. Environmental factors 1. Environmental Water Needs 2. Habitat 3. Cultural Resources 4. Bays and Estuaries	1. Low impact 2. Low impact 3. Low impact 4. Negligible impact
C. Impact on Other State Water Resources	• No apparent negative impacts on state water resources; no effect on navigation
D. Threats to Agriculture and Natural Resources	• None
E. Equitable Comparison of Strategies Deemed Feasible	• Option is considered to meet municipal and industrial shortages
F. Requirements for Interbasin Transfers	• Not applicable
G. Third Party Social and Economic Impacts from Voluntary Redistribution	• None

The participating entities must negotiate a water purchase contract and establish a water rate structure for pricing the water. This would probably include the need for a cost of service study.

Regulatory Permits Required

Requirements specific to pipelines needed to link existing sources to users will include:

- U.S. Army Corps of Engineers Section 404 permit(s) for pipeline stream crossings; discharges of fill into wetlands and waters of the U.S. for construction; and other activities;
- NPDES Storm Water Pollution Prevention Plan;
- TPWD Sand, Shell, Gravel and Marl permit for river crossings.

Mitigation Funding and Other

Mitigation requirements would vary depending on impacts, but could include vegetation restoration, wetland creation or enhancement, or additional land acquisition.

5A.20.5 Interconnection of Central Texas WSC with Salado WSC

This section will be completed pending input from consultants to Central Texas WSC and the Brazos River Authority.