

4B.17 Miscellaneous Strategies

4B.17.1 Strategy Overview

Miscellaneous Strategies represent 54 remaining strategies such as transmission projects, well field development, interconnections between water user groups, and water treatment plant expansions which are not included in any of the other Sections 4B water management strategies. Strategies were developed to overcome the water shortages identified between 2010 and 2060 after other specific water management strategies including conservation were applied for all WUGs. The combined strategies applied to the WUGs should be adequate to provide for 105% of the water demand of the WUG. The WUGs with Miscellaneous Strategies are organized by county and are detailed in Section 4B.17.3

Strategies are summarized below by the name of the miscellaneous strategy, the source of water for the strategy, a list of the facilities necessary, costs, project yield and a short description of the strategy. Costs are consistent with the TWDB and Brazos G assumptions as described in Section 4B.1.4 and are priced in September 2008 dollars. Debt service is calculated at 6% for 20 years. Some strategies include estimates of wholesale water costs as verified through discussion with water providers or as base costs from other strategies.

4B.17.2 Implementation Issues

The miscellaneous strategies for each WUG were evaluated and determined based on plan development criteria. Groundwater, surface water and reuse water supplies are projected to be adequate to implement these miscellaneous strategies. Environmental impacts will need to be mitigated to protect instream flow requirements, habitat, cultural resources, threatened and endangered species and wetlands. Generally, it is assumed that pipelines can be routed to avoid environmentally sensitive areas. Strategies were considered to meet municipal and industrial shortages in the planning area and will not have an apparent negative impact on other state water resources, or on agriculture and natural resources. The strategies do not require interbasin transfers.

Some of the miscellaneous strategies are feasible only if other recommended strategies are implemented. Other considerations for implementation of the miscellaneous strategies are summarized below:

In general, any development of additional groundwater in the Brazos G Area must address several issues including:

- Competition with others for groundwater in the area.
- Purchase of groundwater rights.
- Impact on water levels in the aquifer which could trigger reduction in production permits from the regulating Groundwater Conservation District.

The regulatory permits that are expected to be requirements specific to wells and pipelines include:

- Regulations and permits by the groundwater conservation districts.
- U.S. Army Corps of Engineers Sections 10 and 404 dredge and fill permits for the pipelines impacting wetlands or navigable waters of the United States.
- General Land Office easement for use of state-owned land.
- Texas Parks and Wildlife Department Sand, Gravel, and Marl permit for construction in state-owned streambeds.
- Mitigation requirements would vary depending on impacts, but could include vegetation restoration, wetland creation or enhancement, or additional land acquisition.

4B.17.3 Miscellaneous Pipelines, Pump Stations, and Groundwater Options by County

4B.17.3.1 Bell County

WUG: Bell County Steam-Electric

Strategy: Reuse Supply from the City of Temple

Source: City of Temple WWTP

Facilities: Storage tank, pump station, and pipeline

Total Capital Cost: \$12,045,000

Total Project Cost: \$17,404,000

Total Annual Cost: \$3,375,000

Available Project Yield: 8,407 acft/yr

Annual Cost of Water: \$ 401 per acft/yr or \$ 1.23 per 1,000 gal

This project will include a 14 mile 20 inch diameter pipeline to convey water from the City of Temple WWTP to future steam-electric facilities. The wholesale unit cost of reuse water from Temple is estimated at \$138/acft, based on an existing contract between Temple and Panda Power.

4B.17.3.2 Bosque County

WUG: Bosque County Steam-Electric
Strategy: BRA System Operation
Source: BRA - Lake Whitney
Facilities: Intake, pump station, and transmission pipeline
Total Capital Cost: \$17,125,000
Total Project Cost: \$24,725,000
Total Annual Cost: \$3,307,000
Available Project Yield: 5,222 acft/yr
Annual Cost of Water: \$ 633 per acft/yr or \$ 1.94 per 1,000 gal

This project will include an 18 mile 18 inch diameter pipeline to convey water between Lake Whitney and future steam-electric sites.

4B.17.3.3 Brazos County

WUG: College Station
Strategy: Delivery of BRA System Operations Supply
Source: BRA System Operations
Facilities: Intake, pump stations, transmission pipeline and WTP
Total Capital Cost: \$16,841,000
Total Project Cost: \$23,954,000
Total Annual Cost: \$3,226,000
Available Project Yield: 2,500 acft/yr
Annual Cost of Water: \$ 1,290 per acft/yr or \$ 3.96 per 1,000 gal

This project will include a 3.6 mile 12 inch diameter pipeline to convey water from a diversion point on the Brazos River to College Station. Water will be purchased from BRA and be treated at a new 2.2 MGD Conventional WTP and 1.1 MGD desalination WTP.

WUG: Wickson Creek SUD
Strategy: Purchase Water from City of Bryan
Source: City of Bryan
Facilities: Pump station, storage tank, and transmission pipeline
Total Capital Cost: \$894,000
Total Project Cost: \$1,201,000
Total Annual Cost: \$394,000
Available Project Yield: 1,500 acft/yr
Annual Cost of Water: \$ 263 per acft/yr or \$ 0.81 per 1,000 gal

This project will include an interconnection between the City of Bryan and Wickson Creek SUD including 600 feet of 12 inch diameter pipeline, a pump station and storage tank. Water will be purchased from City of Bryan at an estimated wholesale rate of \$167/acft. Project costs to be shared between Bryan and the SUD.

