Feasibility Study Report

**Texas Water Development Board**
**Regional Water Supply and**
**Wastewater Facilities Planning**

**for the**

# Eastern Navarro County Regional Water Supply Feasibility Study

**Submitted by:**

**Lockwood, Andrews & Newnam, Inc.**

**March 29, 2014**



**1248321464_Final Report**

215 Mary Ave, Suite 300 • Waco, Texas 76701 • 254.753.9545 • Fax: 254.753.9593 • www.lan-inc.com

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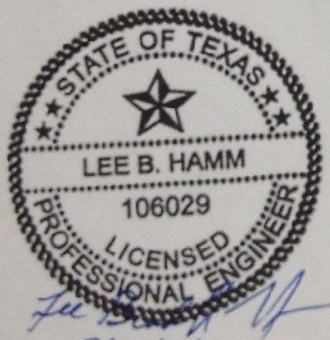


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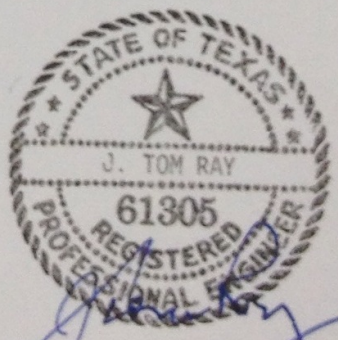


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# Executive Summary

## Project Purpose

The Chatfield Water Supply Corporation (CWSC) retained Lockwood, Andrews & Newnam, Inc. (LAN) to prepare a Feasibility Study that would review the existing system and identify possible alternate water supply sources. CWSC currently purchases water from the City of Corsicana under a Take-or-Pay contract that does not recognize CWSC as a wholesale purchaser and subjects CWSC to variable rates. The objective of this study is to determine the feasibility of developing a new regional water supply, treatment and transmission system for the CWSC area.

## Modeling

The existing system was modeled using WaterCAD V8i and was based upon maps provided by CWSC. The various components of the system (pumps, tanks, meter connections, pipes, etc.) were entered into the system to create an approximate model of the system. This model was used to identify possible issues within the existing system and future upgrades that would likely be necessary if received water from alternate water supply in a different location than the existing supply.

## Data Development

Population projections were taken from the TWDB 2011 Region C Report for the study area. Some adjustments were made to incorporate historical meter installations within CWSC. The population projections developed into water demand projections, based on historical per capita water usage rates for the study. This resulted in the creation of demand curves, which were used for comparison to the supplies identified in the Region C report.

## Environmental Factors

Various environmental evaluation factors were reviewed and included within this report. Factors included the climate, rainfall and water supply, groundwater sources, drainage and physical factors, and geological elements. Additional impacts of development of the water source options on sensitive habitats and endangered species is also discussed, in conjunction with the water transmission line and water line crossings and borings.

## Water Infrastructure

To develop a complete picture of the existing system, an inventory was developed. There are eight primary pump stations in the system, with pipes ranging in size from below 2 inches to 12 inches in diameter. This inventory was compared to the requirements set forth in Chapter 290 of the Texas Commission on Environmental Quality (TCEQ) regulations and the results were presented.

## Water Supply Alternatives

The primary focus of the project was to evaluate the various water supply sources – Tarrant Regional Water District (TRWD), Kerens Lake, groundwater, and the existing supply, the City of Corsicana. The evaluation determined that the TRWD was the most likely alternative, which would require surface water treatment. Various options for treatment were considered, including sizing the plant for regional versus CWSC demands, constructing a conventional treatment plant versus a package plant. Detailed

costs, a breakdown of cost per connection for debt service, and the cost to treat water are presented within the report.

### Recommendation

The primary determination of the study is that, based on the preliminary costs, the option for a package treatment plant sized for CWSC alone is the viable alternative to the existing supply from the City of Corsicana. While it is more expensive when compared in the breakdown of cost per 1,000 gallon - $3.66 versus $3.25, its primary advantage is allowing CWSC control over the water rates for its customers. The City of Corsicana has recently increased its rates for its commercial customers, with planned increases in the near future. It is recommended that CWSC continue to develop an alternative water supply, whether with TRWD or another source.

### Project Implementation

A discussion of the various project implementation funding opportunities available through the TWDB and other sources were compiled and provided. The project implementation plan and rough schedule were discussed and provided.

# Section 1 - Introduction

## Project Background

The Chatfield Water Supply Corporation (hereafter referred to as CWSC) retained Lockwood, Andrews & Newnam, Inc. (hereafter referred to as LAN) to prepare a Feasibility Study to identify the current operational issues within the system and identify potential sources of supply. The Texas Water Development Board (TWDB) is providing a portion of the funding for this study and therefore a more regional view of the water demands is included within this study, primarily the demands of CWSC, Kerens, and MEN WSC. The study will review existing conditions, current and projected demands, raw water supply alternatives available to CSWC, treatment options, facility upgrades based on water modeling, and probable costs for the identified improvements.

## Objective

The objective of this study is to determine the feasibility of developing a new regional water supply, treatment and transmission system for the CWSC area. The study will identify reasonable and sustainable sources of good quality water supply and examine treatment and transmission options for the future of CWSC through the year 2060 Through the TWDB, CWCS feasibility study will be coordinated with the Region C Planning Group and the final recommendations incorporated into the State Water Plan. All reasonable water supply system options are identified and compared to the option of CWSC maintaining its existing water supply contract with the City of Corsicana. Identifying the most cost-effective that provides a sustainable supply for CWSC Board to consider implementing is the primary objective.

## Scope of Work

The scope of work included in the preparation of this report was:

- LAN staff will review the TWDB Regional Water Facility Planning grant requirements with the CWSC staff, including the list of “special requirements” that are included in the TWDB’s standard contract
- Working with the CWSC staff, identify participants and potential participants that would comprise a regional water system
- Identify and assess future water needs to determine the future raw water supply needed by decade for CWSC and the regional participants
- Identify potential sources of future raw water supply
- Coordination with TRWD on available water supply
- Identify any other sources of supply, including any beneficial and sustainable groundwater supplies
- Determine the location, supply volumes, unit price, diversion rate limitations, water quality, and other pertinent information on identified raw water supply options
- Develop an inventory of existing conditions for the CWSC Regional System and forecast future water needs (TWDB minimum requirement)
- Determine potential raw water routing options in coordination with the CWSC staff
- Identify the treatment requirements (unit processes) for raw water supply options

- Develop supply and treatment options, including treatment plant capacity requirements, to meet the future water needs of the CWSC Regional System over time (TWDB minimum requirement)
- Evaluate and compare each water supply and treatment option (alternative) that will meet the CWSC Regional System's future needs (TWDB minimum requirement)
- Provide recommendations to the CWSC on "best" water supply option (TWDB minimum requirement)
- Prepare periodic updates and status reports to the CWSC staff
- Prepare a draft report for review by the CWSC and possibly TWDB staff
- Prepare a final report (Nine copies required by the TWDB, if funded), including required electronic copy
- Attend public meetings

### Demand Allocation and Projections

For the model, the demands were allocated based on a map of the system provided by CWSC staff. The maps had the meters (connections) labeled, and these were entered into the model to provide an approximate demand density for Chatfield's system. The projections were based on the TWDB 2011 Region C Report projects, as detailed in Table 1.

### Model Development

The existing system was modeled using WaterCAD V8i and was based upon maps provided by CWSC. The system is supplied from the City of Corsicana and is simulated by using reservoirs as the supply to the four pump stations that supply water to the rest of the system, water plants 1, 3, 7, and 7A. The booster stations are modeled by combining the ground storage tanks at each site into one tank and connecting the feed directly to the tank. The pumps are simulated as pumps and the pump curve was approximated using the flow rates provided by CWSC staff and a typical pressure of 70 psi. The pumps pull directly from the simulated tank and pump directly into the system. Because of TCEQ requirements that each pump station have a backup pump, only one pump is set to operate.

Connections within WaterCAD V8i are modeled using junctions. Junctions are placed where the water line branches, where the pipe size changes, and near clusters of connections. The connections are grouped together based on their proximity to each other and the corresponding demand is assigned to a nearby junction. This allows the model to run more efficiently while maintaining accuracy.

### Model Verification and Assumptions

All of the water lines 2 inches or larger in diameter have been included in the model. The diameters were approximated using typical PVC diameter values and a friction coefficient, C-value, of 120, as the system is primarily composed of PVC, per conversations with CWSC staff.

The pump stations were set to operate at a pressure of 70 psi, which was based on conversations with CWSC staff.

## Model Results

There are several requirements that the Texas Commission on Environmental Quality states for public water distribution systems which have been compiled primarily in Chapter 290 of the Texas Administrative Code - Title 30 - Environmental Quality. The primary requirements associated with the model are the demands per connection. TCEQ requires that the system provide 1.5 gallons per minute per connection and maintain 35 psi in pressure at all points within the distribution network. The system, when modeled with the 1.5 gpm requirement, presented several areas that appeared to be below the pressure requirement. However, CWSC, after a previous water improvement study, is in the process of obtaining funding to upgrade their system to meet the TCEQ requirements. These proposed improvements were not included as part of the scope of this study.

The model results indicate that as the system growth occurs, the primary distribution lines, which are currently 4-inch and 6-inch lines, will need to be upgraded, especially the transmission lines between the pump stations. There are specific areas that will also require upgrades, particular in the more eastern areas of the system, as these areas are the farthest from CWSC's source and incur the most head loss as the water must travel through longer stretches of pipe to reach them.

It must be noted that the demands were allocated based upon the location of the current connections within the system. The areas of higher density that exist currently were the areas where the greatest growth occurred in the future simulations. This may not be the case for either the location of the growth or the percentage of growth when development occurs in the future.

# Section 2 – Data Development

## Study Area

CWSC serves a population of approximately 4,200 with approximately 1742 connections, which includes one wholesale customer/connection, City of Goodlow, with 300 connections. This system is a rural water supply corporation with no fire protection provided. The majority of the lines are 6-inch diameter and smaller. Booster stations are located throughout the system to feed hydro-pneumatic tanks that provide and hold the pressure on the distribution system. There are currently no elevated or stand pipes in the system.

The current participants are Chatfield with a connection to the community of Goodlow. The potential participants interested in obtaining water from Chatfield's system are:

- City of Kerens
- MEN WSC

These subject participants are in need of additional supply and/or backup of their existing water supply. Price of obtaining additional water will be a major factor in considering contracting with Chatfield to provide the water. Costs of supply as well as infrastructure will be identified in this Feasibility Study.

## Population

The population projections are based on TWDB populations for the study period of 50 years. The population projections are from TWDB as shown in Table 1:

**Table 1 - Population Projections from TWDB Region C Report**

| Entity | | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|
| Chatfield | | 6,000 | 7,800 | 9,799 | 11,718 | 14,075 |
| MEN WSC | | 3,755 | 4,137 | 4,477 | 4,762 | 5,180 |
| Kerens | | 1,937 | 1,937 | 1,937 | 1,937 | 1,937 |

The population projections from the TWDB report are high when compared to the number of annual new meters installed and permitted. A review of the actual meter installations for Chatfield is approximately 36 meters per year. This results in a 2.75% growth per year. Based on the actual meter installation records a growth rate of 2.75% was used to adjust the TWDB growth rates, as shown in Table 2.

**Table 2 - Adjusted Population Projects**

| Entity | | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|
| Chatfield | | 6,000 | 7,245 | 8,748 | 10,563 | 12,755 |
| MEN WSC | | 3,755 | 4,137 | 4,477 | 4,762 | 5,180 |
| Kerens | | 1,937 | 1,937 | 1,937 | 1,937 | 1,937 |

- Chatfield is the only entity adjusted for population based on actual meter installations.

The adjusted population projections reflect the actual growth based on the number of new meters added per year in the system.

## Land Use

Although Interstate 45 borders on the western side of the study area, the housing and commercial density is low. Based on CWSC alone, the approximate number of connections per square mile is 12. Although the study area could be considered rural, the water use per capita is also low (see Table 7), which indicates that the water used from the system is not for agricultural irrigation purposes and limited lawn/landscape irrigation. Based on the water use numbers and review of aerial photographs of the area, the primary use of water is assumed to be residential.

## Existing Water Production, Delivery, and Demand

CWSC is currently being supplied by the City of Corsicana for their water demand requirements. No other sources of water supply are currently utilized. CWSC currently has a Take-or-Pay contract for five (5) million gallons per month, which simply means that CWSC must pay for a minimum of 5 million gallons per month, whether used or not. The contract stipulates a maximum capacity of 60 million gallons per month. In order to meet the 60 million gallons per month, the supply line would need to furnish almost 2 million gallons per day. The model indicates that the supply line's actual capacity is likely less than 1 million gallons per day. Additionally, the current 6-inch supply meter and storage capacity within the CWSC system is too small to allow the maximum monthly capacity of 60 million gallons to be delivered to and stored in CWSC system. According to CWSC staff, the demand for the system is currently averaging 12 million gallons per month.

The City of Corsicana's main supply of water is the Richland Chambers Reservoir. The water is treated by a City of Corsicana surface water treatment plant prior to delivery to CWSC. Corsicana delivers this water through a 4-inch diameter pipe to Booster Station No. 1. There are additional pumps required for delivery to CWSC: Booster station No. 3 is fed by an 8-inch and 4-inch. Booster No. 7 and 7A is fed by 6 & 8-inch lines.

### *Existing Water Cost*

Current costs for the treated water from the City of Corsicana that CWSC purchases is $3.25 per 1000 gallons. Currently CWSC currently charges a $24.00 Service Availability charge to each customer per month. The CWSC charges the customer a total of $4.94 / 1000 gallons of water used; this includes the purchase cost from Corsicana. Below is a tabulation of the average CWSC customer water billing based on typical use of 6,000 gallons per month:

$ 24.00 Service Availability Fee (SAF)
$ 29.64 water (6,000 gallons @ $4.94 / 1,000 gallons)

$ 53.64 Total bill / month (Average customer)

### *Water Usage*

The current average water usage for CWSC is approximately 12.3 million gallons per month, based on information provided by CWSC. This equates to approximately 404,100 gallons per day or 280.6 gallons per minute. The peak water usage was recorded as 867,000 gallons per day, or 602.1 gallons per minute. The current population served by CWSC is 4,200. A per capita usage rate calculates to 96.2 gallons per day per capita for average usage or 206.4 gallons per day per capita for peak usage.

### *Demand Development*

Chatfield's projected demands for the next 50 years are identified by TWDB. These projections appear to be somewhat over-stated, although less than those compiled in the previous water study by TWDB. The projections from TWDB show the following volumes by decade for the next 50 years in Table 3.

**Table 3 - Projected Water Demand in acre-feet per year (2011 TWDB Region C Report)**

| Entity | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|
| CWSC | 726 | 935 | 1153 | 1378 | 1655 |
| MEN WSC | 471 | 510 | 542 | 570 | 621 |
| City of Kerens | 453 | 447 | 440 | 436 | 436 |

This projected water demand is based on the TWDB population projections. Figure 1 illustrates the combined demand projections based on the TWDB 2011 Region C Report.

### *Demand Curve*

Figures 1 and 2 were developed from the 2011 TWDB Region C Report. Figure 1 illustrates the combined demands of CWSC, MEN WSC and the City of Kerens. Figure 2 also has the same demands, but includes the available supply for CWSC and all three entities. As can be seen in Figure 2, a significant shortfall in supply could possibly begin to appear after the year 2020 for all three entities and particularly for CWSC. The supply and demand quantities shown were based on the numbers provided in the Region C Report. The supply line shown does not reflect the maximum contracted amount of 60 million gallons per month between CWSC and the City of Corsicana.

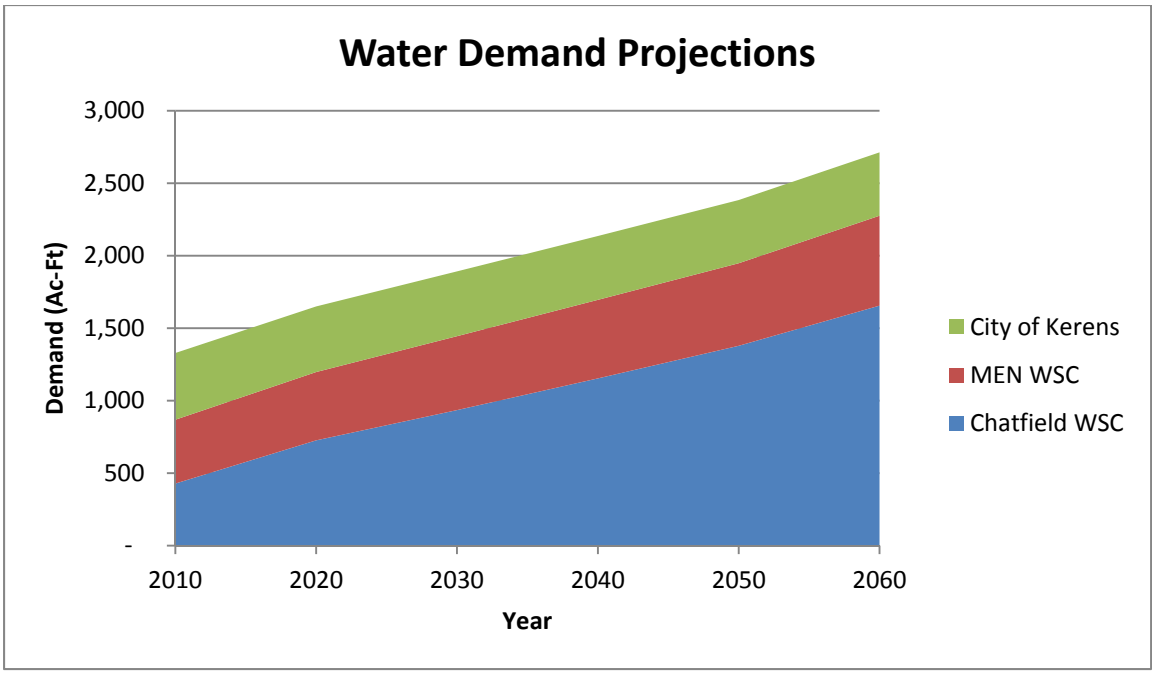



**Figure 1 - Projected Demands (TWDB 2011 Region C Report)**

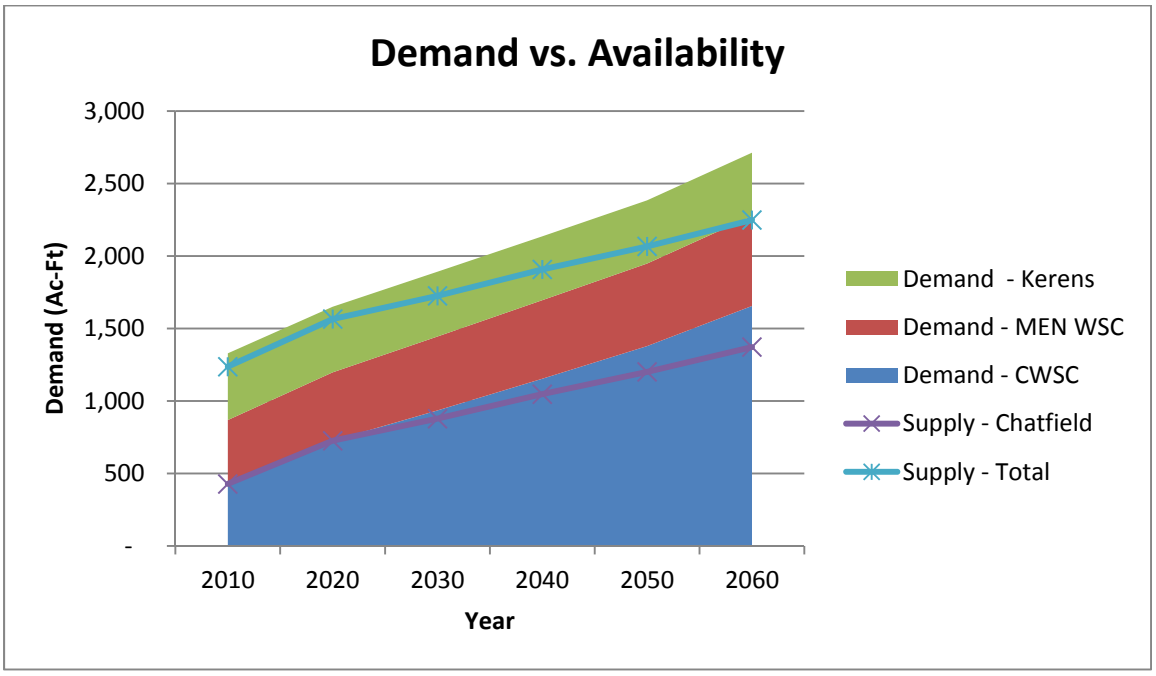



**Figure 2 - Demand versus Availability (TWDB 2011 Region C Report)**

### *Water Loss Factor*

Because CWSC purchases its water from the City of Corsicana, the water loss is calculated by determining the number of gallons purchased and subtracting the number of gallons sold to customers. It must be noted that the resulting quantity is typically composed of water loss due

to leaks, line breaks, fire flows, line flushing, and unmetered connections. For the 2011 year, there were 145.84 million gallons purchased from the City of Corsicana and 134.68 million gallons sold to customers. The calculated loss is 11.16 million gallons. Computing the percentage of water loss from the total amount purchased, the water loss percentage for 2011 was 7.65%.

# Section 3 – Environmental Evaluation Factors

## Environmental Factors for Consideration

The implementation of the CWSC regional water project should recognize environmental considerations and include mitigation efforts based on the type and magnitude of the potential impacts. The CWSC identified both groundwater and surface water options. The following environmental factors should be considered for each supply source option and also for the water transmission pipelines required for either supply option.

## Groundwater Option

The groundwater sources available for the CWSC present a number of environmental concerns. The Woodbine Aquifer is a local aquifer that provides the best opportunity for development in quantities to meet the CWSC demands; however, the quantities available in the vicinity of the study area are limited. Limited production can be expected, which could lead to a requirement for multiple test wells in attempting to locate best production and quality. If quantity is limited as expected, this could lead to multiple production wells.

### *Impacts on Sensitive or Native Habitats and Riparian Corridors*

The environmental impacts of either test or production well construction should be avoided, if possible, by identifying sites previously disturbed by agricultural, mining or other operations. Greenfield areas of undisturbed habitat should be avoided. In the CWSC project area and this portion of Navarro County there is a minimum of undisturbed habitat. The area is predominated by agricultural operations, scattered rural dwellings, and local commercial operations. Consequently, the undisturbed habitat is restricted to riparian corridors and fence row habitat.

For the groundwater option considered, these areas should be avoided. Alternative transmission pipeline routings should be considered to identify routes that will avoid sensitive habitats, including riparian areas, wetland areas, and well-established woodland break areas. The possibility of pipeline construction that crosses these habitat areas will need to minimize impacts by using boring methods or directional drilling methods, with sufficient set-back from creeks or other habitat to avoid or minimize impacts.

If well construction on undisturbed area is unavoidable then mitigation with like-kind habitat area will be necessary.

The Woodbine also has water quality problems that would require demineralization treatment. This treatment would present brine disposal issues either for the surface environment or groundwater integrity depending on the method of disposal. The Woodbine Aquifer is typically high in manganese that, because of potential membrane fouling, makes conventional reverse osmosis problematic. Pretreatment for manganese is typically required.

The well site location should be selected to avoid impacts to native and sensitive habitats. If possible, construction should take place on previously disturbed areas. The construction at the well site should avoid other environmental impacts such as noise, air pollution or groundwater.

#### *Impacts on Endangered or Threatened Species*

As a result of the lack of significant areas of undisturbed habitat coupled with the relatively small footprint required for water well construction, the probability is small that a species listed as endangered or threatened by either the US Fish and Wildlife Service or the Texas Parks and Wildlife Department would be negatively impacted by construction. The most important habitat in the CWSC project area that could potentially provide conditions for even temporary occupation by a threatened or endangered species is the riparian habitats. Riparian habitats are not expected to be disrupted by the construction of groundwater wells or transmission pipelines.

### Surface Water Supply Option

For a number of reasons, the surface water option is preferred. Both the quantity and quality of the available surface water meets the demands of CWSC. The CWSC would purchase water supply from the Tarrant Regional Water District (TRWD), which has confirmed that sufficient quantities of water are available. The details of the surface water option are described in detail in other sections of this report.

The surface water option includes the opportunity to share water facilities, both existing and planned, with the TRWD. The TRWD is constructing a major water supply transmission project, known as the Integrated Pipeline Project (IPL) that will convey major quantities of water supply from Richland-Chambers Reservoirs with other TRWD and City of Dallas reservoir supplies as part of an integrated system to meet existing and future water demands in the Dallas-Fort Worth Metroplex area. The TRWD cooperated with the CWSC and helped identify possible joint use options. The joint use of pump stations, raw water delivery pipeline from Richland-Chambers Reservoir to the IPL pumping stations and pipelines.