4B.17.3.4 Coryell County**WUG:** Gatesville**Strategy:** Coryell County Reservoir (BRA System)**Source:** Coryell County Off-Channel Reservoir**Facilities:** Intake, pump stations, transmission pipeline and WTP**Total Capital Cost:** \$16,257,000**Total Project Cost:** \$23,532,000**Total Annual Cost:** \$4,338,000**Available Project Yield:** 1,500 acft/yr**Annual Cost of Water:** \$ 2,892 per acft/yr or \$ 8.87 per 1,000 gal

This project will include an intake and WTP sized to meet Gatesville and Coryell County Other 2060 demands. The 15 mile 12 inch diameter pipeline will convey water from Coryell County Reservoir to Gatesville along Hwy 84. Estimated wholesale water cost is \$1,007/acft based on Volume II, Section 4B.13.7

WUG: Coryell County Other**Strategy:** Coryell County Reservoir (BRA System)**Source:** Coryell County Off-Channel Reservoir**Facilities:** Intake, pump station, and transmission pipeline**Total Capital Cost:** \$19,440,000**Total Project Cost:** \$28,356,000**Total Annual Cost:** \$5,308,000**Available Project Yield:** 1,865 acft/yr**Annual Cost of Water:** \$ 2,846 per acft/yr or \$ 8.73 per 1,000 gal

This project will include a 22 mile 12 inch diameter pipeline to convey water from Coryell County Reservoir to Coryell County Other along FM 1690 to Izoro and Harmon Rd to Pidcoke. Estimated wholesale water cost is \$1,007/acft based on Volume II, Section 4B.13.7

4B.17.3.5 Eastland County**WUG:** Rising Star**Strategy:** Water Supply from Connection to Westbound WSC**Source:** Eastland, Cisco and Groundwater**Facilities:** Transmission pipeline**Total Capital Cost:** \$167,000**Total Project Cost:** \$262,000**Total Annual Cost:** \$262,000**Available Project Yield:** 150 acft/yr**Annual Cost of Water:** \$ 1,747 per acft/yr or \$ 5.36 per 1,000 gal

This project will include a 0.5 mile 6 inch diameter pipeline to interconnect the City of Rising Star with the Westbound WSC. A treated water rate of \$1,490/acft is applied to the base cost of this project.

4B.17.3.6 Falls County

WUG:	City of Marlin
Strategy:	Brushy Creek Reservoir
Source:	Brushy Creek Reservoir
Facilities:	Intake, pump station, and transmission pipeline
Total Capital Cost:	\$4,391,000
Total Project Cost:	\$6,459,000
Total Annual Cost:	\$1,013,000
Available Project Yield:	2,090 acft/yr
Annual Cost of Water:	\$485 per acft/yr or \$1.49 per 1,000 gal

Costs to construct the Brushy Creek Reservoir are found in Volume II, Section 4B.12.10. In addition to the cost of the reservoir, this project will include an intake, pump station and a 6.8 mile 14 inch diameter pipeline to convey water between the reservoir and the City of Marlin,. Annual costs include the annual unit cost for the City of Marlin's portion of the reservoir costs (\$182/acft).

WUG:	West Brazos WSC
Strategy:	Purchase Water from City of Waco
Source:	City of Waco
Facilities:	Pump Stations, transmission pipeline, and two storage tanks.
Total Capital Cost:	\$6,601,000
Total Project Cost:	\$10,452,000
Total Annual Cost:	\$1,466,000
Available Project Yield:	450 acft/yr
Annual Cost of Water:	\$ 3,258 per acft/yr or \$10 per 1,000 gal

This project will include a 23 mile 8 inch diameter pipeline to convey water between the City of Waco and The City of Chilton (approx. location of center of West Brazos WSC).

4B.17.3.7 Grimes County

WUG:	Grimes County Steam-Electric
Strategy:	Additional Gulf Coast Aquifer Development
Source:	Jackson, Carrizo
Facilities:	Well Field, collection pipes, and pump stations
Total Capital Cost:	\$21,781,000
Total Project Cost:	\$31,630,000
Total Annual Cost:	\$3,574,000
Available Project Yield:	5,600 acft/yr
Annual Cost of Water:	\$638 per acft/yr or \$1.96 per 1,000 gal

This project will include ten 300 gpm wells drilled to 500 ft and five 800 gpm wells drilled to 2,000 ft. Other costs include 18.5 miles of well field piping and groundwater leases estimated at \$40/acft.

WUG: Grimes County Steam-Electric
Strategy: Purchase Reuse Water from College Station and Bryan
Source: Bryan-College Station Reuse Water
Facilities: Pump Stations, Storage Tank, and Transmission Pipeline
Total Capital Cost: \$23,422,000
Total Project Cost: \$33,647,000
Total Annual Cost: \$7,743,000
Available Project Yield: 11,000 acft/yr
Annual Cost of Water: \$ 704 per acft/yr or \$ 2.16 per 1,000 gal

This project will include a 27 mile 27 inch diameter pipeline to convey water between a College Station/Bryan WWTP and Steam Electric facilities in Grimes County. A wholesale unit cost of the reuse water from College Station / Bryan is \$350/acft.

4B.17.3.8 Hill County

WUG: White Bluff Community WS
Strategy: BRA System Operation
Source: BRA Systems - Lake Whitney
Facilities: Intake, Pump Station, Transmission Pipeline, and WTP
Total Capital Cost: \$6,533,000
Total Project Cost: \$9,277,000
Total Annual Cost: \$1,288,000
Available Project Yield: 600 acft/yr
Annual Cost of Water: \$ 2,147 per acft/yr or \$ 6.59 per 1,000 gal

This project will include a 2 mile 6 inch diameter pipeline and 1 MGD WTP to treat and transport water from Lake Whitney to the White Bluff Community WS.

WUG: Woodrow-Osceola WSC
Strategy: BRA System Operation
Source: Lake Whitney - BRA
Facilities: Intake, Pump Station, Transmission Pipeline, and WTP
Total Capital Cost: \$4,744,000
Total Project Cost: \$7,231,000
Total Annual Cost: \$819,000
Available Project Yield: 150 acft/yr
Annual Cost of Water: \$ 5,460 per acft/yr or \$ 16.75 per 1,000 gal

This project will include a 11 mile 6 inch diameter pipeline and a 0.3 MGD WTP to treat and convey water between Lake Whitney and Woodrow-Osceola WSC.

4B.17.3.9 Hood County

WUG: City of Lipan
Strategy: Trinity Aquifer Development
Source: Trinity Aquifer
Facilities: Well Field, collection pipes, and pump stations
Total Capital Cost: \$5,614,000
Total Project Cost: \$8,524,000
Total Annual Cost: \$916,000
Available Project Yield: 685 acft/yr
Annual Cost of Water: \$ 1,337 per acft/yr or \$4.10 per 1,000 gal

This project will include nine 100 gpm wells drilled to 300 ft as well as 7 miles of well field piping, distribution system improvements, and groundwater leases estimated at \$40/acft.

WUG: City of Tolar
Strategy: Trinity Aquifer Development
Source: Trinity Aquifer
Facilities: Well Field, collection pipes, transmission and treatment
Total Capital Cost: \$829,000
Total Project Cost: \$1,286,000
Total Annual Cost: \$134,000
Available Project Yield: 150 acft/yr
Annual Cost of Water: \$ 893 per acft/yr or \$2.74 per 1,000 gal

This project will include two 150 gpm wells drilled to 500 ft as well as 1 mile of transmission pipeline, disinfection treatment, and distribution system improvements.

WUG: Oak Trail Shores Subdivision
Strategy: Purchase Water from City of Granbury
Source: City of Granbury
Facilities: Storage Tank, Pump Station, and Transmission Pipeline
Total Capital Cost: \$1,502,000
Total Project Cost: \$2,416,000
Total Annual Cost: \$638,000
Available Project Yield: 390 acft/yr
Annual Cost of Water: \$ 1,636 per acft/yr or \$ 5.02 per 1,000 gal

This project will include a 5 mile 6 inch diameter pipeline to convey treated water between the City of Granbury and the Oak Trail Shores Subdivision. Wholesale treated water from Granbury estimated at \$1,000/acft.

4B.17.3.10 Johnson County

WUG: Bethany WSC
Strategy: Purchase water from Johnson County SUD
Source: Mansfield
Facilities: Pump Station and Transmission Pipeline
Total Capital Cost: \$552,000
Total Project Cost: \$693,000
Total Annual Cost: \$1,107,000
Available Project Yield: 1,120 acft/yr
Annual Cost of Water: \$ 988 per acft/yr or \$ 3.03 per 1,000 gal

This project will include a connection using 12 inch diameter pipeline to convey treated water between Johnson County SUD and Bethany WSC. Wholesale treated water cost from Johnson County SUD is estimated at \$928/acft. Costs are based Bethany WSC cost estimates.

WUG: Bethesda WSC
Strategy: Contract with City of Arlington
Source: Richard Chambers / Cedar Creek Reservoirs
Facilities: Pump Station and Transmission Pipeline
Total Capital Cost: \$10,478,000
Total Project Cost: \$16,334,000
Total Annual Cost: \$2,357,000
Available Project Yield: 1,248 acft/yr
Annual Cost of Water: \$ 1,889 per acft/yr or \$ 5.80 per 1,000 gal

This project will include a 9 mile 20 inch diameter pipeline to convey treated water between the City of Arlington and Bethesda WSC. Wholesale treated water cost from City of Arlington is estimated at \$651.6/acft. Costs are based on the *Water Supply Study for Ellis County, Johnson County, Southern Dallas County, and Southern Tarrant County* dated April 2009.

WUG: Cleburne
Strategy: Additional BRA supply through system operations – firm up existing BRA contract supplies
Source: Lake Granbury - BRA System
Facilities: Intake, pump stations, and transmission pipeline
Total Capital Cost: \$9,337,000
Total Project Cost: \$14,086,000
Total Annual Cost: \$1,443,000
Available Project Yield: 1,530 acft/yr
Annual Cost of Water: \$ 943 per acft/yr or \$ 2.89 per 1,000 gal

This project will include a 21 mile 12 inch diameter pipeline to convey water from Lake Granbury along FM 2331, to US Hwy 67 into Cleburne.