#### *Impacts on Sensitive or Native Habitats and Riparian Corridors*

Since CWSC will be share facilities with TRWD, including the potential to site the CWSC water treatment plant on or near TRWD property, the impacts on sensitive or native habitat from the construction of raw water transmission or the water treatment plant will be minimal. As discussed above, the area anticipated for the CWSC surface water facilities has been disturbed due to agricultural operations, roads, and other improvements. It is not anticipated that wetlands or sensitive habitat will be distributed.

As discussed above, the native, undisturbed habitat will be associated with riparian area. For the construction of the water treatment plant and the associated raw water pipeline, whether constructed by CWSC or the TRWD, it is anticipated that sensitive, native, and riparian habitat can be avoided. The routing of pipeline and location of the water treatment plant will need to recognize all potential environmental impacts—habitat, wetlands, erosion problems, runoff impacts to waterways, and so forth.

### *Impacts on Endangered or Threatened Species*

For a number of the same reasons as the groundwater option, the impacts to endangered or threatened species will be negligible. In fact, sharing facilities with the TRWD will further reduce the likelihood that a CWSC facility will contribute to disrupting these species.

The CWSC will avoid sensitive habitat that could support endangered or threatened species. The construction will recognize and avoid impacts on these species.

As discussed under the groundwater option above, the most important habitat in the CWSC project area that could potentially provide conditions for even temporary occupation by a threatened or endangered species are the riparian habitats. Riparian habitats are not expected to be disrupted by the construction of groundwater wells or transmission pipelines.

## Transmission Pipeline

Associated with the CWSC project will be transmission pipelines, which should be routed in a manner to avoid as much environmental impact as possible. For the surface water project, there will two types of supply pipelines: one delivering raw water from Richland-Chamber Reservoir to the CWSC water treatment plant site and the other delivering treated water from the treatment plant to the Chatfield WSC and other participants. In the former case, it is anticipated that CWSC will share capacity with the TRWD's major raw water IPL conveyance pipeline. In this case, the potential environmental impacts will be minimal for CWSC as TRWD will conduct the route studies and environmental evaluations to identify impacts for the raw water delivered to its Booster Pump station. The CWSC water treatment plant will be located at or near this TRWD pump station.

### *Pipeline Routing*

Treated water transmission pipelines will be needed for both the surface water system and groundwater system. The CWSC will route these pipelines to avoid environmental impacts by identifying routes through or adjacent to disturbed areas. Often, the county road right-of-way will be used. If cross-country pipelines are the most cost-effective alternative, then the routing will avoid sensitive or native habitat by routing through or adjacent to disturbed areas such as active farming areas.

For pipeline construction, a 30-foot construction easement will be needed. It is anticipated that the transmission pipeline from the TRWD Booster pump site to the CWSC area will require approximately nine months for construction. Erosion control areas will need to be identified as part of the routing effort. Disturbance to existing vegetation during construction will be minimized to the extent feasible. It is anticipated that the pipe material will be properly pressure-rated PVC. The pipeline will be constructed to minimize the time that excavations will be left open. Using PVC will aid in construction and efforts to minimize the time required for open excavations. Standard methods will be included in the construction documents to control erosion and to speed re-vegetation of the backfilled trench after pipe testing.

### *Crossings and Borings*

Depending on the final routing of the treated water transmission, one or two crossings of minor streams will be required. This crossing will be completed using a boring operation with approximately 20 foot set-back from the stream channel to avoid impacts to the stream itself.

County or private road crossing will also be completed using borings with proper set-backs to avoid road disruption.


**Figure 3 - Location of TRWD IPL Booster Station and Stream Crossing Areas**

## Background Information for Navarro County Existing Conditions

Navarro County, an area of 1,084 square miles, is in the central part of northeastern Texas. The economy is based primarily on oil production, agriculture, and some manufacturing. The county has a dry sub-humid climate in the west and moist sub-humid in the east.

### *Climate*

Navarro County has a dry sub-humid climate in the western part, where precipitation is slightly less than potential evapotranspiration, and a moist sub-humid climate in the eastern part, where precipitation is slightly greater than potential evapotranspiration. Annual precipitation is sufficient to sustain extensive agricultural development. Hot summers and mild winters generally provide a long growing season of approximately 259 days.

### *Rainfall and Water Supply*

Annual rainfall averages 35 inches in the western part of the county and 39 inches in the eastern part. Most of the water required for public supply and industrial use in the county in 1968 was supplied by surface water obtained from Navarro Mills, Richland Chambers, and other reservoirs.

### *Groundwater Sources (G.L Thompson, USGS)*

The Hosston Formation, which is untapped by wells in Navarro County, is potentially a valuable source of ground water in the western part of the county. This aquifer presently transmits 1.4 mgd. The Paluxy Sand, which contains fresh to slightly saline water only along the northwestern margin of the county, transmits a quantity of water that is very small chiefly because the amount of saturated sand is thin. The Woodbine Formation transmits 0.4 mgd of which about one-third is pumped in Navarro County. Heavy pumping has caused declines in the water level in the Woodbine of as much as 420 feet from 1907 to 1968. The Nacatoch Sand has considerably less available water than the Woodbine, but drilled wells can pump about 10-15 gpm (gallons per minute) from the aquifer. Alluvium along the Trinity River can yield as much as 150 gpm to wells. The Wilcox Group, Midway Group, Navarro Group (excluding Nacatoch Sand), and Taylor Marl are minor water-bearing units which yield mostly small quantities of water to shallow wells.

### *Drainage and Physical Factors (Fenneman, Thompson, USGS)*

The land surface of the Trinity River watershed in this area is flat to gently rolling and slopes generally southeast at about 8 feet per mile. The total relief is approximately 330 feet, with a range in altitude from 270 to 600 feet. Topographic features include a prominent westward facing escarpment capped by Tehuacana limestone of the Kincaid formation, the channels of minor streams, and the broad, shallow, alluvial floodplains of Chambers and Richland Creeks.

Black and Grand Prairie grasses comprise the principal vegetation of the area, except for the Trinity River floodplain in the extreme eastern part of the area where a heavy growth of oak is found. The blackland soils support pasture and meadow grasses, including big and little bluestem, Indian grass, sideoats grama, and switch grass. Scattered oaks grow along the streams in Navarro County, and some salt tolerant grasses are found along tributary drainage.

Most of the area is drained by Chambers and Richland Creeks, which rise in Hill and Ellis Counties, respectively, and flow southeasterly across Navarro County. The two creeks meet about two miles north of the Freestone County line and flow into the Trinity River. Crab and Cedar Creeks in the central part of the area are also continuously supplied by brine produced from the Powell-Woodbine field; otherwise they would flow only during and immediately after periods of precipitation.

Navarro County is in the northwestern part of the West Gulf Coastal Plain of Texas and includes part of the Black Prairie and the western edge of the East Texas Timber Belt (Fenneman, 1938, pl. VII). Altitudes range from about 240 feet above mean sea level in the southeastern part of the county along the Trinity River to about 630 feet in the northwestern part of the county near

Blooming Grove. The Black Prairie, which is underlain by the Taylor Marl, Navarro Group, and Midway Group, is a relatively flat surface that slopes gently to the east. The East Texas Timber Belt, which is underlain by the lower part of the Wilcox Group, has a sandy, slightly hummocky surface.

### *Geological Elements (Osborne, et al)*

The area of investigation is underlain by sedimentary rocks consisting of alternating beds of glauconitic sandstone and shale and a locally thin lime stone, which belong to the Gulf Series of Cretaceous age and the Midway group of Tertiary age which dip at approximately 115 feet per mile until interrupted by a huge structural graben in the center of the area.

# Section 4 – Water Infrastructure

## System Overview

The existing distribution system is made up of various sizes of pipes from 1-1/2-inch diameter to 8-inch diameter. There are approximately 52 miles of 4-inch pipe, 51 miles of 6-inch pipe and 9.3 miles of 8-inch pipe. According to CWSC staff, all of the piping in the system is PVC with the exception of the piping within the Booster Stations, which is ductile iron.

According to CWSC staff, the average pressure setting on the pumps at the booster stations is approximately 70 psi and the system typically maintains minimum pressures of 50-55 psi.

## Booster Stations

There are eight (8) water plants or booster stations that pump the water into the distribution system. Each of the booster stations consist of a ground storage tank or tanks, a set of pumps, and a hydro-pneumatic tank or tanks. The ground storage tank(s) receives the flow from the transmission lines and provides a buffer for high demand periods. The pumps move water at a certain flow rate from the relatively low pressure of the ground storage tank to the higher pressure of the distribution system. The hydro-pneumatic tanks aid in providing pressure throughout the distribution system by controlling the pumps' cycles and adding additional pressure using air compressors.

Table 4 provides a summary of the various booster stations throughout the CWSC. The three largest stations, Stations 3, 7, and 7A, receive water from the City of Corsicana and, while providing supply for demands with the system, supply other pump stations in the system.

**Table 4 - Existing Water Plant (Booster Station) Data**

| Plant | | Ground Storage Tank Volume(s) | Hydro-Pneumatic Tank Volume(s) | Number of Pumps | GPM |
|---|---|---|---|---|---|
| Station 1 | | 30,000 | 3,000 | 2 | 400 |
| Station 2 | | 66,000 | 7,000 | 2 | 400 |
| Station 3 | | 200,000<br>31,000<br>30,000 | 10,000 | 2 | 500 |
| Station 4 | | 66,000 | 10,000 | 2 | 300 |
| Station 5 | | 15,000<br>36,000 | 6,000 | 2 | 400 |
| Station 6 | | 31,000<br>66,000 | 10,000<br>3,000<br>1,500 | 2 | 400 |
| Station 7 | | 110,000 | 10,000 | 2 | 500 |
| Station 7A | | 120,000 | 12,000 | 2 | 400 |

### Transmission Lines

The transmission lines within CWSC are primarily located to facilitate the distribution of water throughout the system. The largest transmission line is the supply from the City of Corsicana, which is an 8-inch water line. The remaining transmission lines primarily consist of 4-inch and 6-inch water lines, and pass from the pump stations located the closest to the City of Corsicana to the further outlying pump stations.

### Distribution Lines

The distribution lines provide supply to the various connections throughout the system. The primary difference between transmission lines and distribution lines is that transmission lines are larger in diameter (compared to the majority of the system) and move water between storage points within the system, while distribution lines are smaller in diameter and move water from the storage points to the demand connections within the system. The distribution lines for the CWSC consist primarily of pipe sizes from 1 inch to 4 inches in diameter.

### TCEQ Requirements

The TCEQ requirements for public distribution systems can be found in Section 290.45 (Minimum Water System Capacity Requirements) of Chapter 290 (Public Drinking Water) of Title 30 (Environmental Quality) of the Texas Administrative Code. The requirements listed in Table 5 are for purchased water systems, which apply to CWSC as it currently operates.

**Table 5 - TCEQ Requirements for Purchased Water Systems**

| Description | Requirement |
|---|---|
| Purchase rate | At least 0.6 gpm per connection |
| Pump Capacity | 2.0 gpm per connection, or |
| | 1,000 gpm and meet peak hourly demands |
| Total Storage | 200 gallons per connection |
| Pressure Storage | Elevated storage of 100 gallons per connection (required for systems > 2,500 connections), or |
| | Pressure tank capacity of 20 gallons per connection with a maximum of 30,000 gallons |

According to CWSC staff, the requirement for 0.6 gpm per connection has been reduced to 0.4 gpm due to a waiver obtained from TCEQ. Table 6 illustrates the ability of CWSC to meet the TCEQ requirements for Chapter 290.

**Table 6 - CWSC System versus TCEQ Requirements**

| Requirement Description | Current Amount for CWSC |
|---|---|
| Purchase rate | 1,369 gpm (maximum contracted amount) or 0.78 gpm per connection |
| Pump Capacity | 3,300 gpm total (meets 1,000 gpm and peak hourly requirements) |
| Total Storage | 801,000 gallons (meets 200 gallons per connection) |
| Pressure Storage | 86,000 gallons (meets 20 gallons per connection and max requirement) |

# Section 5 – Water Supply Alternative Assessment

## Water Demands

The demands as presented herein from the TWDB indicate a large demand on the Chatfield system by 2060. These demands are actually flattened based on the reduced growth rate for Chatfield. The growth rate of 2.75% per year drops the overall demand by a proportional amount. The projected demand for Chatfield, MEN WSC and Kerens is approximately 2650 Ac-Ft per year of water for the combined entities. No agricultural use is included in this projection. Table 7 is the gallons per capita projections as detailed in the Region C Plan from the TWDB. All of the user groups' per capita usage is anticipated to decrease over time.

**Table 7 - Water Projections - Gallons per Capita**

| User Group | | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|---|
| Chatfield | | 90.9 | 107.9 | 106.9 | 105.0 | 104.9 | 104.9 |
| Men WSC | | 115.7 | 111.9 | 110.0 | 108.0 | 106.8 | 107.0 |
| Kerens | | 211.9 | 208.6 | 205.9 | 202.7 | 200.8 | 200.8 |
| Average | | 139.5 | 142.8 | 138.6 | 138.6 | 137.5 | 137.5 |

## Water Supply Source Evaluations

### *Surface Water (Tarrant Regional Water District)*

Based on communications with the Tarrant Regional Water District (TRWD) staff, raw water supply is currently available from TRWD system. Sufficient water supply could Richland-Chambers Reservoir. The TRWD System provides raw water supply to the City of Fort Worth and surrounding communities. Both Richland Chambers Reservoir in Navarro County and Cedar Creek Reservoir in Henderson County are part of this System and provide raw water to the Fort Worth and Tarrant County area on an as needed basis. Raw water from these two reservoirs can be delivered through a major pipeline and booster pumps.

The TRWD and the Dallas Water Utility (DWU) are currently engaged in a joint effort to expand the raw water delivery system. Known as the "Integrated Water Line" (IPL) project, this expanded system would connect a number of reservoirs from Lake Palestine to Joe Pool Lake, including expanded connection pipelines and booster pumps for Cedar Creek Reservoir and Richland Chambers Reservoir.

The proposed pipeline (designated by TRWD as Pipeline Section 16) from Richland Chambers Reservoir that will connect to the IPL main pipeline bisects the Chatfield system area. The proposed IPL pipeline (Section 15-1) crosses the existing TRWD pipeline that is currently used to convey water to Tarrant County. Figure 1 in Attachment 5 shows the location of these proposed pipeline segments, which are currently in early design phase, and the location of the existing TRWD conveyance pipeline from Richland Chambers Reservoir. At the crossing location of the new IPL pipeline (Section 15-1) and the existing TRWD conveyance pipeline, a major vault will be constructed. The future vault location is shown on Figure 2 in Attachment 5. To accommodate

this facility, the TRWD is acquiring a significant amount of property in fee title. In recent communications with TRWD staff, this location could be used to jointly locate a regional water treatment plant for the CWSC.

### *Surface Water (Kerens City Lake)*

Kerens City Lake is located about 2.5 miles east of the City of Kerens. It has a surface area of approximately 80 acres and (according to Findlakes.com) has a capacity of 1,280 acre-feet. The normal storage is 778 acre-feet and the drainage area for the lake is approximately 6.2 square miles. Unfortunately, the lake's size and distance from CWSC reduces its potential as a possible reservoir. It is approximately 8 miles from Powell, which would require a pump station and transmission main to transport the water to a location that could be distributed throughout the rest of the system.

### *Groundwater*

A partial description of groundwater sources can be found under the Environmental Evaluation Section. Navarro County has four aquifers within its boundaries, two of which are major aquifers – the Trinity and Carrizo-Wilcox, and two of which are minor aquifers – the Woodbine and Nacatoch. The Trinity Aquifer is very deep, is only within the western portion of the county, and the water within the aquifer is not of good quality, making it a poor candidate for ground water supply. The Carrizo-Wilcox only comes into Navarro County in the very southeastern corner, but it is of good quality and is shallower than the Trinity, making it a good candidate for groundwater supply except for the distance that would be required to pump it to CWSC.

The two minor aquifers offer poor alternatives as well. The Woodbine has similar problems to the Trinity: it is deep, has poor quality in this area, and is in the western portion of the county. The second minor aquifer is the Nacatoch. While it has better quality than the Trinity and Woodbine, the well production rates are low, which is not a desirable characteristic for a primary water source for a water supply.

Groundwater in Navarro County does not appear to present a viable alternative to surface water, the current water supply used by the majority of the population in Navarro County.

#### Woodbine Aquifer

At the request of CWSC, a more in-depth look was performed on the Woodbine Aquifer and the cost of the treatment required for groundwater from the aquifer. In order to support the 1742 connections that Chatfield has within its system, TCEQ rules require "two or more wells having a total capacity of 0.6 gpm per connection. Where an interconnection is provided with another acceptable water system capable of supplying at least 0.35 gpm for each connection in the combined system under emergency conditions, an additional well will not be required as long as the 0.6 gpm per connection requirement is met for each system on an individual basis." Therefore, if CWSC was to switch completely over to groundwater, a well would have to provide around 1,050 gallons per minute. Based upon the flow rate into the Woodbine, 0.4 MGD, it does not appear that the aquifer would be able to support a well required to support Chatfield.

### *Trinity River Authority*

The Trinity River Authority (TRA) supports this study, and would look at any possible role in implementing a different water source for CWSC than the current supply from Corsicana. This support includes the water available from TRWD.

### *Corsicana Purchase of Treated Water*

The current source of water for the majority of the rural water supply corporations in Navarro County, particularly the eastern side, is the City of Corsicana. According to CWSC staff, there are currently no issues with the quality of the water that is purchased from the City of Corsicana. It is the pricing of the water that presents an issue to CWSC, as there is no rate structure for wholesale customers for the City of Corsicana.

## Raw Water Purchase Evaluation

### *Corsicana*

Currently, CWSC receives all of its water from the City of Corsicana. However, with the current rates, and planned future increases, the cost of buying treated water from the City of Corsicana presents issues for the water supply companies purchasing the treated water, particularly without a wholesale rate structure. Also, the maximum capacity in CWSC's current contract, 60 million gallons per month, cannot be supplied with the existing infrastructure in place. Significant improvements would be required if CWSC was to utilize the maximum contracted capacity.

CWSC currently receives water from the City of Corsicana through two 2-inch meters and one 6-inch meter. The minimum monthly bills for a 2-inch and 6-inch meter were, in 2010, $89.02 and $556.08, respectively. The volumetric flow cost was set at $3.00 per 1,000 gallons. The total average monthly cost for CWSC was approximately $37,600, based on an average flow of 12.3 million gallons per month. This equates to an average rate of $21.60 per connection for CWSC's customers, just to get the water from Corsicana. This does not include the infrastructure and operation cost that CWSC requires for their system.

The City of Corsicana has proposed a series of rate changes for the years 2010 to 2019. The proposed fees for 2010 were $93.47 and $584.51 for a 2-inch and 6-inch meter, respectively. The cost per 1,000 gallons is $3.25. For the average monthly water usage for CWSC, the cost is approximately $40,750. This equates to an average cost per connection of $23.39. This cost, as stated above, is just to get the water from Corsicana.

The proposed rate for 2019, is $162.66 and $1,017.16 for a 2-inch and 6-inch meter, respectively. The cost per 1,000 gallons is $4.01. For the projected monthly water usage for 2020, 19.7 million gallons, the cost is approximately $80,400. This equates to an average cost per projected connection of $32.30.

### *TRWD Buy In*

Based on recent conversations and meetings with the TRWD planning and engineering staff, there is sufficient TRWD raw water to provide for the CWSC long-term supply requirements. There are two payment terms required: an equity payment and a use payment.

1. Equity Payment: Per the TRWD System Agreement, the equity payment is a charge related to gaining equity position in the TRWD system and is based on the capacity per day that is being reserved. The equity payment is a one-time payment to TRWD relative to the amount of water supply provided. The equity payment can be r financed by CWSC separately. Recently the Equity Payment was reduced by the TRWD by almost 15% presenting a widow of opportunity for CWSC to reduce its buy-in cost. Currently, the payment terms are:

   Equity Payment = $660,000 per million gallons per day

2. Use Payment: The use payment is the payment for actual diversion and use of raw water. The current Use Payment = $0.88 / 1,000 gallons

An additional condition is one of storage. As TRWD is supplying raw water through the pipeline to the Dallas/Fort Worth area, the pumping is on a demand basis. Because of the possibility of low demand or a maintenance shutdown, TRWD requires sixty (60) days of storage on the part of CWSC.

## Storage Evaluation

### *TRWD requirements*

Based on conversations with TRWD staff, there is typically a 60-day requirement of storage for users withdrawing water from the raw water pipelines, in the event of maintenance or low demand periods. However, further discussion with TRWD staff has indicated that TRWD could be willing, as part of their Integrated Pipeline Project (IPL), to build one of their proposed balancing reservoirs ahead of schedule to aid CWSC. This would likely require CWSC to aid TRWD in providing funding for the construction of the reservoir.

### *Chatfield Pump*

TRWD has indicated that it may be possible for CWSC to place a pump and intake structure of its own to connect to their large diameter raw water pipeline. TRWD will work with CWSC to determine if this is the best option for both parties. This would eliminate the need for 60 days of storage, but may require additional ground storage at the site, dependent on the withdrawal rate at the intake.

## Groundwater Treatment Options

As part of CWSC's request for reviewing water from the Woodbine aquifer, treatment options were reviewed and preliminary costs evaluated. The water from the Woodbine Aquifer is saline in nature and contains high amounts of manganese. Reverse Osmosis is typically used to remove saline from groundwater. The high amounts of manganese require additional treatment

as the manganese forms a slurry that fouls the membranes. The method proposed for manganese removal would be pressure filters.

### *Costs*

The preliminary cost for treating groundwater from the Woodbine would be:

- $850,000 for the pressure system treatment for manganese removal
- $1,400,000 for the reverse osmosis system

These costs were based upon preliminary equipment costs provided by a supplier to treat the water based upon a water quality sample provided by CWSC.

Additional costs would be the water supply itself. A well designed to supply 1,050 gpm ranges from $444,000 to $780,000, based on TWDB cost estimates and water depth. Assuming an average cost, the cost would be approximately $620,000. Combining the costs, the groundwater supply cost would be approximately $2.9 million. This exceeds the cost of the 1 MGD package treatment plant shown in Table 11. Considering the well would require the ground storage, booster pump station, and other elements that the 1 MGD package plant would require, the water well supply is more expensive than the package water treatment plant. This assumes that the Woodbine Aquifer would be able to supply the required 1,050 gpm.

## Surface Water Treatment Options

### *Surface water from TRWD*

The water quality parameters for the Richland-Chambers and Cedar Creek Reservoirs shown in Table 8 are approximate averages from the past five years obtained from the Surface Water Quality Monitoring Web Reporting Tool available from TCEQ.

**Table 8 - Surface Water Quality Parameters for Richland Chambers and Cedar Creek Reservoirs**

| Water Quality Parameter | Approximate Average | | Criteria from USEPA |
|---|---|---|---|
| | Richland Chambers (Station 15199) | Cedar Creek (Stations 16747 & 16750) | |
| Total Non-filterable Residue, mg/L | 12.0 | 10.0 | < 400 |
| pH, standard units | 8.1 | 7.7 | 6.5 – 9.0 |
| Alkalinity, mg/L as CaCO3 | 97.5 | 54.0 | |
| Chloride, mg/L as Cl | 10.4 | 13.4 | < 75.0 |
| Transparency, Secchi Disc, cm | 75.6 | 67.1 | |
| Iron, µg/L as Fe | 420 | 462 | |
| Magnesium, mg/L as Mg | 3.3 | 3.6 | |
| Manganese, µg/L as Mn | 74 | 159 | |
| Calcium, mg/L as Ca | 36.9 | 17.6 | |

### *Sizing of Plant for CWSC*

It is standard practice to size surface water treatment plants in phases over time, for several reasons: to aid in reducing the capital costs, upgrade the plant in accordance with regulations, and to reduce the possibility of oversizing the plant in regards to the predicted growth rate versus the actual growth rate. For the purposes of this study, the first phase of the plant would be designed for the 2030 population, which would provide as close to a design life of 20 years as possible.

Currently the average monthly usage rate for the system is 12.3 million gallons per month, or 404,100 gallons per day. The maximum daily demand for recent records was 867,000 gallons per day. The calculated ratio between these numbers produces a peak factor of 2.15.

Based on the TWDB 2011 Region C Report, the 2030 usage number for Chatfield was 935 acre-feet per year, or an average of 834,100 gallons per day. Employing the peaking factor calculated from current usage rates, the peak day usage rate would be 1.794 million gallons per day. TCEQ requires that a surface water treatment plant be sized to handle the peak day usage rate. To maintain a conservative estimate, the surface water treatment plant would be sized to handle 2 MGD.

The booster pump station at the plant, which would distribute water to the system, would be required to handle the peak hourly rate for the system. Per TCEQ requirements, if a system uses hydro-pneumatic tanks to provide pressure, a peaking factor of 1.85 times the peak daily rate is required. With a plant capacity of 2 MGD, the pumps at the plant would need to be sized to handle approximately 2,600 gallons per minute.