WUG: Godley
Strategy: Purchase from BRA SWATS
Source: BRA SWATS - Lake Granbury
Facilities: Storage Tank, Pump Station, and Transmission Pipeline
Total Capital Cost: \$4,160,000
Total Project Cost: \$6,651,000
Total Annual Cost: \$1,100,000
Available Project Yield: 375 acft/yr
Annual Cost of Water: \$ 2,933 per acft/yr or \$ 9 per 1,000 gal

This project will include a 15 mile 8 inch diameter pipeline to convey treated water between the BRA SWATS and the City of Godley. Wholesale treated water cost at the SWATS plant is \$1,218/acft.

WUG: Johnson County SUD
Strategy: Infrastructure project for City of Mansfield water
Source: Mansfield from Tarrant Regional MWD (Lake Benbrook)
Facilities: Pump Station and Transmission Pipeline
Total Capital Cost: \$18,018,000
Total Project Cost: \$27,182,000
Total Annual Cost: \$9,359,000
Available Project Yield: 10,080 acft/yr
Annual Cost of Water: \$ 928 per acft/yr or \$ 2.85 per 1,000 gal

This project will include a 13 mile 30 inch diameter pipeline to convey treated water between the City of Mansfield and Johnson County SUD. Wholesale treated water cost at the Mansfield WTP is estimated at \$652/acft. Costs are based on the *Water Supply Study for Ellis County, Johnson County, Southern Dallas County, and Southern Tarrant County* dated April 2009.

WUG: Johnson County SUD
Strategy: Purchase water from the City of Grand Prairie
Source: Grand Prairie from Tarrant Regional MWD
Facilities: Pump Station and Transmission Pipeline
Total Capital Cost: \$24,056,000
Total Project Cost: \$35,646,000
Total Annual Cost: \$8,016,000
Available Project Yield: 6,726 acft/yr
Annual Cost of Water: \$ 1,192 per acft/yr or \$ 3.66 per 1,000 gal

This project will include a 14 mile 30 inch diameter pipeline to convey treated water between the City of Grand Prairie and Johnson County SUD. Wholesale treated water cost from Grand Prairie is estimated at \$652/acft. Costs are based on the *Water Supply Study for Ellis County, Johnson County, Southern Dallas County, and Southern Tarrant County* dated April 2009.

WUG: Keene
Strategy: BRA System Operation
Source: BRA System Operation through the BRA SWATS plant
Facilities: Pump station and transmission pipeline
Total Capital Cost: \$1,847,000
Total Project Cost: \$3,062,000
Total Annual Cost: \$481,000
Available Project Yield: 157 acft/yr
Annual Cost of Water: \$ 3,064 per acft/yr or \$ 9.4 per 1,000 gal

This project will include an 8 mile 6 inch diameter pipeline to convey water between the BRA SWATS plant to the City of Keene. Wholesale treated water cost at the BRA SWATS plant is estimated at \$1,218/acft.

WUG: Parker WSC
Strategy: Trinity Aquifer Development
Source: Trinity Aquifer
Facilities: Well Field, collection pipes, transmission and treatment
Total Capital Cost: \$1,386,000
Total Project Cost: \$2,045,000
Total Annual Cost: \$214,000
Available Project Yield: 160 acft/yr
Annual Cost of Water: \$ 1,338 per acft/yr or \$4.10 per 1,000 gal

This project will include two 200 gpm wells drilled to 1,600 ft as well as 0.5 mile of transmission pipeline, disinfection treatment, and distribution system improvements.

4B.17.3.11 Lampasas County

WUG: Lampasas County Manufacturing
Strategy: Purchase Water from City of Lampasas
Source: City of Lampasas
Facilities: Storage Tank, Pump Station, and Transmission Pipeline
Total Capital Cost: \$604,000
Total Project Cost: \$971,000
Total Annual Cost: \$246,000
Available Project Yield: 165 acft/yr
Annual Cost of Water: \$ 1,491 per acft/yr or \$ 4.57 per 1,000 gal

This project will include a 2 mile 6 inch diameter pipeline to convey water from the City of Lampasas to manufacturing sites within Lampasas County.

4B.17.3.12 Lee County

WUG: Aqua WSC
Strategy: Additional Carrizo Aquifer Development
Source: Carrizo-Wilcox Aquifer
Facilities: Well Field, transmission and treatment
Total Capital Cost: \$916,000
Total Project Cost: \$1,364,000
Total Annual Cost: \$177,000
Available Project Yield: 403 acft/yr
Annual Cost of Water: \$ 439 per acft/yr or \$1.35 per 1,000 gal

This project will include one 500 gpm well drilled to 1,000 ft as well as 0.5 mile of transmission pipeline, disinfection treatment, and distribution system improvements.

WUG: Lee County WSC
Strategy: Additional Carrizo Aquifer Development
Source: Carrizo-Wilcox Aquifer
Facilities: Well Field, collection piping and treatment
Total Capital Cost: \$1,524,000
Total Project Cost: \$2,166,000
Total Annual Cost: \$335,000
Available Project Yield: 806 acft/yr
Annual Cost of Water: \$ 416 per acft/yr or \$1.28 per 1,000 gal

This project will include two 500 gpm wells drilled to 500 ft as well as one mile of collection piping, disinfection treatment, and distribution system improvements.