For this study, the ground storage tank at the plant will be sized to hold a full day's production from the plant, so that there is a fairly large buffer between the system and the plant during periods of high demand. The ground storage tank size would then be 2 million gallons. In order to allow for a ground storage tank to be offline and to minimize water age, 2 – 1 million gallons tanks would be used.

### *Reservoir Sizing*

Based on TRWD maximum listed requirements, the reservoir that feeds the treatment plant must be sized to handle 60 days of the treatment plant average daily flow rate, 834,100 gallons per day. This calculates to approximately 50 million gallons, or 154 acre-ft of water of raw water stored.

As discussed above, TRWD has indicated that it may be possible for CWSC to place a pump and intake structure of its own to connect to their large diameter raw water pipeline. TRWD will work with CWSC to determine if this is the best option for both parties. This would eliminate the need for 60 days of storage, but may require additional ground storage at the site, dependent on the withdrawal rate at the intake.

- Recent conversations with TRWD staff have provided have identified additional opportunity for CWSC with regard to reserve capacity:
    1. Potential to reduce the number of days required because of special circumstances related to CWSC having groundwater supply available to handle the 60 day reserve requirement, particularly during the initial years of the CWSC system when demands are less; and
    2. Potential for the IPL pipeline in combination with its operation, to provide sufficient storage through pipeline capacity to either reduce or eliminate the total 60 day capacity needed.

The final decision regarding this potential opportunity will be considered during implementation, requiring further negotiations with the TRWD staff. In addition, the IPL is in the design phase currently, future final decisions regarding its final design and construction phasing could impact the timing of this decision.

### *Transmission Main Sizing*

The transmission main will need to be between the surface water treatment plant and the larger pump stations. If the surface water treatment plant is located within close proximity of the proposed TRWD pump station and the water is transported to only Pump Stations 7 and 7A, the transmission main would be at least 8.5 miles long. Assuming a pressure at the pump station of 110 psi and a minimum pressure of 35 psi within the line, the transmission main would be 16 inches in diameter to pump the peak hourly rate of 2,600 gallons per minute.

### *Capital Cost for CWSC Conventional Plant*

#### Raw Water

The cost to Chatfield for purchasing raw water, as described in the TRWD Buy-In Section, can be summed into the following:

- Equity Payment
    - CWSC Ultimate Demand (2060) = 1,655 Acre-feet per year or 1.48 MGD
    - $666,000 ($/MGD) x 1.48 MGD = $ 985,680
- Use Payment (will vary over time because it is based on actual usage)
    - At the CWSC Ultimate Demand (2060) of 1.48 MGD
    - $0.88 ($/1000 gal) x 1.48 MGD = $1,302 per day or $475,376 per year in 2060

#### Treatment Plant

Using cost estimate numbers from the 2011 TWDB Region C Report, the treatment plant costs would be as follows:

**Table 9 - Preliminary Cost Estimates for a Conventional Surface Water Treatment Plant**

| Plant Unit | Approximate Cost |
|---|---|
| Treatment Plant | $8.2 million |
| Transmission Pump Station | $1.5 million |
| Ground Storage Tanks | $1.3 million |
| Reservoir | $2.0 million |
| Total | $13.0 million |

### Transmission Main

Using the cost estimate numbers from recent bid estimates, TxDOT average unit bid prices, and the 2011 TWDB Region C Report, the transmission main cost for a rural installation with appurtenances for a 16-inch diameter line is estimated to be $110/lf and $10/lf for pipeline easements. The preliminary cost estimated to transport water from a water treatment plant site near the proposed TRWD pump station to the CWSC pump stations at 7 and 7A would be approximately $5.4 million.

### Land

To have enough land to place a balancing reservoir, a surface water treatment plant with future expansion, and a pump station, an assumption of 20 acres was used. Based on approximate land prices for the study area, $3,000 an acre, this equals $60,000 for land purchase.

☞ Recent discussions with TRWD staff have identified an opportunity for CWSC to eliminate the balancing reservoir cost and to co-locate the CWSC treatment plant on the property that TRWD has acquired at the crossing of the IPL pipeline Section 15-1 and the existing TRWD transmission line from Richland Chambers Reservoir. The property is required for construction of a significant vault structure. The TRWD staff indicates that there is likely more property than necessary for the vault facilities and could that the area could be sufficient for co-locating the CWSC treatment plant.

### Amortization of Capital Cost

**Table 10 - Cost Summary for CWSC Conventional Plant**

| Description | Approximate Cost |
|---|---|
| Raw Water | $985,680 |
| Treatment Plant | $13.0 million |
| Transmission Main | $5.4 million |
| Land | $ (see note above) |
| Total | $19.39 million |

The estimated total preliminary capital cost for the treatment plant and the associated equipment, the transmission main, and the equity buy-in would be approximately 19 million dollars. Assuming an interest rate of 4% and a 20 year loan, the monthly

payments to pay off the loan would amount to approximately $117,540. With the number of existing connections, 1,742, the cost per connection would be $67.47 per month.

### *Capital Cost for CWSC Package Plant*

An alternative to the conventional plant option is the package plant. Whereas a conventional plant requires concrete basins to be formed and constructed, piping and equipment to be installed, and typically a larger footprint, a package unit is as it sounds. Typically, all the basins, piping, and a majority of the equipment have been pre-assembled into a unit and the unit is shipped to the site fully contained. All that is required is typically a pad to where the unit is to be placed and secured.

LAN contacted a supplier to obtain budgetary numbers for a package plant that would handle 1 MGD. This would allow CWSC to install a package plant that could handle its current peak day demand requirements and provide the ability to add units in the future to match demands. TCEQ requires the installation of dual treatment trains in the event of equipment failure. According to the supplier, a 700 gpm unit (1MGD) is $370,000. A dual treatment train would cost $740,000. This cost is for the unit only, and does not include the delivery or installation at the site, nor any of the appurtenances to connect the treatment units together. To maintain a conservative estimate, the cost for each unit is doubled to estimate what an installed and operating unit would cost. For a 1MGD treatment train, the cost would be approximately $1,500,000.

To upgrade to a 2MGD surface water plant, only an additional unit would have to be added, because with 3 total units there are two 1 MGD plants with a spare 1 MGD unit. The approximate cost for a 2 MGD phased package treatment plant would be $2,250,000.

The package plant price does not include the intake pump station from the reservoir, the pump station to pump into the ground storage tank, or the chlorination system. According to the supplier, a chlorination system for a 1MGD plant would cost approximately $100,000 for installation and all the appurtenances. For the intake pump station, an approximate pump size of 10 HP (assuming a flow rate of 700 gpm and a head of 20 feet). For the plant effluent pump, an approximate pump size of 10 HP would also be used (assuming a flow rate of 700 gpm and a head of 30 feet).

Including the cost for the plant pump stations, transmission pump station, ground storage, reservoir, transmission main, and land, the total cost for a 1 MGD package plant would be $13.8 million dollars. This assumes the same infrastructure (pump station, transmission line, ground storage, etc.) for the 2030 build-out. For a 2 MGD package plant the approximate cost would be $14.5 million.

**Table 11 - Summary of Costs for 1 MGD Package Plant**

| Plant Unit | Approximate Cost |
|---|---|
| Treatment Plant | $1.6 million |
| Plant Pump Stations | $0.75 million |
| Transmission Pump Station | $1.5 million |
| Ground Storage Tanks | $1.3 million |
| Reservoir | $2 million (see ☞ note below) |
| Raw Water | $0.98 million |
| Transmission Main | $5.4 million |
| Land | $0.06 million (see ☞ note below) |
| Total | $13.6 million |

Assuming the same 20 year loan with a 4% rate, the cost per month for a 1 MGD package plant would be $82,420 per month or $47.31 per connection with the current 1,742 connections. For a 2 MGD package plant, at an estimated $14.6 million the cost per month would be $88,475 or $50.79 per connection.

☞ If the CWSC were allowed to meet the reservoir requirements based on the one of the options discussed above, the reservoir cost could be eliminated (or significantly reduced). In addition if siting the CWSC treatment plant on property owned by TRWD is cost-effective in terms of final location, then there could be up to a $60,000 reduction. The overall system cost for the CWSC system would be estimated at 11.54 million, a reduction of 15% of the first phase capital cost. Using the financing terms at 20 years and 4%, this would be a monthly cost of $69,993 and equate to connection cost of $40.18 per month.

Reviewing a "Best Case" and "Worst Case" Scenario for the CWSC building a 1.0 MGD package plant system in cooperation with the TRWD, Table 12 shows the range of impact on the anticipated monthly cost for financing[1] the capital cost:

[1] Allowances were included for typical financing costs, including the cost of issuance and reserve fund; depending on the funding source these costs will vary.

**Table 12 - 1 MGD Package Plant Cost Comparison**

| | |
|---|---|
| **WORST CASE SCENARIO**<br>DESCRIPTION:<br>1. Finance at 20 year loan with 4.0 % interest rate<br>2. Number of Connections = 1,450 (current)<br>3. Required to build reservoir for full storage requirement<br>4. No property cost reduction from co-locating with TRWD at Vault location | |
| Total Capital Cost: | $13,600,000 |
| Monthly Cost: | $82,420.00 |
| Monthly Cost per meter: | $47.31 |
| | |
| **BEST CASE SCENARIO**<br>DESCRIPTION:<br>1. Finance at 20 year loan with 3.0 % interest rate<br>2. Number of Connections = 1,750 (10 years of growth at 30 meters/year – halfway point of loan)<br>3. Not Required to Build Reservoir<br>4. Property cost for WTP is eliminated with co-location at Vault | |
| Total Capital Cost: | $11,540,000 |
| Monthly Cost: | $64,010.00 |
| Monthly Cost per meter: | $36.57 |

### *Water Use Costs and Total Water Bill (1.0 MGD Package Plant – CWSC System)*

The water rates for an average water use of 6,000 gallons per month can be added to the capital cost for the 1.0 MGD Package Plant system. The anticipated water use cost is $2.83 per 1,000 gallons:

- $0.88 / 1,000 gallons – Raw water cost per TRWD
- $1.69 / 1,000 gallons – Chatfield charge for Service Availability
- $0.26 / 1,000 gallons – anticipated treatment cost (see package treatment costs section)

Total: $2.83 / 1,000 gallons

The resulting average monthly water bill, which is estimated monthly cost for financing the system plus the water use charge, would be as follows:

1. WORST CASE SCENARIO
   - $47.31 per month per meter
   - $18.42 water use charge (6,000 gallons)

Total: $65.73 Average monthly bill

2. BEST CASE SCENARIO
   - $36.57 per month per meter
   - $18.42 water use charge (6,000 gallons)

   Total: $54.99 Average monthly bill

These monthly average costs are comparable to the current monthly cost for CWSC customer of $53.64. In the design phase, additional data and information will be collected on alignments, opportunities for cooperation with the TRWD to reduce cost, and better unit cost for pipelines, pumps and package treatment plants.

### *Sizing of Plant for Regional (CWSC, MEN WSC, & Kerens)*

As with the phasing for the CWSC plant, the first phase of a Regional plant would be designed for the 2030 population, which would provide as close to a design life of 20 years as possible.

Based on the TWDB 2011 Region C Report, the 2030 usage number for the regional area was 1,892 acre-feet per year, or an average of 1,690,000 gallons per day. Employing the same peaking factor for peak daily flow as was used for CWSC, the peak day usage rate would be 3.64 million gallons per day. TCEQ requires that a surface water treatment plant be sized to handle the peak day usage rate. To maintain a conservative estimate, the surface water treatment plant would be sized to handle 4 MGD.

The booster pump station at the plant, which would distribute water to the system, would be required to handle the peak hourly rate for the system. Per TCEQ requirements, if a system uses hydro-pneumatic tanks to provide pressure, a peaking factor of 1.85 times the peak daily rate is required. With a plant capacity of 4 MGD, the pumps at the plant would need to be sized to handle approximately 5,200 gallons per minute. Also, a separate pump station will be needed to transport water to MEN WSC. Based upon the peaking factor, the pump station would need to be sized to handle 2,600 gallons per minute.

For this study, the ground storage tank at the plant will be sized to hold a full day's production from the plant, so that there is a fairly large buffer between the system and the plant during periods of high demand. The ground storage tank size would then be 2 million gallons.

### *Reservoir Sizing for Regional*

Using the same 60-day storage of the average daily use, 1.69 MGD, for the regional plant, the size of the reservoir would be 101.4 million gallons, or 312 acre-feet of raw water stored.

### *Transmission Main Sizing for Regional*

The transmission main will need to be between the surface water treatment plant, the larger pump stations, and the other users. If the surface water treatment plant is located within close proximity of the proposed TRWD pump station and the water is transported to only Pump Stations 7 and 7A and then on to Kerens and MEN WSC, there would be two transmissions mains – both of which would be at least 8.5 miles long to transport the water to CWSC and MEN

WSC. Assuming a pressure at the pump station of 120 psi and a minimum pressure of 35 psi within the line, the transmission main to pump water to CWSC would be 20 inches in diameter to pump the peak hourly rate of 5,200 gallons per minute. The transmission main to pump water to MEN WSC would be 16 inches in diameter to pump the peak hourly rate of 2,600 gallons per minute.

### *Capital Cost for a Conventional Regional SWTP*

#### Raw Water

The cost to Chatfield for purchasing raw water, as described in the TRWD Buy-In Section, can be summed into the following:

- Equity Payment
  - Regional Ultimate Demand (2060) = 2,712 Acre-feet per year or 2.42 MGD
  - $666,815 ($/MGD) x 2.42 MGD = $1,613,692.30
- Use Payment (will vary over time because it is based on actual usage)
  - At the Regional Ultimate Demand (2060) of 2.42 MGD
  - $0.88 ($/1000 gal) x 2.42 MGD = $2,130 per day or $777,836 per year in 2060

#### Treatment Plant

Using cost estimate numbers from the 2011 TWDB Region C Report, the treatment plant costs would be as follows:

**Table 13 - Preliminary Cost Estimates for a Regional Surface Water Treatment Plant**

| Plant Unit | Approximate Cost |
|---|---|
| Treatment Plant | $12.4 million |
| Transmission Pump Stations | $3.6 million |
| Ground Storage Tank | $2.0 million |
| Reservoir | $4.0 million(see ☞ note above) |
| Total | $22.0 million |

#### Transmission Main

Using the cost estimate numbers from recent bid estimates, TxDOT average unit bid prices, and the 2011 TWDB Region C Report,, the transmission main cost for a rural installation with appurtenances for a 16-inch diameter line is $110/lf and $10/lf for pipeline easements and for a 20-inch diameter line is $150/lf and $15/lf for pipeline easements. The preliminary cost estimated to transport water from a water treatment plant site near the proposed TRWD pump station would be approximately $12.8 million. However, as the transmission main to MEN WSC is primarily for the benefit of MEN WSC, the cost associated with the construction of the transmission main ($5.4 million)

would not be shared among the three participants. Therefore, the cost shared would only be for the 20" transmission main, or $7.4 million.

### Land

To have enough land to place a balancing reservoir, a surface water treatment plant with future expansion, and a pump station, an assumption of 20 acres was used. Based on approximate land prices for the study area, $3,000 an acre, this equals $60,000 for land purchase. However, see potential option of co-locating at the TRWD property (discussed above).

### Amortization of Capital Cost

**Table 14 - Summary of Costs for a Regional Conventional Treatment Plant**

| Description | Approximate Cost |
|---|---|
| Raw Water | $1,613,692.30 |
| Treatment Plant | $22.0 million |
| Transmission Mains | $12.8 million |
| Land | $60,000 (see ☞ note above) |
| Total | $36.7 million |

The estimated total preliminary capital cost for the treatment plant and the associated equipment, the transmission main, and the equity buy-in would be approximately $36.7 million dollars. Assuming an interest rate of 4% and a 20 year loan, the monthly payments to pay off the loan would amount to approximately $222,400. However, the cost to the total system, which excludes the cost of the transmission main to MEN WSC, with the estimated number of existing connections, 3956, the cost per connection would be $47.95.

## *Treatment Cost*

### Conventional Treatment

For a conventional treatment plant, the estimated treatment cost, according to the TWDB, are to be estimated at $0.70 per 1,000 gallons for conventional surface water treatment plant systems. This cost includes labor, electricity, and chemicals for treatment. Including the raw water cost, $0.88 per 1,000 gallons, the estimated cost for treated water for CWSC would be $1.58 per 1,000 gallons.

### Package Treatment

For package treatment systems, the treatment cost is designed to be more efficient. Based upon estimates provided by the supplier, for a 1MGD plant, the cost for chemicals would be estimated at $0.10 per 1,000 gallons. Because of the automatic nature of the package plant, primarily maintenance labor would be required. However, assuming a single operator at $40,000 a year or $19.23 per hour (excluding benefits, taxes, or overtime) working 40 hours per week at the plant, the cost per 1,000 gallons would be

approximately $0.11. The cost for electricity, based upon estimates provided by the supplier, would be $0.05 per 1,000 gallons. The combined total treatment cost for a package plant would be $0.26 per 1,000 gallons. Including the raw water cost of $0.88 per 1,000 gallons, the cost for a 1MGD treatment plant would be $1.14 per 1,000 gallons.

### *Summary of Capital Costs and Payments*

Table 14 lists a summary of the various capital costs and associated payments per connection. The options, as described in the preceding paragraphs, are listed in the first column. The associated capital cost is listed in the second column. The third column, the interest rate, is broken down from 4% to 1%, in 1% increments. This is to show a range of percentages that could be available for loans. The fourth column, the Grant Amount, is to show the difference in cost should a 1 million dollar grant be available to aid in building the surface water treatment plant. One million dollars can be expected to be the maximum amount available. The fifth and final column, the Monthly Payment per Connection, lists the payment that each current connection would be required to pay based upon the preceding four columns. For example, in the first row, the monthly payment per connection of47.95 is calculated based upon no grants being available (resulting in an amount of $0 for that row), an interest rate of 4%, and the option of a Regional Conventional Treatment Plant at an approximate cost of $31,300,000.

**Table 15 - Summary of Option Costs and Monthly Payments**

| Option | Estimated Cost for CWSC | Interest Rate | Grant Amount | Monthly Payment per Connection |
|---|---|---|---|---|
| Regional Conventional | $31,300,000.00 | 4% | $0 | $47.95 |
| | | 4% | $1,000,000 | $46.42 |
| | | 3% | $0 | $43.88 |
| | | 3% | $1,000,000 | $42.48 |
| | | 2% | $0 | $40.03 |
| | | 2% | $1,000,000 | $38.75 |
| | | 1% | $0 | $36.39 |
| | | 1% | $1,000,000 | $35.23 |
| CWSC Conventional | $19,600,000.00 | 4% | $0 | $68.18 |
| | | 4% | $1,000,000 | $64.70 |
| | | 3% | $0 | $62.40 |
| | | 3% | $1,000,000 | $59.22 |
| | | 2% | $0 | $56.92 |
| | | 2% | $1,000,000 | $54.02 |
| | | 1% | $0 | $51.74 |
| | | 1% | $1,000,000 | $49.10 |
| CWSC Package - 2MGD | $14,500,000.00 | 4% | $0 | $50.44 |
| | | 4% | $1,000,000 | $46.96 |
| | | 3% | $0 | $46.16 |
| | | 3% | $1,000,000 | $42.98 |
| | | 2% | $0 | $42.11 |
| | | 2% | $1,000,000 | $39.20 |
| | | 1% | $0 | $38.28 |
| | | 1% | $1,000,000 | $35.64 |
| CWSC Package - 1MGD | $13,800,000.00 | 4% | $0 | $48.01 |
| | | 4% | $1,000,000 | $44.53 |
| | | 3% | $0 | $43.93 |
| | | 3% | $1,000,000 | $40.75 |
| | | 2% | $0 | $40.08 |
| | | 2% | $1,000,000 | $37.17 |
| | | 1% | $0 | $36.43 |
| | | 1% | $1,000,000 | $33.79 |

## Section 6 – Recommendation

Based upon the rate increase planned by the City of Corsicana, it appears that should the proposed rates be enacted, the average monthly cost to CWSC customers by the year 2020 would be $32.30 just to obtain water. This does not include the operation and infrastructure cost that CWSC must pass on to its customers. Comparing a 3% rate for a 1 MGD package plant, (which includes infrastructure for the 2030 build-out of 2MGD) the average water rate per current connection would be $43.93.

Converting the water rates to a per 1,000 gallons, the cost for the year 2020 using the Corsicana water rates would be $4.08 per 1,000 gallons. To compare the 1 MGD plant at 3%, the monthly payment of $76,550 is converted to an annual payment, $918,600, and is divided by the 1,000 gallons per year that the plant can produce, or 365,000. The per 1,000 gallon rate is $2.52. Adding the treatment cost for the package plant, or $1.14 per 1,000 gallons, and the total per 1,000 gallon rate is $3.66.

CWSC currently has a 5 million gallon take or pay contract with the City of Corsicana. Should CWSC be unable to terminate their contract with Corsicana ahead of the contract term, CWSC can operate the plant to supplement their system for any demands over 5 million gallons. This will also provide an emergency interconnect for CWSC, should CWSC be able to terminate the contract or have converted its entire system onto CWSC treated water by the time the contract term elapses.

The primary advantage for CWSC to consider building its own treatment facilities is control over its rate structure. Based on the rate structure proposed by Corsicana, the rates will significantly increase over the next 10 years and will likely continue to increase beyond the next 10 years.

Based on the above analysis and the availability of water, should a negotiated contract be forthcoming with TRWD, this suggests that CWSC should plan on developing their own water supply and treatment capability and securing contracts with MEN WSC and Kerens.

# Section 7 – Project Implementation

## Implementation Funding Programs

The TWDB offers a number of financial programs that could help provide the funding to implement that CWSC recommended project. More and regularly updated information on the DWSRF is available on the TWDB website. Reviewing the TWDB set of financial assistance programs, the following were identified as having the best potential:

### *1. Drinking Water State Revolving Fund (DWSRF).*

For many years this program has provided low-interest financial assistance for planning, design, and construction of water infrastructure. It is available to both public and private community water systems, which would include the CWSC. All of the water facilities included in the CWSC regional project would be eligible for DWSRF funding.

The DWSRF provides financial assistance for planning, acquisition, and design as well as construction. Therefore, CWSC could make application for funding for the design of the recommended project.

To be considered for funding when the project is ready-to-proceed, CWSC will complete and submit a Project Information Form to the TWDB. The projects considered for the next fiscal year Intended Use Plan (IUP) must have submitted this form between December 1 and March 1. The TWDB may reopen the program for additional projects that meet certain criteria, such as eligible green projects, emergency, and construction-ready projects.

### *2. Rural Water Assistance Fund (RWAF)*

This program targets small rural utilities requiring assistance to obtain low-cost financing for water and wastewater projects. The RWAF offers tax-exempt equivalent interest rate loans with long-term finance options. Non-profit water supply corporations like CWSC are eligible for this program. However, the population served for rural WSC must be 10,000 or less. All of the facilities included in the CWSC recommended project would be eligible for funding.

Only loans are offered through the RWAF. The TWDB states that “The lending rates are intended to provide reasonable rates for TWDB customers while covering the TWDB's cost of funds and risk exposure. Other advantages of the program are a maximum 40-year maturity on loans (consistent with the useful life of the project) and quick turnaround time on the processing of loan applications. In addition, nonprofit water supply corporations are exempt from paying sales tax incurred on any project financed by the program.” The current interest rates are posted on the TWDB website.

If interested, CWSC would complete a financial assistance application. The RWAF program does not have any opening or closing deadlines; the dates for available funding are available upon request from the TWDB staff.

### *3. Water Infrastructure Fund (WIF).*

WIF provides financial assistance for the planning, design and construction of projects that are in the State Water Plan and Regional Water Plans. CWSC is located in the Region C Regional Planning Area. The recommended project will need to be considered and included as a "water management strategy" in the latest, TWDB-approved, Region C plan for CWSC to be eligible for this potential funding.

One important provision of the WIF is the set-aside funding for specifically for planning, design, permitting, and other costs associated with state or federal regulatory activities. As stated by the TWDB, "Utilizing this WIF-Deferred option, an applicant may defer all interest and principal payments for up to 10 years, or until the end of construction of the project, whichever is sooner. Interest is not accrued during the deferral period and the loan is amortized over the final 10 years."

### *4. State Water Implementation Fund for Texas (SWIFT)*

The voters of Texas approved Proposition 6 on November 5, 2013 opening a future opportunity to fund additional water infrastructure projects approved in the State Water Plan.

> "This legislation created two funds—the State Water Implementation Fund for Texas (SWIFT) and the State Water Implementation Revenue Fund for Texas (SWIRFT)—that will help finance projects in the state water plan. As a result of Proposition 6, a one-time $2 billion transfer was authorized from the state's Economic Stabilization Fund (known as the Rainy Day Fund) to the SWIFT."