4B.17.3.13 Limestone County

WUG: Bistone MWSD
Strategy: Carrizo-Wilcox Aquifer Development
Source: Carrizo-Wilcox Aquifer
Facilities: Well Field, collection pipes, transmission and treatment
Total Capital Cost: \$14,045,000
Total Project Cost: \$18,458,000
Total Annual Cost: \$2,024,000
Available Project Yield: 3,600 acft/yr
Annual Cost of Water: \$ 562 per acft/yr or \$1.73 per 1,000 gal

This project will include eight 450 gpm wells drilled to 650 ft, as well as well field collection piping, 5.5 miles of 12 inch diameter transmission pipeline, storage tank and water treatment plant improvements.

WUG: City of Kosse
Strategy: Carrizo-Wilcox Aquifer Development
Source: Carrizo-Wilcox Aquifer
Facilities: Well Field, transmission and treatment
Total Capital Cost: \$1,612,000
Total Project Cost: \$2,386,000
Total Annual Cost: \$237,000
Available Project Yield: 100 acft/yr
Annual Cost of Water: \$ 2,370 per acft/yr or \$7.27 per 1,000 gal

This project will include two 100 gpm wells drilled to 500 ft, eight miles of 4 - 6 inch diameter transmission pipeline, disinfection treatment pump station and elevated storage tank.

WUG: Limestone County Manufacturing
Strategy: Carrizo-Wilcox Aquifer Development
Source: Carrizo-Wilcox Aquifer
Facilities: Well Field, transmission and treatment
Total Capital Cost: \$237,000
Total Project Cost: \$347,000
Total Annual Cost: \$40,000
Available Project Yield: 75 acft/yr
Annual Cost of Water: \$540 per acft/yr or \$1.66 per 1,000 gal

This project will include one 100 gpm well drilled to 250 ft, 0.25 mile of 4 inch diameter transmission pipeline, and disinfection treatment.

4B.17.3.14 McLennan County

WUG: Chalk Bluff WSC
Strategy: Trinity Aquifer Development
Source: Trinity Aquifer
Facilities: Well Field, collection pipes, and treatment
Total Capital Cost: \$1,909,000
Total Project Cost: \$2,707,000
Total Annual Cost: \$287,000
Available Project Yield: 230 acft/yr
Annual Cost of Water: \$ 1,248 per acft/yr or \$3.83 per 1,000 gal

This project will include two 200 gpm wells drilled to 2,125 ft, one mile of 6 inch collection piping, disinfection treatment and distribution system improvements.

WUG: Cross Country WSC
Strategy: Water Supply from City of Waco
Source: City of Waco
Facilities: Transmission pipeline and pump station
Total Capital Cost: \$2,307,000
Total Project Cost: \$3,545,000
Total Annual Cost: \$674,000
Available Project Yield: 333 acft/yr
Annual Cost of Water: \$ 2,023 per acft/yr or \$ 6.2 per 1,000 gal

This project will include a 6 mile 6 inch diameter pipeline to convey treated water from the City of Waco to Cross Country WSC along FM 2490. Wholesale treated water rate from Waco is \$979/acft.

WUG: Hallsburg
Strategy: Water Supply from City of Waco
Source: City of Waco
Facilities: Transmission pipeline and pump station
Total Capital Cost: \$652,000
Total Project Cost: \$1,028,000
Total Annual Cost: \$138,000
Available Project Yield: 49 acft/yr
Annual Cost of Water: \$ 3,643 per acft/yr or \$ 11.18 per 1,000 gal

This project will connect into the 6 inch diameter transmission line from Waco to Mart along Hwy 6 to deliver treated water 3 miles to Hallsburg along FM 3222. Costs include a portion of the main transmission and pump station from Waco to Mart . Wholesale treated water cost is \$979/acft from City of Waco.

WUG: Mart
Strategy: Water Supply from City of Waco
Source: City of Waco
Facilities: Transmission pipeline and pump station
Total Capital Cost: \$5,144,000
Total Project Cost: \$6,960,000
Total Annual Cost: \$1,093,000
Available Project Yield: 300 acft/yr
Annual Cost of Water: \$ 3,643 per acft/yr or \$ 11.18 per 1,000 gal

This project will include a 15 mile 6 inch diameter pipeline to convey treated water from the City of Waco to Mart along Hwy 6 and Hwy 164. Wholesale treated water cost is \$979/acft from City of Waco.

WUG: North Bosque WSC
Strategy: Water Supply from City of Waco
Source: City of Waco
Facilities: Transmission pipeline and pump station
Total Capital Cost: \$1,133,000
Total Project Cost: \$1,793,000
Total Annual Cost: \$361,000
Available Project Yield: 194 acft/yr
Annual Cost of Water: \$ 1,861 per acft/yr or \$ 5.71 per 1,000 gal

This project will interconnect with the City of Waco's 30 in diameter pipeline at the intersection of Hwy 6 and FM 185. The new transmission line will include a 4 mile 6 inch diameter pipeline to convey treated water to North Bosque service area along Hwy 6. Wholesale treated water cost is \$979/acft from City of Waco.

WUG: Riesel
Strategy: Water Supply from City of Waco
Source: City of Waco
Facilities: Transmission pipeline and pump station
Total Capital Cost: \$840,000
Total Project Cost: \$1,326,000
Total Annual Cost: \$179,000
Available Project Yield: 38 acft/yr
Annual Cost of Water: \$3,643 per acft/yr or \$ 11.18 per 1,000 gal

This project will connect into the 6 inch diameter transmission line from Waco to Mart along Hwy 6/ Hwy 164 to deliver treated water 3.7 miles to Riesel. Costs include a portion of the main transmission and pump station from Waco to Mart. Wholesale treated water cost is \$979/acft from City of Waco.

WUG: Western Hills WSC
Strategy: Trinity Aquifer Development
Source: Trinity Aquifer
Facilities: Well Field, transmission and treatment
Total Capital Cost: \$713,000
Total Project Cost: \$1,073,000
Total Annual Cost: \$129,000
Available Project Yield: 198 acft/yr
Annual Cost of Water: \$652 per acft/yr or \$2.00 per 1,000 gal

This project will include one 250 gpm well drilled to 1,150 ft, 0.5 mile of 6 inch diameter transmission pipeline, disinfection treatment and distribution system improvements.

4B.17.3.15 Milam County

WUG: Southwest Milam WSC
Strategy: Additional Carrizo-Wilcox Aquifer Development
Source: Carrizo-Wilcox
Facilities: Well Field, transmission and treatment
Total Capital Cost: \$2,413,000
Total Project Cost: \$3,502,000
Total Annual Cost: \$440,000
Available Project Yield: 966 acft/yr
Annual Cost of Water: \$ 455 per acft/yr or \$1.40 per 1,000 gal

This project will include two 1,000 gpm wells drilled to 1,000 ft, one mile of 12 inch diameter transmission pipeline, disinfection treatment and distribution system improvements.

WUG: Milam County Steam-Electric
Strategy: Additional Carrizo-Wilcox Aquifer Development
Source: Carrizo-Wilcox
Facilities: Well Field and transmission
Total Capital Cost: \$2,201,000
Total Project Cost: \$3,160,000
Total Annual Cost: \$365,000
Available Project Yield: 1,613 acft/yr
Annual Cost of Water: \$ 226 per acft/yr or \$0.69 per 1,000 gal

This project will include two 1,000 gpm wells drilled to 1,000 ft and 1.5 mile of 12 – 16 inch diameter transmission pipeline.

WUG: Milam County Mining
Strategy: Additional Carrizo-Wilcox Aquifer Development
Source: Carrizo-Wilcox
Facilities: Well Field and transmission
Total Capital Cost: \$490,000
Total Project Cost: \$715,000
Total Annual Cost: \$72,000
Available Project Yield: 100 acft/yr
Annual Cost of Water: \$ 719 per acft/yr or \$2.21 per 1,000 gal

This project will include one 150 gpm well drilled to 1,000 ft and 0.5 mile of 4 inch diameter transmission pipeline.

4B.17.3.16 Nolan County

WUG: Sweetwater
Strategy: Alternative: Purchase Raw Water from City of Abilene
Source: City of Abilene
Facilities: Intake, Two Pump Stations, Three Storage Tanks, and Transmission Pipeline
Total Capital Cost: \$26,731,000

Total Project Cost:	\$39,172,000
Total Annual Cost:	\$5,007,000
Available Project Yield:	4,000 acft/yr
Annual Cost of Water:	\$ 1,258 per acft/yr or \$ 3.84 per 1,000 gal

This project will include a 41 mile 16 inch diameter pipeline to convey water between Abilene and Sweetwater along I-20. Wholesale raw water cost from Abilene is estimated at \$100/acft

WUG:	Nolan County Mining
Strategy:	Water Supply from Edwards-Trinity (Plateau) Aquifer
Source:	Edwards-Trinity
Facilities:	Well Field and transmission
Total Capital Cost:	\$463,000
Total Project Cost:	\$679,000
Total Annual Cost:	\$67,000
Available Project Yield:	114 acft/yr
Annual Cost of Water:	\$ 588 per acft/yr or \$1.80 per 1,000 gal

This project will include two 1,000 gpm wells drilled to 300 ft and 0.5 mile of 4 inch diameter transmission pipeline.

WUG:	Nolan County Steam-Electric
Strategy:	Water Supply from City of Abilene
Source:	City of Abilene
Facilities:	Pump Station, Two Booster Pumps, Three Storage Tanks, and Transmission Pipeline
Total Capital Cost:	\$65,169,000
Total Project Cost:	\$91,940,000
Total Annual Cost:	\$14,574,000
Available Project Yield:	20,000 acft/yr
Annual Cost of Water:	\$ 729 per acft/yr or \$ 2.24 per 1,000 gal

This project will include a 43 mile 36 inch diameter pipeline to convey raw water between Abilene and Nolan County Steam Electric facilities located in the Sweetwater vicinity along I-20.

4B.17.3.17 Palo Pinto County

WUG:	City of Strawn
Strategy:	Water Supply from Eastland County WSD
Source:	Eastland County WSD
Facilities:	Transmission Pipeline and Pump Station
Total Capital Cost:	3,192,000
Total Project Cost:	5,158,000
Total Annual Cost:	775,000
Available Project Yield:	200
Annual Cost of Water:	\$3,875 per acft/yr or \$11.89 per 1,000 gal

This project will include a 13 mile 4 inch diameter pipeline to convey water from Ranger to Strawn along Interstate 20 and Highway 16.

4B.17.3.18 Robertson County

WUG: Robertson County Steam-Electric
Strategy: Purchase of Reuse Water from Walnut Creek Mine
Source: Walnut Creek Mine
Facilities: Storage Tank, Pump Station, and Transmission Pipeline
Total Capital Cost: \$16,179,000
Total Project Cost: \$23,126,000
Total Annual Cost: \$7,117,000
Available Project Yield: 15,479 acft/yr
Annual Cost of Water: \$ 460 per acft/yr or \$ 1.41 per 1,000 gal

This project will include a 15 mile 30 inch diameter pipeline to convey water from the Walnut Creek Mine WWTP to steam-electric facilities in Robertson County.