The TWDB must prioritize projects and develop rules on how the funds will operate. It is expected that by December 2014, the TWDB will adopt SWIFT rules and provide an implementation report to the Governor.

By statute, the funding does not include grants, but it will have advantageous low-interest loans. Only projects approved in the State Water Plan are eligible for funding.

### *5. Federal Sources of Financial Assistance*

In the past, federal programs through EPA or the Department of Agriculture and a few others were viable sources for helping fund projects similar to the CWSC recommended project. However, these funds are now extremely limited. CWSC should monitor the availability of federal funds. As the project is considered for design and construction, the federal funding sources should be evaluated.

## Implementation Plan

Unlike many water projects, the basic components of the CWSC regional project needed for the new surface water based regional system do not exist. Therefore, these components must be implemented at the start of the project. The components that require initial implementation are the following:

1. **Raw Water Supply** – Accessing the raw water supply whether from TRWD facilities or with Chatfield WSC raw water intake and pipelines ;

2. **Water Treatment Plant** – Initially a 1.0 mgd water treatment plant will be required; and

3. **Treated Water Transmission** – Pumping facilities and transmission pipelines required to transfer treated water to the Chatfield WSC service area.

The Implementation Plan includes several steps that must be completed prior to construction. These steps are the following:

- Acquisition of necessary easements and rights of way;
- Acquisition of a suitably-located property for the water treatment plant, most likely in fee title;
- Coordination with the Tarrant Regional Water District on 'sharing' raw water facilities associated with the Integrated Pipeline project that is currently under construction;
- If satisfactory arrangements with TRWD on joint use of raw water facilities, then completing negotiations and contracting for raw water supply through TRWD;
- Financing options and meetings with financial advisors, including the TWDB and how the overall project can be financed;
- Review of rate changes in the treated water supply from Corsicana;
- Monitoring growth (number of new water services) in the service area to gauge need and optimize the timing of implementation.

## Schedule for Implementation

A general schedule for the implementation of the Chatfield WSC recommended project, including the implementation steps discussed above, is dependent on water demand for the project. It is anticipated that the starting point will correspond with a future water demand condition either from new growth in the service area or where the cost of wholesale treated water purchased from Corsicana exceeds the cost of a stand-alone Chatfield WSC system.

Table 16 demonstrates a rough project schedule from the time the water demand condition triggers implementation of the project.

**Table 16 - Approximate Implementation Schedule for Recommended Project**

| Implementation Step | Timeframe (estimated) | Remarks |
|---|---|---|
| Coordination with the TRWD, negotiation of raw water contract and joint use of IPL facilities | 6 months | |
| Engineering Design & Survey | 6 months | Alignments will follow recommendation from PER and negotiations with TRWD |
| Easements and ROW, WTP site acquisition | 12 – 16 months | The WTP optimal site would be determined in the preliminary design and secured prior to completing final design |
| Financing and Legal | 3 months | Financing agreements and intergovernmental or other agreements with participants |
| Construction | 18 months | For all system facilities |
| Start-up | 2 months | |

Attachment 1

Existing System Map

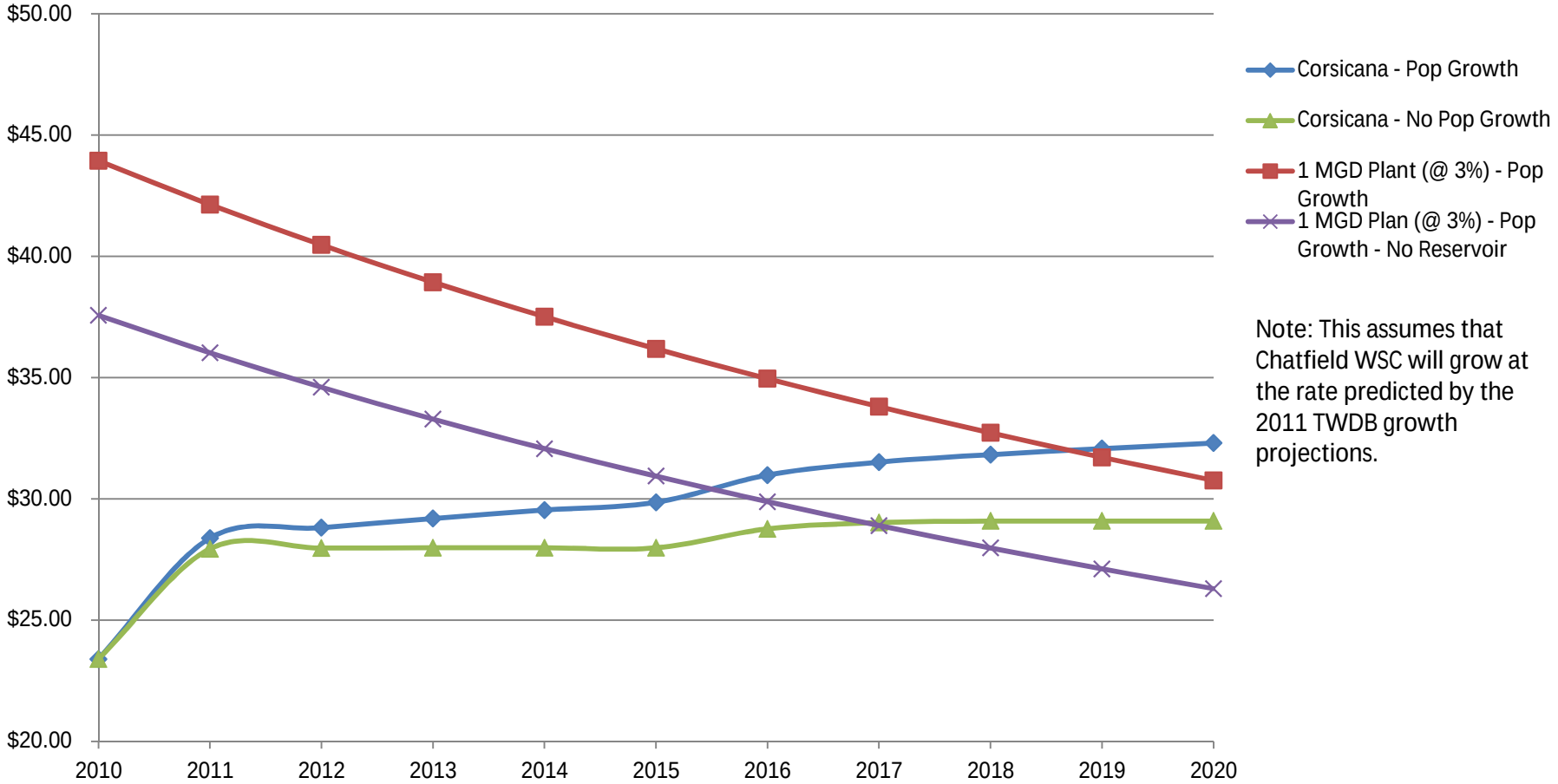
# Attachment 2

# Rate Comparison Over Time

This page has been removed.

Contact publicinfo.twdb.texas.gov for more information.

# Rate Comparison




Note: This assumes that Chatfield WSC will grow at the rate predicted by the 2011 TWDB growth projections.

The four lines on the graph represent four possible patterns for future rates. The blue line (Corsicana - Pop Growth) represents the anticipated rate per connection if CWSC remained on Corsicana water and grew at the TWDB anticipated growth. The green line (Corsicana - No Pop Growth) represents the anticipated rate per connection if CWSC remained on Corsicana water and didn't have any growth - basically showing how Corsicana will be increasing rates even if there's no growth. The red line (1MGD Plant (@3%) - Pop Growth) represents the anticipated rate per connection if the 1MGD plant were installed and the population grew per TWDB projected growth. The purple line (1 MGD Plant (@3%) - Pop Growth - No Reservoir) represents the anticipated rate per connection if the 1 MGD plant were installed , the population grew at the TWDB growth rate, and a reservoir was not required.

# Attachment 3

# Tarrant Regional Water Conservation and Drought Contingency Plan

THIS DOCUMENT WAS ORIGINALLY APPROVED BY THE TRWD BOARD OF DIRECTORS ON TUESDAY, APRIL 14, 2009.

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# TARRANT REGIONAL WATER DISTRICT

## WATER CONSERVATION AND DROUGHT CONTINGENCY PLAN

**APRIL 2009**

David Marshall, P.E.

Linda Christie, J.D.

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## ACKNOWLEDGEMENTS

This water conservation and drought contingency plan is based on a plan originally prepared by Freese and Nichols for North Texas Municipal Water District (NTMWD). Tarrant Regional Water District (TRWD) is adapting the plan to maintain a consistent and regional approach to water conservation and drought response strategies. Certain sections of the plan were customized to meet the needs of TRWD customers. The plan was prepared pursuant to Texas Commission on Environmental Quality rules. Some material is based on the existing water conservation plans listed in Appendix A. Conservation and emergency water management (drought contingency) plans for the City of Fort Worth and the City of Dallas were used extensively.

Questions regarding this water conservation and drought contingency plan should be addressed to the following:

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**APPENDIX B** **Texas Commission on Environmental Quality Rules on Water Conservation and Drought Contingency Plans for Municipal and Wholesale Water Providers**

- Texas Administrative Code Title 30, Part 1, Chapter 288, Subchapter A, Rule §288.1 – Definitions (Page B-1)
- Texas Administrative Code Title 30, Part 1, Chapter 288, Subchapter A, Rule §288.2 – Water Conservation Plans for Municipal Uses by Public Water Suppliers (Page B-4)
- Texas Administrative Code Title 30, Part 1, Chapter 288, Subchapter A, Rule §288.5 – Water Conservation Plans for Wholesale Water Suppliers (Page B-7)
- Texas Administrative Code Title 30, Part 1, Chapter 288, Subchapter B, Rule §288.20 – Drought Contingency Plans for Municipal Uses by Public Water Suppliers (Page B-9)
- Texas Administrative Code Title 30, Part 1, Chapter 288, Subchapter B, Rule §288.22 – Drought Contingency Plans for Wholesale Water Suppliers (Page B-11)

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# TARRANT REGIONALWATER DISTRICT

## Water Conservation and Drought Contingency Plan

APRIL 2009

## 1. INTRODUCTION AND OBJECTIVES

The water supplies we depend on are not endless resources. For one thing, drought conditions are a part of life here in North Texas. Droughts are unpredictable but they have a direct impact on our water resources. Without rainfall and runoff the reservoirs we rely on to meet our needs are depleted faster than they are replenished. In addition, the number of people living in our region is expected to double in the next 50 years. That means the demand for water will certainly rise – and meeting that demand will be a challenge.

In recent years, the growing population and economic development in North Texas has led to an increase in demands for water supplies. At the same time, local and less expensive sources of water supply are largely developed. Additional supplies to meet new demands will be difficult and expensive to develop. Therefore it is important that we use the water we already have more efficiently. By stretching our existing supplies we can:

- delay the need for new supplies,
- minimize the environmental impacts associated with developing new water resources, and
- postpone the high cost of building the pipelines and dams necessary to capture and transport the additional water into our homes and businesses.

Recognizing the need for efficient use of existing water supplies, the Texas Commission on Environmental Quality (TCEQ) has issued guidelines and requirements governing the development of water conservation and drought contingency plans for wholesale water suppliers.[1, 2] TCEQ guidelines and requirements for wholesale suppliers are included in Appendix B. The best management practices published by the Water Conservation Implementation Task Force[3], and established pursuant to SB1094 by the 78th Legislature, were also considered in the development of water conservation measures.

TRWD is a regional wholesale public water supplier serving four primary customers including the cities of Arlington, Fort Worth, Mansfield and the Trinity River Authority and numerous other customers across eleven counties. The service area includes Jack, Wise, Denton, Parker, Tarrant, Johnson, Ellis, Kaufman, Henderson, Navarro and Freestone counties. The Water District currently provides water to more than 1.7 million people. This plan replaces the plan dated May 2007.

The water conservation sections of this plan include measures that are intended to result in ongoing, long-term water savings. The TRWD drought contingency and water

emergency response sections of this plan address strategies designed to temporarily reduce water use in response to specific conditions.

The objectives of this water management plan are as follows:

- To reduce water consumption from the levels that would prevail without conservation efforts.
- To reduce the loss and waste of water.
- To improve efficiency in the use of water.
- To document the level of recycling and reuse in the water supply.
- To extend the life of current water supplies by reducing the rate of growth in demand.

This plan includes all the elements required by TCEQ. Some elements go beyond TCEQ requirements. Customers of TRWD wishing to adjust elements of their individual plan should coordinate with TRWD. The final adopted versions of customer water conservation and drought contingency plans including appendices, rules, resolutions and ordinances should be provided to TRWD, as well as TCEQ and the Texas Water Development Board (TWDB).

# 2. TEXAS COMMISSION ON ENVIRONMENTAL QUALITY RULES

## 2.1 Conservation Plans

The TCEQ rules governing development of water conservation plans for wholesale water suppliers are contained in Title 30, Part 1, Chapter 288, Subchapter A, Rule 288.5 of the Texas Administrative Code, which is included in Appendix B. For the purpose of these rules, a water conservation plan is defined as "A strategy or combination of strategies for reducing the volume of water withdrawn from a water supply source, for reducing the loss or waste of water, for maintaining or improving the efficiency in the use of water, for increasing the recycling and reuse of water, and for preventing the pollution of water." [1] The elements in the TCEQ water conservation rules covered in this conservation plan are listed below.

Minimum Conservation Plan Requirements for Wholesale Water Suppliers

TRWD is a wholesale water supplier to cities and other customers in North Central Texas. In addition to municipalities, TRWD serves utility districts, water supply corporations, and smaller entities, such as schools and golf courses. The minimum requirements in the Texas Administrative Code for water conservation plans for wholesale water suppliers are covered in this report as follows:

- 288.5(1)(A) – Description of Service Area – Section 3 and Appendix C
- 288.5(1)(C) – Specific, Quantified Five and Ten year Goals – Section 4
- 288.5(1)(D) – Measure and Account Water Diverted – Section 5.1
- 288.5(1)(E) – Monitoring and Record Management System – Sections 5.2 and 7.4
- 288.5(1)(F) – Program of Metering and Leak Detection and Repair – Section 5.3
- 288.5(1)(G) – Requirement for Water Conservation Plans by Wholesale Customers – Section 6.1
- 288.5(1)(H) – Reservoir System Operation Plan – Section 6.2
- 288.5(1)(I) – Means of Implementation and Enforcement – Section 9
- 288.5(1)(J) – Documentation of Coordination with Regional Water Planning Groups – Section 6.3
- 288.5(3) – Review and Update of Plan – Section 10

Additional Conservation Strategies

The Texas Administrative Code lists additional water conservation strategies that can be adopted by a wholesale supplier but are not required. Additional strategies adopted by Tarrant Regional Water District include the following:

- 288.5(2)(B) – Program to Assist Customers – Section 7

- 288.5(2)(C) – Program for Reuse and/or Recycling – Section 8.1
- 288.5(2)(D) – Other measures – Sections 8.2 (public education) and 8.3 (in-house conservation measures)

## 2.2 Drought Contingency Plans

The TCEQ rules governing development of drought contingency plans for wholesale water suppliers are contained in Title 30, Part 1, Chapter 288, Subchapter B, Rule 288.22 of the Texas Administrative Code, which is included in Appendix B.

For the purpose of these rules, a drought contingency plan is defined as "a strategy or combination of strategies for temporary supply and demand management responses to temporary and potentially recurring water supply shortages and other water supply emergencies. A drought contingency plan may be a separate document identified as such or may be contained within another water management document(s)." [2] The drought contingency plan for TRWD is contained in Section 11 of this water management plan.

# 3. DESCRIPTION OF TRWD SERVICE AREA

The Tarrant Regional Water District (TRWD) was established in 1924 as a political subdivision of the State of Texas. It has two primary missions: to provide our region with water and to help with flood control.

The Water District is a regional wholesale water supplier located in North Central Texas. It provides untreated surface water to four primary customers in Tarrant County. They include the cities of Arlington, Fort Worth and Mansfield, and the Trinity River Authority (TRA). TRWD also provides water to some smaller utilities and other water user groups located near its reservoirs.

In addition to providing their own citizens with clean drinking water, Fort Worth, Mansfield and TRA supply neighboring municipalities and/or utility districts with treated water and wastewater services. Tables 3.1 through 3.3 list TRWD's customers (direct and indirect). An indirect customer refers to any successive wholesale customers of TRWD's primary customers.

The Water District has a total service population of approximately 1.75 million. It is ultimately responsible for serving 71cities across an 11-county area. However, several of those cities are not currently taking water. Figure 3.1 shows the TRWD service area and supply system, which covers 5,891 square miles in Jack, Wise, Denton, Parker, Tarrant, Johnson, Ellis, Kaufman, Henderson, Navarro and Freestone counties. All but one of these counties is located within the Region C Water Planning Group – one of 16 water planning groups established by the Texas Water Development Board (TWDB) to help develop and revise a comprehensive water plan for the state through 2060. Johnson County is part of the Region G Water Planning Group.

TRWD uses a system of reservoirs to meet the water needs of its customers. Most of its raw water supplies originate from reservoirs constructed and managed by the Water District. They include Lake Bridgeport, Eagle Mountain Lake, Cedar Creek and Richland-Chambers Reservoirs. Two smaller reservoirs in Tarrant County – Lakes Benbrook and Arlington – are used for terminal storage. The total permitted supply currently available to TRWD is 773,100 acre-feet. However, the firm yield of the reservoir system is lower and stands at 533,833 acre-feet. These totals include 63,000 acre-feet from an indirect reuse project at Richland-Chambers Reservoir. The George W. Shannon Wetlands Water Recycling Facility began operation in March 2009. A future reuse project at Cedar Creek Reservoir will add 52,500 acre-feet to the system's supply. Additional information on TRWD's reuse and recycling efforts can be found in Section 8.1.

The Water District uses pump stations and approximately 179 miles of pipelines to transport water into Tarrant County from Cedar Creek and Richland-Chambers reservoirs in East Texas. Total pumping capacity from the eastern division reservoirs is 373 million gallons per day (MGD). The water from Lake Bridgeport and Eagle Mountain Lake on the West Fork of the Trinity River is gravity fed into Lake Worth.

Further details of TRWD's reservoir operations can be found in Section 6.2. Appendix C to the water conservation and drought contingency plans contains a profile for wholesale public water suppliers for TRWD, based on the format recommended by the TCEQ. Table 3.4 summarizes key facts from the wholesale supplier profile.

**Table 3.1**

**TRWD Customers served by Eastern Division Reservoirs including Lake Benbrook, Cedar Creek Reservoir, and Richland-Chambers Reservoir**

| **Lake Benbrook** | **Cedar Creek Reservoir** | **Richland-Chambers Reservoir** |
|---|---|---|
| Benbrook Water Authority | Bill Sisul/Shady Oaks Golf | Calpine/Freestone |
| City of Weatherford | Cedar Creek Country Club (Irr.) | City of Corsicana |
| Fort Worth Country Day School (Irr.) | City of Kemp | City of Fairfield |
| Mira Vista Golf Club (Irr.) | City of Mabank | Texas Parks and Wildlife Department |
| Ridglea Country Club (Irr.) | City of Malakoff | Winkler Water Supply |
| Whitestone Golf Club (Irr.) | City of Star Harbor | |
| Southwest Christian School (Irr.) | City of Trinidad | |
| Indirect Customers: | East Cedar Creek Freshwater Supply District | |
| City of Hudson Oaks | Exelon (Ind.) | |
| Parker County Special Utility District | Golf Driving Range | |
| Parker County Utility District | Long Cove Ranch | |
| | Monarch/Tecon | |
| | Pinnacle Club | |
| | Post Oak Ranch | |
| | Texstar /Enbridge | |
| | West Cedar Creek Municipal Utility District | |
| | Indirect Customers: | |
| | City of Payne Springs | |
| | City of Seven Points | |
| | City of Tool | |

**Table 3.2**

**TRWD Customers served by Western Division Reservoirs, including Lake Bridgeport and Eagle Mountain Lake**

| **Lake Bridgeport** |
|---|
| Brazos Electric Power Company (Ind.) |
| City of Bridgeport |
| City of Jacksboro |
| City of Runaway Bay |
| Hanson (Ind.) |
| Martin Marietta (Ind.) |
| Runaway Bay Golf Club (Irr.) |
| Suez (Ind.) |
| Texas Industries (Ind.) |
| Walnut Creek Special Utility District |
| West Wise Rural Water Supply Corp. |
| Wise County Water Supply District (Decatur) |
| Indirect Customers: |
| City of Boyd |
| City of Decatur |
| City of Newark |
| City of Paradise |
| City of Reno |
| City of Rhome |

| **Eagle Mountain Lake** |
|---|
| City of Azle |
| City of River Oaks |
| City of Springtown |
| Community Water Supply |
| Hawk's Creek Golf Club (Irr.) |
| Shady Oaks Country Club (Irr.) |
| Trinity Materials |
| TXU Eagle Mountain Plant (Ind.) |

**Table 3.3**

**Wholesale Water Customers Served by TRWD's Primary Customers: the cities of Arlington, Fort Worth, Mansfield and the Trinity River Authority**

| **Arlington:** | |
|---|---|
| Arlington does not currently provide water supply to any wholesale customers. | |
| **Fort Worth** (List includes current and future customers) | |
| City of Aledo | City of Northlake |
| Bethesda Water Supply Corporation | City of North Richland Hills |
| Benbrook Water Authority | City of Richland Hills |
| City of Burleson | City of Roanoke |
| City of Crowley | City of Saginaw |
| City of Dalworthington Gardens | City of Sansom Park Village |
| City of Edgecliff Village | City of Southlake |
| City of Everman | City of Watauga |
| City of Forest Hill | City of Westover Hills |
| City of Grand Prairie | City of Westworth Village |
| City of Haltom City | City of Westlake |
| City of Haslet | City of White Settlement |
| City of Hurst | Dallas-Fort Worth International Airport |
| City of Keller | Trinity River Authority |
| City of Kennedale | Trophy Club Municipal Utility District |
| City of Lake Worth | |

| **Mansfield** | |
|---|---|
| Johnson County Special Utility District | |

| **Trinity River Authority** | |
|---|---|
| <u>Cities served through Tarrant County Water Supply Project:</u><br>City of Bedford<br>City of Colleyville<br>City of Euless<br>City of Grapevine<br>City of North Richland Hills<br><br><u>Cities served by direct contract:</u><br>City of Ennis<br><br><u>Cities and entities served under the Ellis County contract:</u><br>Avalon Water and Sewer Service Corporation | Buena Vista-Bethel Special Utility District<br>City of Ferris<br>City of Italy<br>City of Maypearl<br>City of Midlothian<br>City of Palmer<br>City of Red Oak<br>Ellis County Water Control and Improvement District (City of Waxahachie)<br>Nash-Forreston Water Supply Corporation<br>Rockett Special Utility District<br><br><u>Indirect Customers:</u><br>City of Venus |

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Contact publicinfo.twdb.texas.gov for more information.

**Table 3.4**

**Summary of Wholesale Public Water Supplier Profile for Tarrant Regional Water District**

| | |
|---|---|
| **Water District Service Area:** | 5,891 square miles |
| **Water Supply Sources (Year Impounded):** | Lake Bridgeport (1931)<br>Eagle Mountain Lake (1932)<br>Lake Benbrook (1952)<br>Cedar Creek Reservoir (1965)<br>Richland-Chambers Reservoir (1987) |
| **Distribution System:** | Cedar Creek Pipeline:<br>Year completed: 1971<br>Length: 75 miles<br>Diameter: 72-inches<br>Maximum capacity: 127 mgd<br><br>Richland-Chambers Pipeline<br>Year completed: 1989<br>Length: 78 miles<br>Diameter: 90-inches<br>Maximum capacity: 249 mgd<br><br>Benbrook Pipeline:<br>Year completed: 1998<br>Length: 11 miles<br>Diameter: 90-inches<br><br>Eagle Mountain Pipeline:<br>Year completed: 2008<br>Length: 20 miles<br>Diameter: 90 and 84-inches<br><br>Eleven Pump Stations:<br>Cedar Creek, Richland-Chambers, Ennis (2), Waxahachie (2), Lake Benbrook (2), Rolling Hills Drinking Water Treatment Plant, Richland-Chambers Wetlands Water Reuse Project (2) |
| **Population:**<br>Estimated Population in 2008:<br>Projected Population in 2050: | <br>1,733,983<br>3,322,927 |

**Total Water Diversions for all Water Uses (in acre-feet) 2000 – 2008:**

| Year | Volume | Population Served |
|---|---|---|
| 2000 | 393,910 | 1,440,342 |
| 2001 | 394,318 | 1,473,172 |

| **Total Water Diversions for all Water Uses (in acre-feet) 2000 – 2008 continued:** | | |
|---|---|---|
| 2002 | 356,140 | 1,505,912 |
| 2003 | 428,734 | 1,538,652 |
| 2004 | 355,866 | 1,587,452 |
| 2005 | 523,482 | 1,622,908 |
| 2006 | 473,527 | 1,659,137 |
| 2007 | 355,900 | 1,696,157 |
| 2008 | 441,114 | 1,733,983 |

# 4. SPECIFICATION OF WATER CONSERVATION GOALS

TCEQ rules require the adoption of specific water conservation goals to be included in this water conservation plan. The goals must include five and ten year targets for water savings, including, where appropriate, target goals for municipal use in gallons per capita per day across the Water District service area. However, as a wholesale water supplier, TRWD does not directly control the water use of its customers nor does it have a direct relationship with the retail customers who are the ultimate consumers of the water.