4B.17.3.19 Williamson County

WUG: Blockhouse MUD
Strategy: Increase Supply from Cedar Park
Source: Cedar Park – Highland Lakes
Facilities: Transmission pipeline and pump station
Total Capital Cost: \$1,586,000
Total Project Cost: \$2,291,000
Total Annual Cost: \$1,964,000 (assuming full implementation initially)
Available Project Yield: 2,100 acft/yr
Annual Cost of Water: \$ 935 per acft/yr or \$ 2.87 per 1,000 gal (assuming full implementation initially)

This project will include a 1.5 mile 10 inch diameter pipeline to convey water from the Lake Travis regional water line to Blockhouse MUD along North Bell Blvd. The wholesale treated water rate from Cedar Park is estimated at \$829/acft.

WUG: Brushy Creek MUD
Strategy: Rehabilitate Existing Wells
Source: NA
Facilities: NA
Total Capital Cost: \$260,000
Total Project Cost: \$350,000 (per Brushy Creek MUD)
Total Annual Cost: \$33,000
Available Project Yield: 1,100 acft/yr
Annual Cost of Water: \$30 per acft/yr or \$0.09 per 1,000 gal

This project will rehabilitate existing wells to increase capacity by 1,100 acft/yr.

WUG: Chisholm Trail SUD
Strategy: Transmission from Round Rock
Source: Highland Lakes (LCRA through the Brushy Creek RUA)
Facilities: Transmission pipeline and pump station
Total Capital Cost: \$9,086,000
Total Project Cost: \$13,264,000
Total Annual Cost: \$5,460,000
Available Project Yield: 3,472 acft/yr
Annual Cost of Water: \$1,573 per acft/yr or \$4.83 per 1,000 gal

This project will include a 13 mile 16 inch diameter pipeline to convey water between Round Rock and Chisholm Trail SUD north to Hwy 263 to FM 2338. Wholesale treated water cost from Round Rock is estimated at \$1,148/acft.

WUG: City of Florence
Strategy: Trinity Aquifer Development
Source: Trinity Aquifer
Facilities: Well Field, transmission and treatment
Total Capital Cost: \$1,087,000
Total Project Cost: \$1,648,000
Total Annual Cost: \$191,000
Available Project Yield: 322 acft/yr
Annual Cost of Water: \$ 593 per acft/yr or \$1.82 per 1,000 gal

This project will include two 200 gpm wells drilled to 750 ft, one mile of 4 inch diameter transmission pipeline and distribution system improvements.

WUG: Liberty Hill
Strategy: Purchase water from City of Leander
Source: Leander – Highland Lakes
Facilities: Transmission pipeline and pump station
Total Capital Cost: \$5,986,000
Total Project Cost: \$8,691,000
Total Annual Cost: \$1,723,000
Available Project Yield: 1,800 acft/yr
Annual Cost of Water: \$ 2,872 per acft/yr or \$ 8.81 per 1,000 gal (1st 600 acft with debt service for full project from 2010 to 2020)

\$1,425 per acft/yr or \$ 4.37 per 1,000 gal (next 1,200 acft without debt service from 2030 to 2050)

This project will include an 8 mile 12 inch diameter pipeline to convey water from Leander to Liberty Hill along Highways 183 and 29. The wholesale unit cost of treated water varies from \$1,380/acft for the first 600 acft to \$1,348/acft for the remaining 1,200 acft.

WUG: Williamson County-Other
Strategy: Trinity Wells
Source: Trinity Aquifer
Facilities: Well Field, transmission and treatment
Total Capital Cost: \$1,294,000
Total Project Cost: \$1,995,000
Total Annual Cost: \$216,000
Available Project Yield: 280 acft/yr
Annual Cost of Water: \$ 770 per acft/yr or \$2.36 per 1,000 gal

This project will include two 200 gpm wells drilled to 750 ft, two miles of 4 inch diameter transmission pipeline and distribution system improvements.

WUG: Multiple WUGs in Williamson County
Strategy: EWCRWTS Supply to Williamson County
Source: BRA (Lake Granger)
Facilities: Transmission Pipelines and Pump Stations
Total Capital Cost: \$29,733,000
Total Project Cost: \$44,706,000
Total Annual Cost: \$7,844,000
Available Project Yield: 8,847 acft/yr
Annual Cost of Water: \$887 per acft/yr or \$2.72 per 1,000 gal

This project will include a 40 mile pipe network to convey water from the BRA's EWCRWTS at Lake Granger to area WUGs. WUGs that will receive water from this project include the following:

- City of Bartlett,
- City of Granger,
- City of Hutto (via City of Taylor),
- City of Jarrell,
- Jarrell-Schwertner WSC,
- Jonah Water SUD,
- City of Thrall,
- City of Weir,
- Center Texas WSC, and
- Williamson County Other.