Many of TRWD's municipal customers are projected to have increasing per capita demands in the future.[5] The reasons for these projected increases include the following:

- The transformation of portions of the TRWD service area from historically rural to primarily suburban areas.
- Rapid population growth, which has historically been associated with increasing per capita municipal water use in North Texas.
- The influx of commercial development, changes in housing types, and growth in employment associated with urbanization.

The municipal per capita use for TRWD's system can be affected by changes in per capita use of its customers. It can also be affected by how much water TRWD is asked to supply to high per capita use customers versus low per capita use customers. These factors and others, such as increases in industrial or commercial usage and municipal water losses, cannot be controlled by TRWD.

TRWD does control the operation of its water supply and delivery system and can take direct action to maximize the efficiency of that system. In areas under its direct control, TRWD adopts the following goals for water conservation and efficiency:

- Keep the level of unaccounted water in the system below 5%, as discussed in Section 5.2.
- Maintain universal metering of customers, meter calibration, and meter replacement and repair, as discussed in Section 5.2.
- Maintain a program of leak detection and repair, as discussed on Section 5.3.
- Begin to utilize indirect reuse as a major source of water supply, as discussed in Section 8.1.
- Continue to implement in-house water conservation efforts, as discussed in Section 8.4.
- Raise public awareness of water conservation and encourage responsible public behavior by a public education program, as discussed in Section 8.2.

As a wholesale provider, TRWD will assist its customers in the development of water conservation programs. TRWD will develop a *Model Water Conservation Plan for*

*TRWD Customers* and a *Model Drought Contingency Plan for TRWD Customers* that its customers can use to develop their own water conservation and drought contingency plans.

As part of the model water conservation plan, TRWD requires water utility customers to provide annual water conservation reports, modeled after the Utility Profile developed by TCEQ. A copy of the report is included in Appendix F. TRWD will review these reports and compile the information as part of its own annual conservation report, which will be used to manage TRWD's water conservation program.

In calculating target goals for per capita water savings among its municipal users, TRWD focused on water use among its four primary customers in Tarrant County. The cities of Arlington, Fort Worth, Mansfield and the Trinity River Authority and their successive customers (listed in Table 3.2) receive an average of 90 to 92 percent of all TRWD water deliveries. Table 4.1 summarizes annual water use for these customers from 2003 – 2008. The data shown in the table reflect the following:

- Population estimates (Table 4.2) are based on information provided by the North Central Texas Council of Governments (NCTCOG). The art of estimating population is by no means an exact science. The NCTCOG methodology for determining population is based on building permits, occupancy factors and household size factors. The figures are reviewed at a regional level for consistency with other indicators of regional population such as labor force estimates and vital statistics.[6]
- Populations of some TRA customers were adjusted to reflect the percentage of water needs it meets within those cities, (Grapevine: 63 percent; North Richland Hills: 40 percent). Populations were also adjusted for communities that rely on groundwater to supplement water supplies, (Bedford: 4 percent; Euless: 15 percent).
- The Water District serves approximately 98 percent of Tarrant County. Its four primary customers and the customers they serve represent approximately 92 percent of the total Tarrant County population.
- The gallons per capita per day (gpcd) figures represent all water uses and are calculated by dividing total amount of water diverted and/or pumped for potable use by total population.[7] Water use categories include residential, commercial, institutional, and industrial, as well as process-related and municipal system water losses.
- Industrial use varies by community and represents approximately three percent of Arlington's water use, six percent of Mansfield's water use, and eight percent of Fort Worth's water use.
- Rainfall data recorded at DFW International Airport is also included to show the correlation between water use and precipitation. Higher water use is consistently observed during periods of below average rainfall. This is predominantly due to an increase in the amount of water used for irrigation.

**Table 4.1**

**Water Use among TRWD's Primary Customers and heir Successive Customers 2003-2008, including Rainfall, Total Water Supplied, Estimated Population, and Total Gallons per Capita per Day**

| Year | Rainfall at DFW Airport (inches) | Total Water Supplied to Primary Customers | Estimated Population of Primary customers (including wholesale) | Total Gallons per Capita per Day |
|---|---|---|---|---|
| 2003 | 24.55 | 301,061 | 1,445,291 | 186.0 |
| 2004 | 47.57 | 282,700 | 1,484,637 | 170.0 |
| 2005 | 18.97 | 344,596 | 1,523,983 | 201.9 |
| 2006 | 29.75 | 362,091 | 1,563,329 | 206.8 |
| 2007 | 50.05 | 284,343 | 1,597,425 | 158.9 |
| 2008 | 27.10 | 337,192 | 1,630,603 | 184.6 |
| Current 5-Year Average Per Capita Municipal Use among TRWD's Primary Customers without Credit for Reuse. | | | | 184.4 |

*Total gpcd = [(total acre-feet supplied x 325,851 gallons/acre-foot) / population] / 365 days per year]*

**Table 4.2**

**Estimated Population Served by TRWD's Primary Customers and their Successive Customers 2003-2008 based on data from the North Central Texas Council of Governments**

| Year | Arlington | Fort Worth | Mansfield | Trinity River Authority |
|---|---|---|---|---|
| 2003 | 348,260 | 898,946 | 38,391 | 159,695 |
| 2004 | 353,356 | 927,430 | 41,844 | 162,007 |
| 2005 | 358,453 | 955,913 | 45,297 | 164,320 |
| 2006 | 363,550 | 984,397 | 48,750 | 166,632 |
| 2007 | 364,300 | 1,012,880 | 51,300 | 168,945 |
| 2008 | 369,150 | 1,034,958 | 54,618 | 171,877 |
| Percent increase 2004-2008 | 4.28% | 10.39% | 23.39% | 5.74% |

In a special report to the 79th Legislature, the TWDB recommends a minimum annual reduction of one percent total gpcd, based upon a five-year rolling average until at such time as the entity achieves a total gpcd of 140 or less.[7] Table 4.3 shows projected municipal per capita water use for TRWD. The per capita use does not include the effect of new water conservation measures that may be adopted by TRWD customers. Table 4.3 also includes TRWD's targets for reduction to municipal per capita use due to the implementation of this water conservation and drought contingency plan and the plans to be developed by its customers. The information shown on the table reflects the following:

- The target for the five-year (2013) municipal per capita water use for TRWD's primary customers and their successive customers is 175 gallons per capita per day in an average climatic year, as shown in Table 4.3. This represents five percent reduction of over nine gallons per capita per day.
- The target for the ten-year (2018) municipal per capita water use for TRWD's primary customers and their successive customers is 166 gallons per capita per day in an average climatic year, as shown in Table 4.3. This represents a decrease of eighteen gallons per capita per day, or approximately ten percent.
- Projected total per capita water use figures are based on an average climate conditions. Per capita water use in years with less precipitation, especially during the summer, should be more than projected here.
- Indirect reuse diversion volumes shall be credited against total diversion volumes for the purpose of calculating gpcd for targets and goals.[7] The Water District estimates that over the next five years approximately two percent of its water supplies will be derived from indirect reuse. Credit for reuse is included in the five and ten year per capita goals.

**Table 4.3**

**Five-Year and Ten-Year Municipal Per Capita Water Use Goals for TRWD's Primary Customers and their Successive Customers (Total GPCD)**

| Description | Year | Per capita |
|---|---|---|
| Current 5-Year Average Per Capita Municipal Use Among TRWD's Primary Customers | 2004 – 2008 | 184 |
| 5-Year Goal (5% reduction with credit for reuse) | 2013 | 175 |
| 10-Year Goal (5% reduction with credit for reuse) | 2018 | 166 |

# 5. METERING, WATER USE RECORDS, CONTROL OF UNACCOUNTED WATER, AND LEAK DETECTION AND REPAIR

One of the key elements in water conservation is careful tracking of water use and control of losses. Accurate metering of water deliveries and detection and repair of leaks in the raw water delivery system are important elements of TRWD's program to control losses.

## 5.1 Practices to Measure and Account for the Amount of Water Diverted

TRWD uses two different methods to measure raw water diversions from its reservoirs. Releases from Lake Bridgeport and Eagle Mountain Lake are determined using 48-inch diameter gate valves. Each valve is calibrated so that the volumetric flow rate can be calculated based the size of the gate opening. The Water District meters its raw water diversions from Cedar Creek and Richland-Chambers Reservoirs by meters with accuracy ±5%. The master meters are calibrated semi-annually and repaired or replaced as needed.

## 5.2 Monitoring and Record Management Program for Determining Deliveries, Sales, and Losses

As a wholesale water supplier, TRWD has instituted a monitoring and record management program to assure that its customers are charged appropriately for their water use. The program includes the following elements:

- Customers with annual demands less than 7,500 acre-feet are required to document their usage in a monthly raw water report. The report includes initiation dates, usage dates, customer name changes and meter status changes.
- TRWD performs scheduled and random readings of customer meters; with no less than three readings taken during a three-month period and a fourth quarter reading taken between September 20 and October 10. In addition, one random reading is performed annually between June 1$^{st}$ and September 30$^{th}$.
- All meters are documented and the serial number is verified and recorded at each reading.
- Customers with a demand of 7,500 acre-feet or more must provide TRWD with a daily usage total and a monthly reconciliation of usage. Usage volumes are monitored and recorded daily. They are also verified monthly and annually.
- Customers are required to provide, operate, maintain, and read meters. By contract meters must have an accuracy ±5%. TRWD can access the meters at all reasonable times and, upon written request, can have the meters calibrated once per month. In the event a meter is not functioning properly, the customer is required to install a new meter or repair it within 180 days.
- The Water District has the authority to replace or repair any meter.

- Methods to verify water deliveries include calibration tests, mathematical calculations, and estimations based on historical meter data under similar conditions.
- Inaccurate meters at Lake Benbrook and Arlington outlets were replaced in 2008. The meters are currently being calibrated and the Water District anticipates them to be functional June 2009. The new meters will allow TRWD to better account for water deliveries at those locations.
- TRWD reconciles the water deliveries and reservoir diversions into daily mass balances. All of the Water District's reservoir levels and local precipitation are monitored from USGS recording stations. Measured pan evaporations performed by the USACE are also recorded daily and utilized in conjunction with the TWDB's evaporation coefficients. Using all of the above data, daily mass balances of each reservoir are performed to calculate natural inflows.

One of the goals of TRWD's water conservation program is to maintain unaccounted water below five percent in every year.

## 5.3 Metering and Leak Detection and Repair

TRWD metering program for raw water is described in Sections 5.1 and 5.2. The following information details the Water District's program to control, detect and repair leaks of its pipeline system:

- All TRWD water transmission pipelines are reinforced concrete cylinder pipe or steel cylinder pipe with an internal protective liner and an external protective coating. Because of the multiple layers of material, these pipelines have very long service lives and are not subject to frequent development of leaks.
- Most joints in TRWD pipelines are designed with bell and spigot joint construction including rubber gasket. Some joints are welded. For larger lines, each joint is also sealed with concrete.
- All TRWD water pipelines are constructed in legally defined and identified rights-of-way, properly registered with authorities in each county.
- TRWD personnel routinely inspect Water District pumping equipment, facilities, and pipelines for leaks or mechanical problems. Aerial surveillance combined with ground observation is used to regularly inspect pipeline routes for breaks and leaks. Repairs are undertaken as soon as practicable in order to minimize waste.
- TRWD conducts annual inspections of sections of the Cedar Creek and Richland-Chambers pipelines using an advanced technology to assess the condition of pipe segments. The method, which uses remote field eddy current transformer coupling technology (RFEC/TC), is a non-destructive way of detecting broken wires in pre-stressed concrete pipe. The analysis is cost-effective and highly accurate, which allows the Water District to target individual pipe segments for replacement. Pipeline repairs are conducted during the winter when demands are typically at their lowest.

- In the summer 2004, TRWD employed the Pressure Pipe Inspection Company's Sahara Leak Detection Technology to inspect a ten-mile section of the Richland-Chambers pipeline where a number of wet areas were observed. No leaks were found and shallow groundwater appears to have been the source of the water-logged soil.
- TRWD operates a program for right-of-way identification for construction projects adjacent to Water District facilities and pipelines in order to minimize leaks caused by pipeline damage during construction

# 6. OTHER REQUIRED MEASURES

## 6.1 Requirement for Water Conservation Plans by Wholesale Customers

Every contract for the wholesale sale of water by TRWD entered into, renewed, or extended after the adoption of this water conservation and drought contingency plan will include a requirement that the wholesale customer and any wholesale customers of that wholesale customer develop and implement a water conservation plan meeting the requirements of Title 30, Part 1, Chapter 288, Subchapter A, Rule 288.2 of the Texas Administrative Code. This requirement will extend to each successive wholesale customer in the resale of water. TRWD will provide the model water conservation and drought contingency plans described in Section 7.2 to all wholesale customers to assist them in developing their own water conservation and drought contingency plans.

## 6.2 Reservoir System Operation

TRWD currently has a permitted water supply from the following sources:

| | |
|---|---|
| Lake Bridgeport (local) | 15,000 acre-feet per year |
| Lake Bridgeport (downstream releases) | 78,000 acre-feet per year |
| Eagle Mountain Lake | 159,600 acre-feet per year |
| Cedar Creek Reservoir | 175,000 acre-feet per year |
| Richland-Chambers Reservoir | 210,000 acre-feet per year |
| Lake Benbrook | 72,500 acre-feet per year |
| Reuse – Richland-Chambers* | 63,000 acre-feet per year |
| Reuse – Cedar Creek* | 52,500 acre-feet per year |

*The Cedar Creek indirect reuse project represents future water supplies. A schedule for developing a water recycling facility at Cedar Creek Reservoir has not yet been determined. The indirect reuse project at Richland-Chambers Reservoir began operations in 2009 and will be fully functional by 2012. Available water supplies from this facility are currently less than the amount authorized.

Permitted water supply does not reflect the amount of water TRWD can safely deliver to its customers without adversely affecting the watersheds from which the supplies originate. The following list of sources depicts the firm yield capacities of TRWD's reservoir system. Firm yield of a reservoir is typically defined as the maximum yield that could be delivered without failure during the historical drought of record.

| | |
|---|---|
| Western Division reservoirs (includes | |
| Lake Bridgeport and Eagle Mountain Lake) | 79,000 acre-feet per year |
| Cedar Creek Reservoir | 175,000 acre-feet per year |
| Richland-Chambers Reservoir | 210,000 acre-feet per year |
| Lake Benbrook | 6,833 acre-feet per year |
| Reuse – Richland-Chambers* | 63,000 acre-feet per year |
| **TOTAL** | **533,833 acre feet per year** |

TRWD's water supply network includes seven major reservoirs – Lake Bridgeport, Eagle Mountain Lake, Lake Worth, Cedar Creek Reservoir, Richland-Chambers Reservoir, Lake Arlington and Lake Benbrook. The Water District's reservoir system operation plan for its various sources of supply seeks to maximize efficiency of water withdraws within the constraints of existing water rights. Other priorities include maintaining water quality and minimizing potential impacts on recreational users, fish, and wildlife. Each reservoir is operated on a policy of flood release above the conservation elevation. Due to the geographic locations of the reservoirs, TRWD's operations are essentially split into two divisions.

Lake Bridgeport, Eagle Mountain Lake and Lake Worth comprise the Western Division. Each reservoir is situated on the West Fork of the Trinity River. Lake Bridgeport is located in Wise and Jack counties; Eagle Mountain Lake sits downstream in northwest Tarrant County; and Lake Worth is further downstream in Tarrant County. In addition to water supply, each of these reservoirs is used to regulate floodwaters on the West Fork.

The Water District may divert 93,000 acre-feet per year from Lake Bridgeport, of which, 78,000 acre-feet per year may be released downstream into Eagle Mountain Lake. TRWD may divert a maximum of 159,600 acre-feet per year from Eagle Mountain, but that total also includes water released from Lake Bridgeport into Eagle Mountain Lake. The estimated firm yield of the Western Division reservoirs is 79,000 acre-feet per year.

Water is gravity fed from Lake Bridgeport to Eagle Mountain and from Eagle Mountain to Lake Worth to water treatment plants in the city of Fort Worth and neighboring cities and industries. The Water District's operation of the West Fork seeks to maintain Lake Worth's elevation to support the intake of Fort Worth's Holly Water Treatment Plant and the cooling operations at Lockheed Martin.

TRWD follows a series of operational rules to minimize spills and evaporation and regulate elevation in Lake Worth. The TRWD system operation plan calls for a shift in water deliveries to the Eastern Division reservoirs if the combined storage capacity in Lake Bridgeport and Eagle Mountain falls below 50 percent.

Construction of a new pipeline carrying water from Cedar Creek and Richland-Chambers to Eagle Mountain Lake was completed in May 2008. The 20.5-mile extension taps into an existing pipeline at Lake Benbrook and continues to Eagle Mountain Lake. Water from East Texas can now be delivered into Eagle Mountain Lake for terminal storage. The additional water will help meet the future water needs of a rapidly growing northwest Tarrant County and should reduce pressure on the West Fork during periods of peak demand (summer) and drought. It also supplies the expanded capacity of the city of Fort Worth's Eagle Mountain Water Treatment Plant.

Cedar Creek and Richland-Chambers reservoirs generate most of the water supply from the Eastern Division. Lakes Arlington and Benbrook are primarily operated as terminal storage reservoirs. Cedar Creek Reservoir is situated in Kaufman and Henderson counties; Richland-Chambers Reservoir is located in Navarro and Freestone counties; Lake Arlington is located on Village Creek in Tarrant County; and Lake Benbrook is a U.S. Army Corps of Engineers project in southwest Tarrant County.

The firm yield of Cedar Creek Reservoir is 175,000 acre-feet per year. A 70-mile pipeline is used to transport water from Cedar Creek into Tarrant County. An outlet on the Cedar Creek pipeline allows the Water District to deliver water into Village Creek which flows into Lake Arlington. Richland-Chambers has a firm yield of 210,000 acre-feet per year. The Water District constructed a 78-mile pipeline to carry water from Richland-Chambers into Tarrant County. Both East Texas pipelines terminate at the City of Fort Worth's Rolling Hills Water Treatment Plant. A pipeline extension from Rolling Hills to Lake Benbrook was completed in 1998.

TRWD manages deliveries from its East Texas reservoirs to meet customer needs and to supplement lake volumes in Eagle Mountain Lake, Lake Arlington, and Lake Benbrook during off-peak periods. The yields from the latter two lakes are less than 10,000 acre-feet per year so most of the supply is by pipeline delivery. Under normal operating conditions, the Water District diverts water in excess of demands into Lake Arlington and Lake Benbrook. The goal is to bring each of these lakes to at or near conservation elevation (694' msl and 500' msl, respectively) prior to June 1 to maximize terminal storage and meet peak demands during the summer. Using Lake Arlington and Lake Benbrook to provide summertime water deliveries to customers minimizes energy costs. Pumping from East Texas ceases if Lake Benbrook is above conservation. However, pumping will resume if demands exceed the pumping capabilities from Lake Benbrook.

The Water District has permits for two indirect reuse projects at Richland-Chambers and Cedar Creek Reservoirs. The projects involve diverting return flows in the Trinity River through constructed wetland systems to remove pollutants, such as nutrients and sediment. The water will then be routed to the reservoirs to supplement yields by as much as 30 percent. The wetland water reuse facility at Richland-Chambers began operations in spring 2009. Additional details about the water recycling projects can be found in Section 8.1.

## 6.3 Water Conservation Implementation Report

Appendix D includes the TCEQ required water conservation implementation report. The report is due to the TCEQ by May 1 of every year, starting in the year 2009. This report lists various water conservation strategies that have been implemented, including the date the strategy was implemented. The report also calls for the five and ten year per capita water use goals from the previous water conservation plan. The reporting entity must answer whether or not these goals have been met and if not, why not. The amount of water saved is also reported.

## 6.4 Coordination with Regional Water Planning Groups

Appendix E includes a copy of letters sent to the Chairs of Region C and Region D water planning groups with this water conservation and drought contingency plan.

# 7. ADDITIONAL TRWD WATER CONSERVATION MEASURES TO ASSIST CUSTOMERS

TRWD will implement a number of water conservation measures intended to help direct and indirect customers with their water conservation planning, including:

- Holding water conservation workshops for the staff of customers within its service area.
- Providing model water conservation and drought contingency plans for use by customers in developing their own plans.
- Requiring an annual report on water conservation efforts from customers and developing a district water conservation report.

These measures will allow TRWD to serve as a regional resource for water conservation efforts in its service area.

## 7.1 Water Conservation Workshops

The Water District will continue to coordinate water conservation workshops for staff of customers (direct and indirect) that receive water from TRWD. The workshops will cover TCEQ requirements for water conservation and drought contingency plans, current TRWD water conservation efforts, water supply updates, municipal water conservation programs and best management practices, and related topics. TRWD will present the model water conservation and drought contingency plans described in Section 7.2 to cities and assist in the development of their plans.

In 2007, the Water District held a water conservation symposium for its customer cities. The program was designed to show customers strategies that they could use to save water, save money, and reduce demands. Speakers from across the nation were invited to share their experience and expertise. Discussions centered on key elements of successful water conservation programs. The symposium is now an annual event and jointly coordinated by the region's three major water providers – TRWD, North Texas Municipal Water District, and the city of Dallas.

In addition to the symposium, the Water District joined other North Texas water suppliers, and the Dallas and Fort Worth Chambers of Commerce to coordinate a Legislative Summit in October 2008 for state and local lawmakers. The event, which focused on water supply and conservation issues impacting North Texas, was repeated for water utility managers and their staff.

Additional water conservation workshops and educational programs targeting end water users will be developed as part of the Water District's community outreach program. Further information on TRWD's public education programs are listed in Section 8.2.

## 7.2 TRWD *Model Water Conservation Plan for TRWD Customers* and *Model Drought Contingency Plan for TRWD Customers*

In order to assist its cities in the development of their own water conservation and drought contingency plans, TRWD will develop a *Model Water Conservation Plan for TRWD Customers* and a *Model Drought Contingency Plan for TRWD Customers*. The model water conservation plan addresses the TCEQ requirements for water conservation plans for municipal use by public water suppliers and includes several provisions that go beyond TCEQ requirements. TRWD will work with its customers to develop water conservation and drought contingency plans using the model plan as a guide.

The model water conservation plan includes the following elements addressing TCEQ requirements for water conservation plans for public water suppliers: [1]

- 288.2(a)(1)(A) – Utility Profile
- 288.2(a)(1)(C) – Specification of Goals
- 288.2(a)(1)(D) – Accurate Metering
- 288.2(a)(1)(E) – Universal Metering
- 288.2(a)(1)(F) – Determination and Control of Unaccounted Water
- 288.2(a)(1)(G) – Public Education and Information Program
- 288.2(a)(1)(H) – Non-promotional Water Rate Structure
- 288.2(a)(1)(I) – Reservoir System Operation Plan
- 288.2(a)(1)(J) – Means of Implementation and Enforcement
- 288.2(a)(1)(K) – Coordination with Regional Water Planning Group
- 288.2(a)(2)(A) – Leak Detection, Repair, and Water Loss Accounting
- 288.2(a)(2)(B) – Record Management System
- 288.2(a)(2)(C) – Requirement for Water Conservation Plans by Wholesale Customers

TRWD's model water conservation plan also includes water conservation strategies that go beyond TCEQ's requirements:

- 288.2(a)(3)(A) – Conservation Oriented Water Rates
- 288.2(a)(3)(B) – Ordinances, Plumbing Codes or Rules on Water-Conserving Fixtures
- 288.2(a)(3)(D) – Reuse and Recycling of Wastewater
- 288.2(a)(3)(F) – Landscape Water Management Ordinance
- 288.2(a)(3)(G) – Monitoring Method

## 7.3 Annual Reports

One element of TRWD's *Model Water Conservation Plan for TRWD Customers* is a requirement that all water supply customers (direct and indirect) produce annual conservation reports (Appendix F) by May1 the following year and submit them to TRWD. TRWD will compile these reports and use them to help generate its own annual water conservation report. The Water District's report will be used to review the effectiveness of its water conservation program and will be shared with the TRWD board and the Advisory Committee.

# 8. ADDITIONAL TRWD WATER CONSERVATION MEASURES

## 8.1 Indirect Reuse and Recycling of Water

Indirect and/or direct reuse is a major part of future water supply plans for North Texas. TRWD is taking a lead role in water reuse by recycling return flows in the Trinity River. Return flows are a renewable resource; they are made up of water discharged by wastewater treatment plants in Fort Worth-Dallas area. A large portion of those flows originated from reservoirs managed by the Water District.