The pipe network will originate at the EWCRWTS located on the south shore of Lake Granger. An approximately 830 horse power pump station will be located at the treatment plant; existing plant capacity is assumed to be adequate (i.e., costs for treatment plant expansion are not included). A 24-inch line will extend west along FM 1331 from the pump station to SH 95. From the intersection of FM 1331 and SH 95, a 24-inch line will extend northward along SH 95 through the Cities of Granger and Bartlett, and terminate in the City of Holland. Central Texas WSC will be supplied at the terminus of the line in Holland. In

addition to Granger, Bartlett, and Central Texas WSC, the City of Jarrell, Jarrell-Schwertner WSC, and Jonah SUD will be served by the line located along SH 95. A 6-inch line will extend eastward from Taylor to Thrall along U.S. Highway 79. For cost estimating purposes, it is assumed that existing transmission capacity from the FM 1331 – SH 95 intersection to Taylor is sufficient to convey the required supplies for Hutto and Thrall to Taylor. Hutto will be supplied at Taylor through existing infrastructure. Lastly, a 14-inch spur line will extend westward from SH 95 along SH 29 to the intersection of County Road 120. An approximately 270 horse power booster station will be included on this line. A 6-inch line will extend northward along County Road 120 to serve the City of Weir. The 14-inch line and pump station provide sufficient capacity so that the line can be extended westward along SH 29 across Interstate 35 to meet needs of Chisholm Trail SUD, which are project to occur in 2050, as part of the BRA Lake Granger Augmentation Project.

Costs for the EWCRWTS are based on construction of the facilities described above. The unit water cost is based on the total project cost and the total volume of water delivered. This cost is applied to each WUGs receiving water from the project, except as noted in the Williamson County Plan discussion.

WUG: City of Round Rock, Williamson County Other, Chisholm Trail SUD

Strategy: Lake Granger Augmentation – Conjunctive Use

Source: Lake Granger

Facilities: Water Treatment Plant Expansion, Transmission Pipeline and Pump Station

Total Capital Cost: \$152,108,000

Total Project Cost: \$229,822,000

Total Annual Cost: \$33,212,000

Available Project Yield: 38,394 acft/yr

Annual Cost of Water: \$865 per acft/yr or \$2.65 per 1,000 gal

This project will include a 65.5 MGD expansion to the BRA's EWCRWTS at Lake Granger and a 25 mile 48 inch diameter pipeline to convey water from the treatment plant to Round Rock. In addition, the project will include extending the 14-inch EWCRWTS pipeline located along SH 29 10 miles to the west, crossing Interstate 35, to serve Chisholm Trail SUD.

4B.17.4 Water Treatment Plants

There are a total of ten water user groups and or wholesale water providers that will require a water treatment plant expansion or a new water treatment plant to meet potable water demand during the planning period. New or expanded treatment plants are sized for peaking capacity. However the yield of these projects is assumed to be 50% of the expansion or plant size to be consistent with the methodology for the surface water constraints as described in Volume I, Section 3. Table 4B.17-1 summarizes water treatment plant strategies. This table includes only the water treatment plant strategies that are not included in any of the other Section 4B water management strategy evaluations.

Table 4B.17-1.
Miscellaneous Strategies: Water Treatment Plant Strategies for WUGs/WWPs

WUG/WWP	Strategy	Project Yield (acft/yr)	Capital Cost	Total Project Cost	Annual Cost	Unit Cost	
						\$/acft	\$/kgal
Temple	Phase I expansion (14 MGD)	7,840	\$16,393,000	\$23,017,000	\$3,681,000	\$470	\$1.44
Temple	Phase II expansion (14 MGD)	7,840	\$16,277,000	\$22,853,000	\$5,678,000	\$362	\$1.11
Granbury	Expand WTP by 14 MGD	7,840	\$22,303,000	\$31,314,000	\$4,622,000	\$590	\$1.81
Cleburne	Expand WTP by 5 MGD	2,800	\$9,936,000	\$13,951,000	\$1,814,000	\$648	\$1.99
Johnson County SUD ¹	Expand BRA SWATS by 5.66 MGD	3,170	\$23,284,000	\$33,320,000	\$4,778,000	\$1,218	\$3.74
Stamford	Expand WTP by 6 MGD	3,360	\$9,730,000	\$13,662,000	\$1,958,000	\$583	\$1.79
Jayton	New WTP (0.4 MGD)	224	\$2,508,000	\$3,522,000	\$488,000	\$2,179	\$6.68
Robinson	Expand WTP by 2 MGD	1,120	\$3,243,000	\$4,554,000	\$653,000	\$583	\$1.79
² Palo Pinto County MWD No. 1	New WTP (15 MGD)	8,400	\$25,514,000	\$35,822,000	\$5,268,000	\$627	\$1.92
Albany	Expand WTP by 0.1 MGD	56	\$162,000	\$228,000	\$32,663	\$583	\$1.79
Georgetown	Expand WTP by 7.2 MGD	4,032	\$8,431,000	\$11,838,000	\$1,893,000	\$469	\$1.44
Georgetown	Expand WTP by 11.1 MGD	6,216	\$12,998,000	\$18,249,000	\$3,950,000	\$384	\$1.18
Georgetown	Expand WTP by 12.7 MGD	7,112	\$14,697,000	\$20,635,000	\$5,162,000	\$297	\$0.91
Abilene	Expand WTP by 23.2 MGD	12,992	\$35,116,000	\$49,304,000	\$7,424,000	\$571	\$1.75
1 - Implementation of this strategy will also affect cost of water to Keene, Acton MUD and Granbury 2 - City of Mineral Wells may also have partial ownership in this WTP							

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