Here's how indirect reuse projects work:

A) Treated water from area lakes is consumed in homes and business.

B) Water that flows down the drain ends up at a wastewater treatment plant.

C) Wastewater treatment plants clean the water and release it into the Trinity River. However, discharges from wastewater treatment plants can contain elevated levels of nutrients, such as nitrogen and phosphorus.

D) As the water flows downstream, it picks up sediments and more nutrients along the way.

E) The return flows are captured and pumped into constructed wetlands. The wetlands provide a natural way to remove sediments and nutrients from the river water.

F) With most of the sediments and nutrients removed, the treated water is returned to area lakes to supplement drinking water supplies.

G) Water from lakes is pumped to drinking water treatment plants, then back into homes and businesses and reused.

The first of TRWD's two planned indirect reuse projects began operations in spring 2009. The George Shannon Wetlands Water Recycling Facility is located adjacent to Richland-Chambers Reservoir. Over the next five years, the Water District plans to recycle enough water from the Trinity River to make up approximately two percent of its raw water supplies. That adds up to about 10 million gallons per day (MGD) eight months of the year.

Another facility is planned for Cedar Creek Reservoir. The wetland treatment systems will grow in size, up to 2,000 acres each, as water demands increase. The unique projects will ultimately supplement current yields in both reservoirs by 30 percent – an additional 63,000 acre-feet at Richland-Chambers and 52,500 acre-feet at Cedar Creek.

## 8.2 Public Education Program

TRWD will work closely with its customers (direct and indirect) to inform consumers on ways to use water more efficiently. TRWD's public education program is intended to

assist and supplement the public education efforts of its customers. TRWD's public education efforts include the following elements:

Public Outreach Campaign

- Since 2007, TRWD has partnered with Dallas Water Utilities (DWU) to spread a uniform water conservation message across the Metroplex. The awareness campaign – "Save water. Nothing can replace it" – uses radio and television spots, newspaper ads, billboards, and other forms of communication to encourage people to use water responsibly. The cooperative spirit between DWU and TRWD is an excellent example of how agencies can unite to achieve a common goal. Together both agencies will spend $1.7 million for the 2009 campaign.

Brochures and Conservation Literature

- TRWD developed an award-winning water conservation brochure in 2008. It contains water saving tips for both indoor and outdoor settings. The brochure was made available to customer cities for distribution at public events, libraries, municipal offices, garden centers, and home improvement stores.
- Additional printed materials will be developed as the Water District's conservation program matures and the need arises.

School Education Programs

- Since 2003, TRWD has provided the "Learning to Be Water Wise" curriculum to the Fort Worth and Arlington Independent School Districts at no cost. In 2007, the city of North Richland Hills partnered with TRWD to provide the program in the Birdville ISD. The "Learning to Be Water Wise" curriculum includes student kits and activities to educate 5$^{th}$ grade students on the importance of water and the need for water conservation in their homes and communities. The kits contain water saving devices, which the students are encouraged to install in their own residences.
- From 2004 to 2008, the Water District was a sponsor of a regional Newspapers in Education program about water. More than 1,000 area teachers signed up to receive a free supplement entitled, "Water: From Here to Eternity and Back Again." It was customized to include topics that specifically related to water issues in North Central Texas.
- In 2005, TRWD began offering the "Major Rivers" curriculum to area school districts at no cost. The Arlington ISD was the first to adopt the program; the Fort Worth ISD began using it in 2007. "Major Rivers" is a curriculum designed to teach 4$^{th}$ grade students about Texas water resources, how water is treated and delivered to homes and schools, how to care for water resources, and how to use them wisely. A classroom package includes a teacher's guide with full color overhead transparencies, an introductory video, and full color student workbooks and home information leaflets. The Water District ordered teacher kits and replacement packages containing more than 9,000 student activity workbooks for the upcoming school year (2009-10).

- Since 2005, the Water District has supported the distribution of book covers with a water conservation message to middle schools in Azle, Eagle-Mountain-Saginaw, Decatur, and Birdville Independent School Districts at no cost.
- TRWD completed an interactive multi-media module in 2007 to educate students about its wetlands water reuse project. The product can be accessed online at www.trwd.com. The module blends short videos, panoramic photos and a game to teach school age children about wetland ecosystems and the environmental benefits of the water recycling project.
- In 2008, the Water District created a student activitiy workbook to complement the information featured in the online wetland media module. The workbook was provided to 6th graders at All Saints Episcopal School in Fort Worth. Plans are in the works to expand distribution to more students in the Water District's service area.

Water Efficient Landscaping

- TRWD was one of the original funding partners of the award-winning Texas SmartScape CD-ROM. The Water District provided funding for the conversion of Texas SmartScape into an interactive Web site and for regional distribution of the CD version. Texas SmartScape is an educational tool designed to assist citizens with the design and development of landscaping using Texas native and drought tolerant plants.
- In a partnership with the City of Fort Worth, TRWD helped fund the creation of a water conservation demonstration garden located at the Fort Worth Botanic Gardens. The garden is designed to show area residents the benefits, both environmental and aesthetic, of using native and adapted drought tolerant plants in their own residential setting. Information signs emphasizing the responsible use of our water resources are being developed.
- Through a grant provided by the Texas Water Development Board, TRWD partnered with the city of Arlington to develop another water conservation demonstration garden at the Southwest Branch Library. As a condition for grant funding, TRWD and the city coordinated workshops directed towards landscape professionals, builders, and developers on ways to design and install water efficient landscapes. Several more public workshops on waterwise landscaping are planned for spring 2009.

Internet

- Beginning in 2007, TRWD began producing an online water conservation newsletter, available at its Web site (www.trwd.com). The "Supply Side" newsletter includes information about local water resources, trends in water use, and indoor and outdoor water saving suggestions.
- To go along with its 2009 save water public awareness campaign, the Water District is revamping the www.savetarrantwater.com Web site. This site offers another channel to disseminate water conservation information. Ideally it will be a place to:

- Spotlight community conservation news and programs.
- Promote local events and public workshops.
- Feature stories and updates about water resources, water reuse, and conservation.
- Dig deeper into the principles of waterwise landscaping.
- Provide more in-depth and practical advice on how to save water.
- Discuss water efficient products and technology.

Community Group Presentations

- TRWD has prepared and presented programs to area cities, civic organizations and other groups concerning the need for water conservation and strategies that can be implemented on an individual and corporate level. Presentations have been made to Rotary Clubs, Lions Clubs, Garden Clubs, Tarrant County Master Gardeners, Chambers of Commerce, mayors, city councils, city staff, etc.

Special Events

- TRWD participates in several special events providing opportunities distribute water conservation information to the public:
  - The Water District sponsors a 2000-$ft^2$ landscape demonstration garden at Mayfest, a four-day outdoor community festival in Fort Worth. The event gives visitors an opportunity to see firsthand the beauty and water saving benefits of a Texas SmartScape. Master Gardeners of the Tarrant County Extension Office are on hand to educate the public about climate-appropriate landscaping.
  - The Water District also sponsors four lake and river cleanups annually – two in the spring and two in the fall. These special events provide excellent opportunities to emphasize the importance of protecting and conserving water resources. On average, a total of more than 2,000 volunteers join TRWD each year to clean the watersheds of Eagle Mountain Lake, Lake Bridgeport, the Trinity River, and Cedar Creek Reservoir.

## 8.3 In-House Water Conservation Efforts

TRWD has and will continue to implement and in-house water conservation program, including the following elements:

- Wherever possible, landscapes will use native or adapted drought tolerant plants, trees and shrubs.
- Irrigation at TRWD facilities will occur before 10 a.m. and after 6 p.m. year-round in order to lower losses due to evaporation.

- Irrigation will be limited to the amount needed to promote survival and health of plants and lawns. The Water District has eliminated irrigation at some pump station locations altogether.
- Irrigation will be avoided on Saturday and Sunday if possible, since these are periods of high water use by the public.
- Irrigation will be done with untreated source water wherever feasible and reasonable.

# 9. ADOPTION AND AUTHORIZATION TO ENFORCE THE WATER CONSERVATION AND DROUGHT CONTINGENCY PLAN

Appendix G contains a copy of the minutes of the TRWD Board meeting at which this amended water conservation and drought contingency plan was adopted. The General Manager of TRWD is authorized to implement and enforce, to the extent provided herein, the water conservation and drought contingency plan. As discussed in Section 7.3 TRWD will prepare a water conservation report every year, incorporating the reports required from direct and indirect customers. This report will be used to review the effectiveness of TRWD's water conservation program, and results will be reported to the Advisory Committee and the TRWD board.

## 10. REVIEW AND UPDATE OF WATER CONSERVATION PLAN

TCEQ requires that water conservation plans be updated prior to May 1, 2009 and every five years thereafter. TRWD will review and update this plan as appropriate based on new or updated information.

# 11. DROUGHT CONTINGENCY PLAN

## 11.1 Introduction

The purpose of this drought contingency plan is as follows:

- To conserve the available water supply in times of drought and emergency
- To maintain supplies for domestic water use, sanitation, and fire protection
- To protect and preserve public health, welfare, and safety
- To minimize the adverse impacts of water supply shortages
- To minimize the adverse impacts of emergency water supply conditions.

As this plan is being prepared (February 2007), TRWD is in a Stage 2 drought. The lack of rainfall and runoff in the previous two years has seriously depleted lake levels. In response to the drought conditions, TRWD is updating its water conservation and drought contingency plan to take a more active role in educating the public about the importance of using water efficiently.

TRWD recognizes the need for developing a regional approach to implementing water conservation strategies. The Water District is working closely with other water suppliers to create an educational campaign with unified themes and messages. The campaign will be designed to provide people with information and tools that can be used to save water. The extensive effort will consist of multiple methods to reach and educate the public, which may include:

- Television ads
- Radio ads
- Transit ads
- Billboards
- Yard signs
- Newspaper and magazine ads
- Messages on gasoline pumps (“pump toppers”)
- Movie theater ads
- Mall ads
- Fact sheets
- Web site
- An ongoing print and media relations campaign with print and electronic media

- Other outreach programs, such as a traveling exhibit for community events and meetings with representatives of plumbing, landscape irrigation, nurseries, and other industries with influence on water use.

The specifics of the public outreach and education campaign will vary depending on the circumstances of future droughts, but this current example shows TRWD's commitment to an appropriate drought response.

## 11.2 State Requirements for Drought Contingency Plans

This drought contingency plan is consistent with the Texas Commission on Environmental Quality (TCEQ) guidelines and requirements for the development of drought contingency plans by wholesale water suppliers, contained in Title 30, Part 1, Chapter 288, Subchapter B, Rule 288.22 of the Texas Administrative Code. This rule is included in Appendix B.

Minimum Requirements

TCEQ's minimum requirements for drought contingency plans are addressed in the following subsections of this report:

- 288.22(a)(1) – Provisions to Inform the Public and Provide Opportunity for Public Input – Section 10.3
- 288.22(a)(2) – Coordination with the Regional Water Planning Group – Section 10.9
- 288.22(a)(3) – Criteria for Initiation and Termination of Drought Stages – Section 10.4
- 288.22(a)(4) – Drought and Emergency Response Stages – Section 10.5
- 288.22(a)(5) – Procedures for Initiation and Termination of Drought Stages – Section 10.5
- 288.22(a)(6) – Specific Measures to Be Implemented during Each Drought Stage – Section 10.5
- 288.22(a)(7) – Provision for Wholesale Contracts to Require Water Distribution According to Texas Water Code §11.039 – Sections 10.5 and 10.6.
- 288.22(a)(8) – Procedures for Granting Variances to the Plan – Section 10.7
- 288.22(a)(9) – Procedures for Enforcement of Mandatory Restrictions – Section 10.8
- 288.22(b) – Notification of Implementation of Mandatory Measures – Section 10.4
- 288.22(c) – Review and Update of Plan – Section 10.10

## 11.3 Provisions to Inform the Public and Opportunity for Public Input

TRWD provided opportunity for public input in the development of the 2007 drought contingency plan by the following means:

- Meeting with customer representatives to discuss the draft plan.
- Providing the draft plan to anyone requesting a copy.
- Providing written notice of the proposed plan by Web site and posted notice and giving the public an opportunity to comment on the plan at a public meeting.
- Notice of the public meeting was published twice in the Fort Worth Star Telegram, a local newspaper with an average daily circulation of approximately 220,000 and an estimated readership of more than 500,000. In addition, notice of the public meeting was broadcast on KRLD 1080 AM Radio.
- Holding a public meeting at Tarrant Regional Water District offices in Fort Worth, at 5:30 p.m., on Monday, June 11, 2007.

This version of the drought contingency plan does include updates. Most of the 2007 drought contingency plan remains intact; however some measures and actions in this plan were modified in order to specifically match those contained in the plans recently adopted by most of TRWD's primary customers – the cities of Arlington, Fort Worth, and Mansfield. Each of the municipalities provided opportunities for public comment through public hearings and/or making the drought plan available for review on their Web sites.

The changes made to this plan are consistent with taking a regional approach to conserve water in times of drought or emergency. The public was invited to submit its input at a Water District board meeting held at 9:30 a.m., on Tuesday, April 14, 2009. For those unable to attend the meeting, TRWD will post this plan its Web site.

## 11.4 Initiation and Termination of Drought Response Stages

Initiation of Drought Response Stage

The General Manager may order the implementation of a drought response stage or water emergency when one or more of the trigger conditions for that stage is met. The following actions will be taken when a drought stage is initiated:

- The designated representative(s) of primary wholesale customers will be notified by email with a follow-up letter or fax that provides details of the reasons for initiation of the drought stage.
- The public will be notified through local media following the notification of primary wholesale customers.
- If any mandatory provisions of the drought contingency plan are activated, TRWD will notify the Executive Director of the TCEQ within five business days.

The General Manager may decide not to order the implementation of a drought response stage or water emergency even though one or more of the trigger criteria for the stage are met. Factors which could influence such a decision include, but are not limited to, the time of year, weather conditions, the anticipation of replenished water supplies, or the anticipation that additional facilities will become available to meet needs.

The trigger conditions in this plan pertaining to TRWD's system volume were established following an intensive study of the North Texas climate and its impact on water supplies by Hydrosphere, an engineering firm based in Boulder, Colorado. The study projected the effects of simulated weather patterns on the combined storage capacity of TRWD reservoirs. Using computer simulations, Hydrosphere compared the water savings that would be achieved at various trigger points with and without outdoor watering restrictions in place. Under severe drought conditions, the estimated water savings that would be achieved by implementing this plan would extend water supplies by several months. A more detailed summary of the study's findings is included in Appendix H.

Termination of a Drought Stage

The General Manager may order the termination of a drought response stage or water emergency when the conditions for termination are met at his/her discretion. The following actions will be taken when a drought stage is terminated:

- The designated representative(s) of primary wholesale customers will be notified by telephone with a follow-up letter, e-mail, or fax.
- The public will be notified through local media following the notification of primary wholesale customers.
- When mandatory provisions of the drought contingency plan that have been activated are terminated, TRWD will notify the Executive Director of the TCEQ within five business days.

The General Manager may decide not to order the termination of a drought response stage or water emergency even though conditions for termination of the stage are met. Factors which could influence such a decision include, but are not limited to, the time of year, weather conditions, or the anticipation of potential changed conditions that warrant the continuation of the drought stage.

## 11.5 Drought and Emergency Response Stages and Measures

Stage 1, Water Watch

Triggering and Terminating Conditions

- Total combined raw water supply in TRWD western and eastern division reservoirs drops below 75% (25% depleted) of conservation storage capacity.
- Water demand for all or part of the delivery system approaches delivery capacity because delivery capacity is inadequate.

- Water demand is projected to approach the limit of permitted supply.
- Supply source becomes contaminated.
- Water supply system is unable to deliver water due to the failure or damage of major water system components.
- The General Manager, with concurrence of the TRWD Board of Directors, finds that conditions warrant the declaration of a Stage 1 drought.

Stage 1 may terminate when raw water supply exceeds 75% storage capacity, and/or when the circumstances that caused the initiation of Stage 1 no longer prevail, or at the discretion of the General Manager.

Goal for Use Reduction

The goal for water use reduction under Stage 1, Water Watch, is to decrease use by five percent. If circumstances warrant, the General Manager can set a goal for greater water use reduction.

Actions Available under Stage 1, Water Watch

The General Manager may order the implementation of any of the actions listed below, as deemed necessary. Measures imposing mandatory requirements on customers require notification to TCEQ. TRWD must notify TCEQ within five business days if any mandatory measures are implemented.

Require customers (including indirect customers) to initiate Stage 1 in their drought contingency plans. Indirect customers include any successive wholesale customers of TRWD's primary wholesale customers.

All Water Users

- Initiate mandatory restrictions to prohibit non-essential water use as follows:
  - Prohibit hosing of paved areas, such as sidewalks, driveways, parking lots, tennis courts, or other impervious surfaces, except to alleviate an immediate health or safety hazard.
  - Prohibit hosing of buildings or other structures for purposes other than fire protection or surface preparation prior to painting.
  - Prohibit using water in such a manner as to allow runoff or other waste, including:
    1) failure to repair a controllable leak, including a broken sprinkler head, a leaking valve, leaking or broken pipes, or a leaking faucet;
    2) operating a permanently installed irrigation system with: (a) a broken head; (b) a head that is out of adjustment and the arc of the spray head is over a street or parking lot; or (c) a head that is misting because of high water pressure; or
    3) during irrigation, allowing water to (a) run off a property and form a stream of water in a street for a distance of 50 feet or greater; or

(b) to pond in a street or parking lot to a depth greater than one-quarter of an inch.

- Prohibit outdoor watering with sprinklers or irrigation systems between 10 a.m. and 6 p.m.
- Limit landscape watering with sprinklers or irrigation systems at each service address to twice per week. Includes landscape watering of parks, golf courses and sports fields.

  Exceptions:

  - Foundations may be watered up to two hours on any day by handheld hose; or using a soaker hose or drip system placed within 24-inches of the foundation that does not produce a spray of water above the ground.
  - Newly installed shrubs (first year) and trees may be watered up to two hours on any day by handheld hose, drip irrigation, soaker hose, or tree bubbler. Tree watering is limited to an area not to exceed the drip line of a tree.
  - Establishing new turf is discouraged. If new hydromulch, grass sod, or grass seed is installed for the purpose of establishing a new lawn, there are no watering restrictions for the first 30 days while it is being established. After that, the watering restrictions set forth in this stage apply. (This exception does not include over seeding with rye since turf already exists.)
  - Outdoor watering at service addresses with large with large multi-station irrigation systems may take place in accordance with a variance granted by the Water Utilities Director, if the Water Utilities Director determines that a property can not be completely irrigated with an average of three-quarters of an inch of water in a single day, and that the property should be divided into sections to be watered on different days.
  - Twice per week watering restrictions do not apply to locations using well water or treated wastewater effluent for irrigation.
- Washing of any motor vehicle, motorbike, boat, trailer, airplane, or other vehicle shall be limited to the use of a hand-held bucket or a hand-held hose equipped with a positive shutoff nozzle for quick rinses. Vehicle washing may be done at any time on the premises of a commercial car wash or commercial service station. Further, such washing may be exempt from these requirements if the health, safety, and welfare of the public are contingent upon frequent vehicle cleansing, such as garbage trucks and vehicles used to transport food and perishables.
- All users are encouraged to reduce frequency of draining and refilling swimming pools.
- All users are encouraged to use Texas native and drought tolerant plants in landscaping.

City and Local Governments

In addition to actions listed above:

- Review conditions and problems that caused Stage 1. Take corrective action.
- Increase public education efforts on ways to reduce water use.
- Increase enforcement efforts.
- Intensify leak detection and repair efforts.
- Audit all city and local government irrigation systems to ensure proper condition, settings, and operation.
- Identify and encourage voluntary reduction measures by high-volume water users through water use audits.
- Landscape watering of municipal parks, golf courses, and sports fields is limited to twice per week watering schedule; or twice per week per irrigation station if a variance is granted by the Water Utilities Director. (See exceptions to outdoor watering restrictions in all water users category for rules that apply to facilities with large multi-station irrigation systems.)

  Exceptions:

  - Golf courses may water greens and tee boxes without restrictions, however watering must be done before 10 a.m. and after 6 p.m.
  - Skinned areas of sports fields may be watered as needed for dust control.
- Reduce non-essential water use. As used herein, non-essential water uses are those that do not have any health or safety impact and are not needed to meet the core function of the agency.
- Notify wholesale customers of actions being taken and request them to implement the same drought stage and measures.

Commercial or Industrial

- All actions listed above for all water users apply to commercial and industrial users.
- Landscape watering of parks, golf courses, and sports fields is limited to twice per week watering schedule; or twice per week per irrigation station if a variance is granted by the Water Utilities Director. (See exceptions to outdoor watering restrictions in all water users category above for rules that apply to facilities with large multi-station irrigation systems.)

  Exceptions:

  - Golf courses may water greens and tee boxes without restrictions, however watering must be done before 10 a.m. and after 6 p.m.
  - Skinned areas of sports fields may be watered without restrictions as needed for dust control.

  - Professional sports fields (playing fields with a stadium only – not surrounding landscaping) may be watered as needed to maintain league standards.

- Stock at commercial plant nurseries is exempt from Stage 1 watering restrictions.
- Hotels, restaurants, and bars are encouraged to serve drinking water to patrons on an "on demand" basis.
- Hotels are encouraged to implement laundry conservation measures by encouraging patrons to reuse linens and towels.

Stage 2, Water Warning

Triggering and Terminating Conditions

- Total raw water supply in TRWD western and eastern division reservoirs drops below 60% (40% depleted) of conservation storage capacity.
- Water demand for all or part of the delivery system approaches delivery capacity because delivery capacity is inadequate.
- Water demand is projected to approach the limit of permitted supply.
- Supply source becomes contaminated.
- Water supply system is unable to deliver water due to the failure or damage of major water system components.
- The General Manager, with concurrence of the TRWD Board of Directors, finds that conditions warrant the declaration of a Stage 2 drought.

Stage 2 may terminate when raw water supply exceeds 60% storage capacity, and/or when the circumstances that caused the initiation of Stage 2 no longer prevail, or at the discretion of the General Manager.

Goal for Use Reduction

The goal for water use reduction under Stage 2, Water Warning, is to decrease use by 10 percent. If circumstances warrant, the General Manager can set a goal for greater water use reduction.

Actions Available under Stage 2, Water Warning

The General Manager may order the implementation of any of the actions listed below, as deemed necessary. Measures imposing mandatory requirements on customers require notification to TCEQ. TRWD must notify TCEQ within five business days if any mandatory measures are implemented.

- Continue or initiate any actions available under Stage 1.

- Require customers (including indirect customers) to initiate Stage 2 in their drought contingency plans. Indirect customers include any wholesale customer of TRWD's primary wholesale customers.
- Initiate engineering studies to evaluate water supply alternatives should conditions worsen.

All Water Users

- Limit landscape watering with sprinklers or irrigation systems at each service address to once every seven days. Outdoor watering schedule to be determined by the Water Utilities Director.

  Exceptions:

  - Foundations may be watered up to two hours on any day by handheld hose; or using a soaker hose or drip system placed within 24 inches of the foundation that does not produce a spray of water above the ground.
  - Newly installed shrubs (first year), and trees may be watered up to two hours on any day by handheld hose, drip irrigation, or a soaker hose. Tree watering is limited to an area not to exceed the drip line of a tree.
  - Outdoor watering at service addresses with large with large multi-station irrigation systems may take place in accordance with a variance granted by the Water Utilities Director, if the Water Utilities Director determines that a property can not be completely irrigated with an average three-quarters of an inch of water in a single day, and that the property should be divided into sections to be watered on different days.
  - Once per week watering restrictions do not apply to locations using well water or treated wastewater effluent for irrigation.
- All users are encouraged to wait until the current drought or emergency situation has passed before establishing new landscaping and turf. If new hydromulch, grass sod, or grass seed is installed for the purpose of establishing a new lawn, there are no watering restrictions for the first 30 days while it is being established. After that, the watering restrictions set forth in this stage apply. (This exception does not include over seeding with rye since turf already exists.)
- Prohibit the use of water for dust control, except as required to protect public health.
- Prohibit the operation of ornamental fountains or ponds that use potable water except where necessary to support aquatic life or where such fountains or ponds are equipped with a recirculation system.
- Prohibit filling of swimming pools with automatic valves.

City and Local Governments

In addition to actions listed above:

- Continue or initiate any actions available under Stage 2.

- Review conditions or problems that caused Stage 2. Take corrective action.
- Increase frequency of media releases on water supply conditions.
- Further accelerate public education efforts on ways to reduce water use.
- Landscape watering of municipal parks, golf courses, and sports fields is limited to once every seven days; or once every seven days per irrigation station if a variance is granted by the Water Utilities Director. (See Stage 1 exceptions to outdoor watering restrictions in all water users category for rules that apply to facilities with large multi-station irrigation systems.)

  Exceptions:

  - Golf courses may water greens and tee boxes as needed to keep them alive, however watering must be done before 10 a.m. and after 6 p.m. Fairways are restricted to once per week watering as outlined above. Golf course rough can not be watered.
  - Watering for dust control on skinned areas of sports fields is not allowed.
- Eliminate non-essential water use. As used herein, non-essential water uses are those that do not have any health or safety impact and are not needed to meet the core function of the agency.
- Prohibit wet street sweeping.
- Notify wholesale customers of actions being taken and request them to implement the same drought stage and measures.

Commercial or Industrial

- All actions listed above for all water users apply to commercial and industrial users.
- Landscape watering of parks, golf courses, and sports fields is limited to once every seven days; or once every seven days per irrigation station if a variance is granted by the Water Utilities Director. (See Stage 1 exceptions to outdoor watering restrictions in all water users category for rules that apply to facilities with large multi-station irrigation systems.)

  Exceptions:

  - Golf courses may water greens and tee boxes as needed to keep them alive, however watering must be done before 10 a.m. and after 6 p.m. Fairways are restricted to once per week watering as outlined above. Golf course rough can not be watered.
  - Watering for dust control on skinned areas of sports fields is not allowed.
  - Professional sports fields (playing fields with a stadium only – not surrounding landscaping) may be watered as needed to maintain league standards.

Stage 3, Water Emergency

Triggering and Terminating Conditions

- Total raw water supply in TRWD western and eastern division reservoirs drops below 45% (55% depleted) of conservation storage capacity.
- Water demand exceeds the amount that can be delivered to customers.
- Water demand for all or part of the TRWD delivery system approaches delivery capacity because delivery capacity is inadequate.
- One or more of TRWD's water supply sources has become limited in availability.
- Water demand is projected to approach the limit of permitted supply.
- Supply source becomes contaminated.
- Water supply system is unable to deliver water due to the failure or damage of major water system components.
- The General Manager, with concurrence of the TRWD Board of Directors, finds that conditions warrant the declaration of a Stage 3 drought.

Stage 3 may terminate when raw water supply exceeds 45% storage capacity, and/or when the circumstances that caused the initiation of Stage 3 no longer prevail, or at the discretion of the General Manager.

Goal for Use Reduction

The goal for water use reduction under Stage 3, Water Emergency, is to decrease use by 20 percent. If circumstances warrant, the General Manager can set a goal for greater water use reduction.

Actions Available under Stage 3, Water Emergency

The General Manager can order the implementation of any of the actions listed below, as deemed necessary. Measures imposing mandatory requirements on customers require notification to TCEQ. TRWD must notify TCEQ within five business days if these measures are implemented.

- Continue or initiate any actions available under Stages 1 and 2.
- Require customers (including indirect customers) to initiate Stage 3 in their drought contingency plans. Indirect customers include any wholesale customer of TRWD's primary wholesale customers.

All Water Users

- Prohibit all landscape watering, including at parks, golf courses, and sports fields.

  Exceptions:

  - Foundations may be watered up to two hours on any day by handheld hose; or using a soaker hose or drip irrigation system placed within 24-

inches of the foundation that does not produce a spray of water above the ground.

- Trees may be watered up to two hours on any day by handheld hose, drip irrigation, or soaker hose. Tree watering is limited to an area not to exceed the drip line of a tree.

- Prohibit establishment of new landscaping.
- Vehicle washing restricted to commercial car wash or commercial service station and can only be done as necessary for health, sanitation, or safety reasons, including but not limited to the washing of garbage trucks and vehicles used to transport food and other perishables. All other vehicle washing is prohibited.
- Prohibit the operation of ornamental fountains or ponds that use potable water except where necessary to support aquatic life.
- Prohibit the draining, filling, or refilling of swimming pools, wading pools and Jacuzzi type pools. Existing private and public pools may add water to maintain pool levels; however they may not be refilled using automatic fill valves.

City and Local Governments

In addition to actions listed above:

- Continue or initiate any actions available under Stages 1 and 2.
- Review conditions or problems that caused Stage 3. Take corrective action.
- Implement viable alternative water supply strategies.
- Increase frequency of media releases explaining emergency situation.
- Reduce city and local government water use to maximum extent possible.
- Prohibit the permitting of new swimming pools, Jacuzzi type pools, spas, ornamental ponds and fountain construction. Pools already permitted and under construction may be completely filled with water.
- Landscape watering at municipal parks, golf courses, and sports fields is prohibited.

  Exceptions

  - Golf course greens may be watered by hand as needed to keep them alive, however watering must be done before 10 a.m. and after 6 p.m.
- Institute a mandated reduction in deliveries to all customers. Such a reduction will be distributed as required by Texas Water Code §11.039.
- If TRWD has imposed a reduction in water available to customers, impose the same percent reduction on wholesale customers.
- Notify wholesale customers of actions being taken and request them to implement the same drought stage and measures.

Commercial or Industrial

- All actions listed above for all water users apply to commercial and industrial users.
- Landscape watering at parks, golf courses, and sports fields is prohibited.

  Exceptions

  - Golf course greens may be watered by hand as needed to keep them alive, however watering must be done before 10 a.m. and after 6 p.m.
  - Professional sports fields (playing fields with a stadium only – not surrounding landscaping) may be watered as needed to maintain league standards.
- Hotels, restaurants, and bars required to serve drinking water to patrons on an "on demand" basis.
- Hotels are required to implement laundry conservation measures by encouraging patrons to reuse linens and towels.
- Stock at commercial plant nursery may be watered only with a hand-held hose, hand-held watering can, or drip irrigation system.
- Commercial water users required to reduce water use by a set percentage determined by the Water Utilities Director.

## 11.6 Procedure for Curtailment of Water Supplies

Any mandatory reduction to deliveries from TRWD to its customers shall be distributed as required by Texas Water Code §11.039, which is attached as Appendix I. In addition, every wholesale water supply contract entered into or renewed after adoption of this plan, including contract extensions, shall include a provision that water will be distributed in accordance with the Texas Water Code §11.039 in case of a water shortage resulting from drought.

To the extent not prevented by enforcement of provisions in the Water District's wholesale contracts in effect before November 28, 1999, TRWD will implement pro rata curtailment of water deliveries pursuant to Texas Water Code §11.039.

## 11.7 Procedure for Granting Variances to the Plan

The General Manager may grant temporary variances for existing water uses otherwise prohibited under this drought contingency plan to a customer if one or more of the following conditions are met:

- Failure to grant such a variance would cause an emergency condition adversely affecting health, sanitation, or fire safety for the public or the person requesting the variance.
- Compliance with this plan cannot be accomplished due to technical or other limitations.

- Alternative methods that achieve the same level of reduction in water use can be implemented.

Variances shall be granted or denied at the discretion of the General Manager. All petitions for variances should be in writing and should include the following information:

- Name and address of petitioner(s)
- Purpose of water use
- Specific provisions from which relief is requested
- Detailed statement of the adverse effect of the provision from which relief is requested
- Description of the relief requested
- Period of time for which the variance is sought
- Alternative measures that will be taken to reduce water use
- Other pertinent information.

## 11.8 Procedure for Enforcing Mandatory Water Restrictions

Water District customers (direct and indirect) shall provide TRWD with an order, ordinance, or resolution to demonstrate adequate enforcement provisions for the customer's own drought contingency plan.

Mandatory water use restrictions may be imposed in Stage 1, Stage 2, and Stage 3 drought stages. These mandatory water use restrictions will be enforced by warnings and penalties as follows:

- On the first violation, the customer will be given a written warning that they have violated one or more of the mandatory water use restrictions.
- After a second violation, TRWD will notify the customer of its intent to publish the name and contact phone numbers of any entity in violation of this water conservation and drought contingency plan in local print media and on its Web site. In addition, TRWD will require the customer to implement a more comprehensive public education and outreach program in a manner that increases the public's awareness about mandatory water use restrictions and the current drought status. The customer will also be required to submit documentation to TRWD of the steps it has taken to ensure compliance with this water conservation and drought contingency plan within 90 days after receiving the second notice of violation.
- TRWD may petition the Texas Commission on Environmental Quality to initiate formal enforcement action against customers that repeatedly fail to comply with the mandatory water use restrictions implemented during any stage of this water conservation and drought contingency plan.

## 11.9 Coordination with the Regional Water Planning Groups

Appendix E includes copies of letters sent to the Chairs of the Region C and Region D water planning group with this water conservation and drought contingency plan.

## 11.10 Review and Update of Drought Contingency Plan

As required by TCEQ rules, TRWD will review this water plan in 2009 and every five years thereafter. The plan will be updated as appropriate based on new or updated information.

# APPENDIX A
# LIST OF REFERENCES

## Appendix A

## List of References

(1) Title 30 of the Texas Administrative Code, Part 1, Chapter 288, Subchapter A, Rules 288.1, 288.2 and 288.5, downloaded from http://info.sos.state.tx.us/pls/pub/readtac$ext.ViewTAC?tac_view=5&ti=30&pt=1&ch=288&sch=A&rl=Y , March 2009.

(2) Title 30 of the Texas Administrative Code, Part 1, Chapter 288, Subchapter B, Rule 288.20 and 288.22, downloaded from http://info.sos.state.tx.us/pls/pub/readtac$ext.ViewTAC?tac_view=5&ti=30&pt=1&ch=288&sch=B&rl=Y , March 2009.

(3) Region C Water Planning Group, "2006 Region C Water Plan," Freese and Nichols, Inc., Alan Plummer Associates, Inc. Chiang, Patel and Yerby, Inc., Cooksey Communications, Inc., available online at http://www.regioncwater.org/Documents/index.cfm?Category=2006+Region+C+Water+Plan, December 5, 2005.

(4) Texas Water Development Board, Report 362, "Water Conservation Best Management Practices Guide," Water Conservation Implementation Task Force, available online at http://www.twdb.state.tx.us/assistance/conservation/TaskForceDocs/WCITFBMPGuide.pdf, November 2004.

(5) Edward Motley, Marisa Vergara, Tom Gooch, and Stephanie Griffin: Memorandum to File on "Region C Municipal Water Use Projections Adopted on August 18, 2003," Fort Worth, August 21, 2003.

(6) North Central Texas Council of Governments, "2008 Current Population Estimates," Arlington, available online http://www.nctcog.org/ris/demographics/population/2008PopEstimates.pdf, June 2008.

(7) Texas Water Development Board and Water Conservation Implementation Task Force, "Special Report, Report to the 79th Legislature, Austin, available online http://www.twdb.state.tx.us/assistance/conservation/TaskForceDocs/WCITF_Leg_Report.pdf, November 2004.

This water conservation and drought contingency plan was largely adapted from the following two plans:

a. North Texas Municipal Water District: "Water Conservation and Drought Contingency Plan," prepared by Freese and Nichols, Inc., Fort Worth, August 2004 with revisions in April 2006.

b. Tarrant Regional Water District: "Water Conservation and Drought Contingency Plan," originally developed by HDR Engineering, Inc., Austin, June 1998 and updated by TRWD in April 2005.

The following conservation and drought contingency plans and related documents were reviewed in the development of the North Texas Municipal Water District (NTMWD) plan cited above. References marked with a * were used heavily in the development of the NTMWD plan.

c. City of Austin Water Conservation Division: "City of Austin Water Drought Contingency Plan, Developed to Meet Senate Bill 1 Regulatory Requirements," Austin, August 1999.

d. City of Austin Water Conservation Division: "City of Austin Water Conservation Plan, Developed to Meet Senate Bill 1 Regulatory Requirements," Austin, August 1999.

e. Upper Trinity Regional Water District: "Water Conservation Plan and Emergency Water Demand Management Plan," adopted by the Board of Directors, Lewisville, August 5, 1999.

f. Upper Trinity Regional Water District: "Water Conservation Plan and Emergency Water Demand Management Plan (2002 Amended)," adopted by the Board of Directors, Lewisville, February 2002.

g. *City of Dallas Water Utilities Department: "City of Dallas Water Management Plan," adopted by the City Council, Dallas, September 1999.

h. Updates to City of Dallas Water Management Plan found at http://www.dallascityhall.com in September 2003.

i. City of Dallas Water Utilities Department: "City of Dallas Water Conservation Plan," adopted by the City Council, Dallas, September 1999.

j. City of Fort Worth: "Water Conservation plan for the City of Fort Worth," Fort Worth, August 1999.

k. Updates to the City of Fort Worth water conservation plan found at http://ci./fort-worth.tx.us in September 2003.

l. *City of Fort Worth: "Emergency Water Management Plan for the City of Fort Worth," Fort Worth, August 19, 2003.

m. HDR Engineering, Inc.: "Water Conservation and Emergency Demand Management Plan," prepared for the Tarrant Regional Water District, Austin, February 2000.

n. Freese and Nichols, Inc.: "Water Conservation and Drought Contingency Plan," prepared for Brown County Water Improvement District No. 1, Fort Worth, August 1999.

o. Freese and Nichols, Inc.: "Water Conservation and Drought Contingency Plan," prepared for the Sabine River Authority of Texas, Fort Worth, September 1994.

p. HDR Engineering, Inc.: "Water Conservation and Emergency Demand Management Plan," prepared for the Tarrant Regional Water District, Austin, June 1998.

q. HDR Engineering, Inc.: "Water Conservation Plan for the City of Corpus Christi," adopted by the City of Corpus Christi City Council, August 24, 1999.

r. City of Houston's water conservation plan downloaded September 2003 from http://www.cityofhouston.gov

s. City of Houston: "Ordinance N. 2001-753, Amending Chapter 47 of the Code of Ordinances Relating to Water Emergencies," Houston, August 2001.

t. City of Houston: "Ordinance No. 98-764, Relating to Water Conservation," Houston, September 1998.

u. City of Houston: "Water Conservation Plan," 1998.

v. City of Houston: "Water Emergency Response Plan," Houston, July 15, 1998.

w. City of Lubbock: "Water Conservation Plan," ordinance number 10177 adopted by the City Council in August 1999.

x. City of El Paso Water Conservation Ordinance downloaded August 14, 2003 from http://www.epwu.org/ordinance.html

y. San Antonio Water System: "Water Conservation and Reuse Plan," San Antonio, November 1998 with June 2002 updates.

z. *North Texas Municipal Water District: "District Policy No. 24 Water Conservation Plan Containing Drought Contingency Plan," adopted August 1999.

aa. GDS Associates, Inc.: "Water Conservation Study," prepared for the Texas Water Development Board, Fort Worth, 2002.

bb. A & N Technical Services, Inc.: "BMP Costs & Savings Study: A Guide to Data and Methods for Cost-Effectiveness Analysis of Urban Water Conservation Best Management Practices," prepared for The California Urban Water Conservation Council, Santa Monica, California, July 2000.

cc. City of Dallas: "City of Dallas Ordinances, Chapter 49, Section 21.1," Dallas, October 1, 2001.

# APPENDIX B

# TEXAS COMMISSION ON ENVIRONMENTAL QUALITY RULES ON WATER CONSERVATION AND DROUGHT CONTINGENCY PLANS FOR MUNICIPAL AND WHOLESALE WATER PROVIDERS

# APPENDIX B

## Texas Commission on Environmental Quality Rules on Water Conservation and Drought Contingency Plans for Wholesale Water Suppliers

**Texas Administrative Code**

| | |
|---|---|
| **TITLE 30** | ENVIRONMENTAL QUALITY |
| **PART 1** | TEXAS COMMISSION ON ENVIRONMENTAL QUALITY |
| **CHAPTER 288** | WATER CONSERVATION PLANS, DROUGHT CONTINGENCY PLANS, GUIDELINES AND REQUIREMENTS |
| **SUBCHAPTER A** | WATER CONSERVATION PLANS |
| **RULE §288.1** | **Definitions** |

The following words and terms, when used in this chapter, shall have the following meanings, unless the context clearly indicates otherwise.

(1) Agricultural or Agriculture--Any of the following activities:

(A) cultivating the soil to produce crops for human food, animal feed, or planting seed or for the production of fibers;

(B) the practice of floriculture, viticulture, silviculture, and horticulture, including the cultivation of plants in containers or non-soil media by a nursery grower;

(C) raising, feeding, or keeping animals for breeding purposes or for the production of food or fiber, leather, pelts, or other tangible products having a commercial value;

(D) raising or keeping equine animals;

(E) wildlife management; and

(F) planting cover crops, including cover crops cultivated for transplantation, or leaving land idle for the purpose of participating in any governmental program or normal crop or livestock rotation procedure.

(2) Agricultural use--Any use or activity involving agriculture, including irrigation.

(3) Best management practices--Voluntary efficiency measures that save a quantifiable amount of water, either directly or indirectly, and that can be implemented within a specific time frame.

(4) Conservation--Those practices, techniques, and technologies that reduce the consumption of water, reduce the loss or waste of water, improve the efficiency in the use of water, or increase the recycling and reuse of water so that a water supply is made available for future or alternative uses.

(5) Drought contingency plan--A strategy or combination of strategies for temporary supply and demand management responses to temporary and potentially recurring

water supply shortages and other water supply emergencies. A drought contingency plan may be a separate document identified as such or may be contained within another water management document(s).

(6) Industrial use--The use of water in processes designed to convert materials of a lower order of value into forms having greater usability and commercial value, commercial fish production, and the development of power by means other than hydroelectric, but does not include agricultural use.

(7) Irrigation--The agricultural use of water for the irrigation of crops, trees, and pastureland, including, but not limited to, golf courses and parks which do not receive water through a municipal distribution system.

(8) Irrigation water use efficiency--The percentage of that amount of irrigation water which is beneficially used by agriculture crops or other vegetation relative to the amount of water diverted from the source(s) of supply. Beneficial uses of water for irrigation purposes include, but are not limited to, evapotranspiration needs for vegetative maintenance and growth, salinity management, and leaching requirements associated with irrigation.

(9) Mining use--The use of water for mining processes including hydraulic use, drilling, washing sand and gravel, and oil field repressuring.

(10) Municipal per capita water use--The sum total of water diverted into a water supply system for residential, commercial, and public and institutional uses divided by actual population served.

(11) Municipal use--The use of potable water within or outside a municipality and its environs whether supplied by a person, privately owned utility, political subdivision, or other entity as well as the use of sewage effluent for certain purposes, including the use of treated water for domestic purposes, fighting fires, sprinkling streets, flushing sewers and drains, watering parks and parkways, and recreational purposes, including public and private swimming pools, the use of potable water in industrial and commercial enterprises supplied by a municipal distribution system without special construction to meet its demands, and for the watering of lawns and family gardens.

(12) Municipal use in gallons per capita per day--The total average daily amount of water diverted or pumped for treatment for potable use by a public water supply system. The calculation is made by dividing the water diverted or pumped for treatment for potable use by population served. Indirect reuse volumes shall be credited against total diversion volumes for the purpose of calculating gallons per capita per day for targets and goals.

(13) Nursery grower--A person engaged in the practice of floriculture, viticulture, silviculture, and horticulture, including the cultivation of plants in containers or nonsoil media, who grows more than 50% of the products that the person either sells or leases, regardless of the variety sold, leased, or grown. For the purpose of this definition, grow means the actual cultivation or propagation of the product beyond the mere holding or maintaining of the item prior to sale or lease, and typically includes activities associated with the production or multiplying of stock such as the development of new plants from cuttings, grafts, plugs, or seedlings.

(14) Pollution--The alteration of the physical, thermal, chemical, or biological quality of, or the contamination of, any water in the state that renders the water harmful, detrimental, or injurious to humans, animal life, vegetation, or property, or to the public health, safety, or welfare, or impairs the usefulness or the public enjoyment of the water for any lawful or reasonable purpose.

(15) Public water supplier--An individual or entity that supplies water to the public for human consumption.

(16) Regional water planning group--A group established by the Texas Water Development Board to prepare a regional water plan under Texas Water Code, §16.053.

(17) Retail public water supplier--An individual or entity that for compensation supplies water to the public for human consumption. The term does not include an individual or entity that supplies water to itself or its employees or tenants when that water is not resold to or used by others.

(18) Reuse--The authorized use for one or more beneficial purposes of use of water that remains unconsumed after the water is used for the original purpose of use and before that water is either disposed of or discharged or otherwise allowed to flow into a watercourse, lake, or other body of state-owned water.

(19) Water conservation plan--A strategy or combination of strategies for reducing the volume of water withdrawn from a water supply source, for reducing the loss or waste of water, for maintaining or improving the efficiency in the use of water, for increasing the recycling and reuse of water, and for preventing the pollution of water. A water conservation plan may be a separate document identified as such or may be contained within another water management document(s).

(20) Wholesale public water supplier--An individual or entity that for compensation supplies water to another for resale to the public for human consumption. The term does not include an individual or entity that supplies water to itself or its employees or tenants as an incident of that employee service or tenancy when that water is not resold to or used by others, or an individual or entity that conveys water to another individual or entity, but does not own the right to the water which is conveyed, whether or not for a delivery fee.

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**Source Note:** The provisions of this §288.1 adopted to be effective May 3, 1993, 18 TexReg 2558; amended to be effective February 21, 1999, 24 TexReg 949; amended to be effective April 27, 2000, 25 TexReg 3544; amended to be effective August 15, 2002, 27 TexReg 7146; amended to be effective October 7, 2004, 29 TexReg 9384; amended to be effective January 10, 2008, 33 TexReg 193

**Texas Administrative Code**

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|---|---|
| **TITLE 30** | ENVIRONMENTAL QUALITY |
| **PART 1** | TEXAS COMMISSION ON ENVIRONMENTAL QUALITY |
| **CHAPTER 288** | WATER CONSERVATION PLANS, DROUGHT CONTINGENCY PLANS, GUIDELINES AND REQUIREMENTS |
| **SUBCHAPTER A** | WATER CONSERVATION PLANS |
| **RULE §288.2** | **Water Conservation Plans for Municipal Uses by Public Water Suppliers** |

(a) A water conservation plan for municipal water use by public water suppliers must provide information in response to the following. If the plan does not provide information for each requirement, the public water supplier shall include in the plan an explanation of why the requirement is not applicable.

(1) Minimum requirements. All water conservation plans for municipal uses by public drinking water suppliers must include the following elements:

(A) a utility profile including, but not limited to, information regarding population and customer data, water use data, water supply system data, and wastewater system data;

(B) until May 1, 2005, specification of conservation goals including, but not limited to, municipal per capita water use goals, the basis for the development of such goals, and a time frame for achieving the specified goals;

(C) beginning May 1, 2005, specific, quantified five-year and ten-year targets for water savings to include goals for water loss programs and goals for municipal use, in gallons per capita per day. The goals established by a public water supplier under this subparagraph are not enforceable;

(D) metering device(s), within an accuracy of plus or minus 5.0% in order to measure and account for the amount of water diverted from the source of supply;

(E) a program for universal metering of both customer and public uses of water, for meter testing and repair, and for periodic meter replacement;

(F) measures to determine and control unaccounted-for uses of water (for example, periodic visual inspections along distribution lines; annual or monthly audit of the water system to determine illegal connections, abandoned services, etc.);

(G) a program of continuing public education and information regarding water conservation;

(H) a water rate structure which is not "promotional," i.e., a rate structure which is cost-based and which does not encourage the excessive use of water;

(I) a reservoir systems operations plan, if applicable, providing for the

coordinated operation of reservoirs owned by the applicant within a common watershed or river basin in order to optimize available water supplies; and

(J) a means of implementation and enforcement which shall be evidenced by:

(i) a copy of the ordinance, resolution, or tariff, indicating official adoption of the water conservation plan by the water supplier; and

(ii) a description of the authority by which the water supplier will implement and enforce the conservation plan; and

(K) documentation of coordination with the regional water planning groups for the service area of the public water supplier in order to ensure consistency with the appropriate approved regional water plans.

(2) Additional content requirements. Water conservation plans for municipal uses by public drinking water suppliers serving a current population of 5,000 or more and/or a projected population of 5,000 or more within the next ten years subsequent to the effective date of the plan must include the following elements:

(A) a program of leak detection, repair, and water loss accounting for the water transmission, delivery, and distribution system in order to control unaccounted-for uses of water;

(B) a record management system to record water pumped, water deliveries, water sales, and water losses which allows for the desegregation of water sales and uses into the following user classes:

(i) residential;

(ii) commercial;

(iii) public and institutional; and

(iv) industrial; and

(C) a requirement in every wholesale water supply contract entered into or renewed after official adoption of the plan (by either ordinance, resolution, or tariff), and including any contract extension, that each successive wholesale customer develop and implement a water conservation plan or water conservation measures using the applicable elements in this chapter; if the customer intends to resell the water, then the contract between the initial supplier and customer must provide that the contract for the resale of the water must have water conservation requirements so that each successive customer in the resale of the water will be required to implement water conservation measures in accordance with applicable provisions of this chapter.

(3) Additional conservation strategies. Any combination of the following strategies shall be selected by the water supplier, in addition to the minimum requirements in paragraphs (1) and (2) of this subsection, if they are necessary to achieve the stated water conservation goals of the plan. The commission may require that any of the following strategies be implemented by the water supplier if the commission determines that the strategy is necessary to achieve the goals of the

water conservation plan:

(A) conservation-oriented water rates and water rate structures such as uniform or increasing block rate schedules, and/or seasonal rates, but not flat rate or decreasing block rates;

(B) adoption of ordinances, plumbing codes, and/or rules requiring water-conserving plumbing fixtures to be installed in new structures and existing structures undergoing substantial modification or addition;

(C) a program for the replacement or retrofit of water-conserving plumbing fixtures in existing structures;

(D) reuse and/or recycling of wastewater and/or greywater;

(E) a program for pressure control and/or reduction in the distribution system and/or for customer connections;

(F) a program and/or ordinance(s) for landscape water management;

(G) a method for monitoring the effectiveness and efficiency of the water conservation plan; and

(H) any other water conservation practice, method, or technique which the water supplier shows to be appropriate for achieving the stated goal or goals of the water conservation plan.

(b) A water conservation plan prepared in accordance with 31 TAC §363.15 (relating to Required Water Conservation Plan) of the Texas Water Development Board and substantially meeting the requirements of this section and other applicable commission rules may be submitted to meet application requirements in accordance with a memorandum of understanding between the commission and the Texas Water Development Board.

(c) Beginning May 1, 2005, a public water supplier for municipal use shall review and update its water conservation plan, as appropriate, based on an assessment of previous five-year and ten-year targets and any other new or updated information. The public water supplier for municipal use shall review and update the next revision of its water conservation plan not later than May 1, 2009, and every five years after that date to coincide with the regional water planning group.

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**Source Note:** The provisions of this §288.2 adopted to be effective May 3, 1993, 18 TexReg 2558; amended to be effective February 21, 1999, 24 TexReg 949; amended to be effective April 27, 2000, 25 TexReg 3544; amended to be effective October 7, 2004, 29 TexReg 9384

**Texas Administrative Code**

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| **TITLE 30** | ENVIRONMENTAL QUALITY |
| **PART 1** | TEXAS COMMISSION ON ENVIRONMENTAL QUALITY |
| **CHAPTER 288** | WATER CONSERVATION PLANS, DROUGHT CONTINGENCY PLANS, GUIDELINES AND REQUIREMENTS |
| **SUBCHAPTER A** | WATER CONSERVATION PLANS |
| **RULE §288.5** | **Water Conservation Plans for Wholesale Water Suppliers** |

A water conservation plan for a wholesale water supplier must provide information in response to each of the following paragraphs. If the plan does not provide information for each requirement, the wholesale water supplier shall include in the plan an explanation of why the requirement is not applicable.

(1) Minimum requirements. All water conservation plans for wholesale water suppliers must include the following elements:

(A) a description of the wholesaler's service area, including population and customer data, water use data, water supply system data, and wastewater data;

(B) until May 1, 2005, specification of conservation goals including, where appropriate, target per capita water use goals for the wholesaler's service area, maximum acceptable unaccounted-for water, the basis for the development of these goals, and a time frame for achieving these goals;

(C) beginning May 1, 2005, specific, quantified five-year and ten-year targets for water savings including, where appropriate, target goals for municipal use in gallons per capita per day for the wholesaler's service area, maximum acceptable unaccounted-for water, and the basis for the development of these goals. The goals established by wholesale water suppliers under this subparagraph are not enforceable;

(D) a description as to which practice(s) and/or device(s) will be utilized to measure and account for the amount of water diverted from the source(s) of supply;

(E) a monitoring and record management program for determining water deliveries, sales, and losses;

(F) a program of metering and leak detection and repair for the wholesaler's water storage, delivery, and distribution system;

(G) a requirement in every water supply contract entered into or renewed after official adoption of the water conservation plan, and including any contract extension, that each successive wholesale customer develop and implement a water conservation plan or water conservation measures using the applicable elements of this chapter. If the customer intends to resell the water, then the contract between the initial supplier and customer must provide that the contract for the resale of the water must have water conservation requirements so that each successive customer in the resale of the water will be required to implement water

conservation measures in accordance with applicable provisions of this chapter;

(H) a reservoir systems operations plan, if applicable, providing for the coordinated operation of reservoirs owned by the applicant within a common watershed or river basin. The reservoir systems operations plans shall include optimization of water supplies as one of the significant goals of the plan;

(I) a means for implementation and enforcement, which shall be evidenced by: a copy of the ordinance, rule, resolution, or tariff, indicating official adoption of the water conservation plan by the water supplier; and a description of the authority by which the water supplier will implement and enforce the conservation plan; and

(J) documentation of coordination with the Regional Water Planning Groups for the service area of the wholesale water supplier in order to insure consistency with the appropriate approved regional water plans.

(2) Additional conservation strategies. Any combination of the following strategies shall be selected by the water wholesaler, in addition to the minimum requirements of paragraph (1) of this section, if they are necessary in order to achieve the stated water conservation goals of the plan. The commission may require by commission order that any of the following strategies be implemented by the water supplier if the commission determines that the strategies are necessary in order for the conservation plan to be achieved:

(A) conservation-oriented water rates and water rate structures such as uniform or increasing block rate schedules, and/or seasonal rates, but not flat rate or decreasing block rates;

(B) a program to assist customers in the development of conservation pollution prevention and abatement plans;

(C) a program for reuse and/or recycling of wastewater and/or graywater; and

(D) any other water conservation practice, method, or technique which the wholesaler shows to be appropriate for achieving the stated goal or goals of the water conservation plan.

(3) Review and update requirements. Beginning May 1, 2005, the wholesale water supplier shall review and update its water conservation plan, as appropriate, based on an assessment of previous five-year and ten-year targets and any other new or updated information. A wholesale water supplier shall review and update the next revision of its water conservation plan not later than May 1, 2009, and every five years after that date to coincide with the regional water planning group.

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**Source Note:** The provisions of this §288.5 adopted to be effective May 3, 1993, 18 TexReg 2558; amended to be effective February 21, 1999, 24 TexReg 949; amended to be effective April 27, 2000, 25 TexReg 3544; amended to be effective October 7, 2004, 29 TexReg 9384

**Texas Administrative Code**

| | |
|---|---|
| **TITLE 30** | ENVIRONMENTAL QUALITY |
| **PART 1** | TEXAS COMMISSION ON ENVIRONMENTAL QUALITY |
| **CHAPTER 288** | WATER CONSERVATION PLANS, DROUGHT CONTINGENCY PLANS, GUIDELINES AND REQUIREMENTS |
| **SUBCHAPTER B** | DROUGHT CONTINGENCY PLANS |
| **RULE §288.20** | **Drought Contingency Plans for Municipal Uses by Public Water Suppliers** |

(a) A drought contingency plan for a retail public water supplier, where applicable, must include the following minimum elements.

(1) Minimum requirements. Drought contingency plans must include the following minimum elements.

(A) Preparation of the plan shall include provisions to actively inform the public and affirmatively provide opportunity for public input. Such acts may include, but are not limited to, having a public meeting at a time and location convenient to the public and providing written notice to the public concerning the proposed plan and meeting.

(B) Provisions shall be made for a program of continuing public education and information regarding the drought contingency plan.

(C) The drought contingency plan must document coordination with the Regional Water Planning Groups for the service area of the retail public water supplier to insure consistency with the appropriate approved regional water plans.

(D) The drought contingency plan must include a description of the information to be monitored by the water supplier, and specific criteria for the initiation and termination of drought response stages, accompanied by an explanation of the rationale or basis for such triggering criteria.

(E) The drought contingency plan must include drought or emergency response stages providing for the implementation of measures in response to at least the following situations:

(i) reduction in available water supply up to a repeat of the drought of record;

(ii) water production or distribution system limitations;

(iii) supply source contamination; or

(iv) system outage due to the failure or damage of major water system components (e.g., pumps).

(F) The drought contingency plan must include specific, quantified targets for water use reductions to be achieved during periods of water shortage and drought. The entity preparing the plan shall establish the targets. The goals established by the entity under this subparagraph are not enforceable.

(G) The drought contingency plan must include the specific water supply or water demand management measures to be implemented during each stage of the plan including, but not limited to, the following:

(i) curtailment of non-essential water uses; and

(ii) utilization of alternative water sources and/or alternative delivery mechanisms with the prior approval of the executive director as appropriate (e.g., interconnection with another water system, temporary use of a non-municipal water supply, use of reclaimed water for non-potable purposes, etc.).

(H) The drought contingency plan must include the procedures to be followed for the initiation or termination of each drought response stage, including procedures for notification of the public.

(I) The drought contingency plan must include procedures for granting variances to the plan.

(J) The drought contingency plan must include procedures for the enforcement of any mandatory water use restrictions, including specification of penalties (e.g., fines, water rate surcharges, discontinuation of service) for violations of such restrictions.

(2) Privately-owned water utilities. Privately-owned water utilities shall prepare a drought contingency plan in accordance with this section and incorporate such plan into their tariff.

(3) Wholesale water customers. Any water supplier that receives all or a portion of its water supply from another water supplier shall consult with that supplier and shall include in the drought contingency plan appropriate provisions for responding to reductions in that water supply.

(b) A wholesale or retail water supplier shall notify the executive director within five business days of the implementation of any mandatory provisions of the drought contingency plan.

(c) The retail public water supplier shall review and update, as appropriate, the drought contingency plan, at least every five years, based on new or updated information, such as the adoption or revision of the regional water plan.

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**Source Note:** The provisions of this §288.20 adopted to be effective February 21, 1999, 24 TexReg 949; amended to be effective April 27, 2000, 25 TexReg 3544; amended to be effective October 7, 2004, 29 TexReg 9384

**Texas Administrative Code**

| | |
|---|---|
| **TITLE 30** | ENVIRONMENTAL QUALITY |
| **PART 1** | TEXAS COMMISSION ON ENVIRONMENTAL QUALITY |
| **CHAPTER 288** | WATER CONSERVATION PLANS, DROUGHT CONTINGENCY PLANS, GUIDELINES AND REQUIREMENTS |
| **SUBCHAPTER B** | DROUGHT CONTINGENCY PLANS |
| **RULE §288.22** | **Drought Contingency Plans for Wholesale Water Suppliers** |

(a) A drought contingency plan for a wholesale water supplier must include the following minimum elements.

(1) Preparation of the plan shall include provisions to actively inform the public and to affirmatively provide opportunity for user input in the preparation of the plan and for informing wholesale customers about the plan. Such acts may include, but are not limited to, having a public meeting at a time and location convenient to the public and providing written notice to the public concerning the proposed plan and meeting.

(2) The drought contingency plan must document coordination with the regional water planning groups for the service area of the wholesale public water supplier to insure consistency with the appropriate approved regional water plans.

(3) The drought contingency plan must include a description of the information to be monitored by the water supplier and specific criteria for the initiation and termination of drought response stages, accompanied by an explanation of the rationale or basis for such triggering criteria.

(4) The drought contingency plan must include a minimum of three drought or emergency response stages providing for the implementation of measures in response to water supply conditions during a repeat of the drought-of-record.

(5) The drought contingency plan must include the procedures to be followed for the initiation or termination of drought response stages, including procedures for notification of wholesale customers regarding the initiation or termination of drought response stages.

(6) The drought contingency plan must include specific, quantified targets for water use reductions to be achieved during periods of water shortage and drought. The entity preparing the plan shall establish the targets. The goals established by the entity under this paragraph are not enforceable.

(7) The drought contingency plan must include the specific water supply or water demand management measures to be implemented during each stage of the plan including, but not limited to, the following:

(A) pro rata curtailment of water deliveries to or diversions by wholesale water customers as provided in Texas Water Code, §11.039; and

(B) utilization of alternative water sources with the prior approval of the executive

director as appropriate (e.g., interconnection with another water system, temporary use of a non-municipal water supply, use of reclaimed water for non-potable purposes, etc.).

(8) The drought contingency plan must include a provision in every wholesale water contract entered into or renewed after adoption of the plan, including contract extensions, that in case of a shortage of water resulting from drought, the water to be distributed shall be divided in accordance with Texas Water Code, §11.039.

(9) The drought contingency plan must include procedures for granting variances to the plan.

(10) The drought contingency plan must include procedures for the enforcement of any mandatory water use restrictions including specification of penalties (e.g., liquidated damages, water rate surcharges, discontinuation of service) for violations of such restrictions.

(b) The wholesale public water supplier shall notify the executive director within five business days of the implementation of any mandatory provisions of the drought contingency plan.

(c) The wholesale public water supplier shall review and update, as appropriate, the drought contingency plan, at least every five years, based on new or updated information, such as adoption or revision of the regional water plan.

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**Source Note:** The provisions of this §288.22 adopted to be effective February 21, 1999, 24 TexReg 949; amended to be effective April 27, 2000, 25 TexReg 3544; amended to be effective October 7, 2004, 29 TexReg 9384

# APPENDIX C

# TARRANT REGIONAL WATER DISTRICT
# WHOLESALE PUBLIC WATER SUPPLIER PROFILE
# BASED ON TCEQ FORMAT

## Appendix C

## Tarrant Regional Water District Wholesale Public Water Supplier Profile Based on TCEQ Format

**Name of Entity:** Tarrant Regional Water District

**Address & Zip:** 800 East Northside Drive

**Telephone Number:** (817) 335-2491 **Fax:** (817) 877-5137

**Form Completed by:** Laura Blaylock

**Title:** Hydrologist

**Signature:**

**Name and Phone Number of Person/Department responsible for implementing a Water conservation program:** Linda Christie, (817) -335-2491, Government Relations

**PROFILE**

## I. WHOLESALE SERVICE AREA POPULATION AND CUSTOMER DATA

### A. Population and Service Area Data

#### 1 – 3. Service area data

| | |
|---|---|
| Service Area in Square Miles | 5,891 |
| Estimated Population of Service Area (2009) | 1,772,634 |
| Current Population Served For: | |
| Water | 1,772,634 |
| Wastewater | TRWD does not supply any wastewater treatment |

#### 4. Population served for previous five years

| | |
|---|---|
| 2004 | 1,587,452 |
| 2005 | 1,622,908 |
| 2006 | 1,659,137 |
| 2007 | 1,696,157 |
| 2008 | 1,733,983 |

#### 5. Projected population for service area in following decades

| | |
|---|---|
| 2010 | 1,822,150 |
| 2020 | 2,192,837 |
| 2030 | 2,527,947 |
| 2040 | 2,877,040 |
| 2050 | 3,322,927 |

**6. Source method for the calculation of current and projected population**

Population projections from the 2006 Region C Regional Water Plan were used as a reference point for county-wide populations. The percentage of populations within each county that is served by TRWD is based on information provided by the Region C Water Planning Group (RCWPG). This information along with historical population data obtained from the North Central Texas Council of Governments is used to estimate service area populations from 2004 – 2008.

Decadal population projections reported in section I.A.5 were obtained from the RCWPG. Projected annual populations for intervening years 2009 – 20018 reported in section II.C are based on data from the RCWPG and interpolating the data between decades.

## B. Customers Data

List or attach names of all TRWD customers, amount of each annual contract, and amount of the annual use for each for the previous year:

| CUSTOMER | CONTRACTUAL AMOUNT | USAGE IN 2008 (acre-feet) |
|---|---|---|
| City of Fort Worth (all) | All Needs | 219,887 |
| City of Arlington | All Needs | 67,786 |
| Trinity River Authority, Tarrant County Water Supply Project (TRA TCWSP) | All Needs | 37,698 |
| City of Mansfield | All Needs | 11,821 |
| City of Bridgeport | 1,700 | 1,271 |
| City of Jacksboro | 263 | 0 |
| City of Runaway Bay | 1,120 | 274 |
| Walnut Creek Water Supply Corp. | All Needs | 2,021 |
| West Wise SUD | 986 | 397 |
| Wise County WSD | 4,000 | 1,582 |
| Hanson Aggregates | 1,475 | 0 |
| Texas Industries, Inc. | 1,200 | 147 |
| Brazos Electric | 4,257 | 2,147 |
| Suez Power Co. | 4,600 | 1,961 |
| Trinity Materials | Temp | 53 |

| CUSTOMER | CONTRACTUAL AMOUNT | USAGE IN 2008 (acre-feet) |
|---|---|---|
| ROWSCO (Bay Golf Course) | 124 | 23 |
| The Lodge | Temp | 0 |
| Martin Marietta | Temp | 117 |
| City of Azle | 1,680 | 1,822 |
| Hawk's Creek | 350 | 301 |
| Community Water Supply | 1,851 | 265 |
| City of Springtown | 1,344 | 461 |
| City of River Oaks | All Needs | 763 |
| Eagle Mountain Country Club | 300 | 0 |
| Shady Oaks Country Club | 575 | 158 |
| The Landing | Temp | 0 |
| TU Electric (Eagle Mountain Plant) | open | 0 |
| Transit Mix Co. | Temp | 0 |
| Exelon ( Handley SES) | 2,184 | 639 |
| Benbrook Water Authority | All Needs | 3,439 |
| City of Weatherford | 5,892 | 0 |
| Ridglea Country Club | 475.58 | 373 |
| Mira Vista Country Club | 568 | 327 |
| Southwest Christian School | 3 | 0 |
| FW Country Day School | 153.45 | 63 |
| Somerset Whitestone Golf, Ltd | 400 | 180 |
| Monarch/TECON (Carolynn + SW water Service) | All Needs | 459 |
| East Cedar Creek Fresh Water Supply District | All Needs | 1,064 |
| City of Kemp | 600 | 281 |
| City of Mabank | All Needs | 990 |
| City of Malakoff | All Needs | 27 |
| City of Star Harbor | 168 | 102 |
| City of Trinidad | N/A | 0 |
| West Cedar Creek MUD | All Needs | 1,128 |

| CUSTOMER | CONTRACTUAL AMOUNT | USAGE IN 2008 (acre-feet) |
|---|---|---|
| Long Cove Ranch Co. | Temp | 39 |
| Cedar Creek Country Club | 125 | 103 |
| Golf Driving Range | 4.6 | 0 |
| Bill Sisul | 10 | 2 |
| Pinnacle Club | 125 | 101 |
| Texstar Services (Enbridge) | 150 | 132 |
| Winkler Water Supply Corp. | 560 | 61 |
| City of Corsicana | All Needs | 0 |
| Calpine/Freestone | 5,602 | 3,231 |
| City of Fairfield | 1,680 | 0 |
| Texas Parks & Wildlife Dept. | Temp | 0 |

## II. WATER USE DATA FOR SERVICE AREA

### A. Water Delivery

Indicate if the water provided under wholesale contracts is treated or raw water and the annual amount for each previous year:

Total amount delivered or sold for previous year (acre-feet)

| | |
|---|---|
| Treated | TRWD does not supply treated water |
| Raw | 364,053 acre-feet in 2008 |

### B. Water Accounting Data

1. Total amount of water diverted at point of diversion(s) for previous five years (in acre-feet) for all water uses:

| | **2004** | **2005** | **2006** | **2007** | **2008** |
|---|---|---|---|---|---|
| **January** | 19,482 | 23,727 | 25,396 | 19,682 | 23,187 |
| **February** | 17,802 | 21,681 | 23,206 | 17,984 | 21,187 |
| **March** | 19,864 | 24,192 | 25,893 | 20,067 | 23,641 |
| **April** | 22,116 | 26,935 | 28,829 | 22,343 | 26,321 |
| **May** | 25,380 | 30,910 | 33,084 | 25,640 | 30,206 |
| **June** | 29,198 | 35,560 | 38,061 | 29,497 | 34,750 |
| **July** | 37,134 | 45,226 | 48,407 | 37,515 | 44,196 |
| **August** | 37,338 | 45,474 | 48,673 | 37,721 | 44,439 |
| **September** | 30,353 | 36,967 | 39,567 | 30,664 | 36,125 |
| **October** | 26,154 | 31,853 | 34,093 | 26,422 | 31,127 |
| **November** | 21,073 | 25,665 | 27,470 | 21,289 | 25,080 |
| **December** | 19,992 | 24,348 | 26,061 | 20,197 | 23,794 |
| **Annual Total** | 305,885 | 372,537 | 398,741 | 309,022 | 364,053 |

2. Wholesale population served and total amount of water diverted for municipal use for previous five years:

| **Year** | **Total Population Served** | **Total Annual Diverted for Municipal Use (acre-feet)** |
|---|---|---|
| 2004 | 1,587,452 | 305,885 |
| 2005 | 1,622,908 | 372,537 |
| 2006 | 1,659,137 | 398,741 |
| 2007 | 1,696,157 | 309,022 |
| 2008 | 1,733,983 | 364,053 |

## C. Projected Water Demands

If applicable, project and attach water supply demands for the next ten years using information such as population trends, historical water use, and economic growth in the service area over the next ten years and any additional water supply requirement from such growth.

For operational planning, TRWD uses projected demand data from Region C (which are based on a climatic dry year condition) and converts it to reflect anticipated demand conditions in an average climatic year. The conversion is based on a 30-year historical record of TRWD water demands under different climatic scenarios. The factor normalizes demands so that they are based on years with average rainfall, which are lower than demand projections based on drought or dry year conditions.

Projected annual populations for intervening years 2009 – 20018 are based on data from Region C and interpolation between decades.

| **Year** | **Total Population Projected** | **Total Demands Projected (acre-feet)** |
|---|---|---|
| 2009 | 1,772,634 | 364,003 |
| 2010 | 1,822,150 | 371,103 |
| 2011 | 1,852,477 | 378,203 |
| 2012 | 1,893,706 | 385,302 |
| 2013 | 1,935,833 | 392,402 |
| 2014 | 1,978,874 | 399,502 |
| 2015 | 2,022,850 | 406,602 |
| 2016 | 2,067,781 | 413,701 |
| 2017 | 2,113,687 | 420,801 |
| 2018 | 2,160,589 | 427,901 |

## III. WATER SUPPLY SYSTEM DATA

### A. Water Supply Sources

List all current water supply sources and the amounts authorized with each:

| Source | Amount Authorized (acre-feet) |
|---|---|
| Lake Bridgeport | 93,000 |
| Eagle Mountain Lake | 159,600 |
| Cedar Creek Reservoir | 175,000 |
| Richland-Chambers Reservoir | 210,000 |
| Lake Benbrook | 72,500 |
| Reuse – Richland-Chambers | 63,000 |
| Reuse – Cedar Creek* | 52,500 |
| Total permitted water supply: | 825,600 |

The amount authorized does not represent firm yield, which is typically defined as the maximum yield that could be delivered without failure during the historical drought of record. See Section 6.2 of the TRWD Water Conservation Plan for firm yield capacities of the Water District's reservoir system.

*The Cedar Creek indirect reuse project represents future water supplies. A schedule for developing a water recycling facility at Cedar Creek Reservoir has not yet been determined. The indirect reuse project at Richland-Chambers Reservoir began operations in 2009. Available water supplies from this facility are currently less than the amount authorized.

### B. Treatement and Distribution System

TRWD does not operate water treatment and distribution systems.

## IV. WASTEWATER SYSTEM DATA

TRWD is a regional wholesale public water supplier and provides its customers with untreated water. It does not provide wastewater treatment services.

# APPENDIX D

# TCEQ WATER CONSERVATION IMPLEMENTATION REPORT

**Texas Commission on Environmental Quality**

**Water Conservation Implementation Report**

This report must be completed by entities that are required to submit a water conservation plan to the TCEQ in accordance with Title 30 Texas Administrative Code, Chapter 288. Please complete this report and submit it to the TCEQ. If you need assistance in completing this form, please contact the Resource Protection Team in the Water Supply Division at (512) 239-4691.

| | | |
|---|---|---|
| **Name:** | Tarrant Regional Water District | |
| **Address:** | 800 E. Northside Drive | |
| **Telephone Number:** | ( 817 ) 335-2491 | **Fax:** ( 817 ) 877-5137 |
| **Form Completed By:** | Mark Olson | **Title:** Water Conservation Coordinator |
| **Signature:** | | **Date:** April 29, 2009 |

## I. WATER USES

Indicate the type(s) of water uses (example: municipal, industrial, or agricultural).

_Municipal_____ Use

_Irrigation_____ Use

## II. WATER CONSERVATION MEASURES IMPLEMENTED

Provide the water conservation measures and the dates the measures were implemented.

Public Outreach Campaign

- Since spring 2007, TRWD has partnered with Dallas Water Utilities (DWU) to spread a uniform water conservation message across the Metroplex. The awareness campaign – "Save water. Nothing can replace it" – uses radio and television spots, newspaper ads, billboards, and other forms of communication to encourage people to use water responsibly. The cooperative spirit between DWU and TRWD is an excellent example of how agencies can unite to achieve a common goal. Together both agencies will spend $1.7 million for the 2009 campaign.

Brochures and Conservation Literature

- TRWD developed an award-winning water conservation brochure in fall 2008. It contains water saving tips for both indoor and outdoor settings. The brochure was made available to customer cities for distribution at public events, libraries, municipal offices, garden centers, and home improvement stores. Additional printed materials will be developed as the Water District's conservation program matures and the need arises.

School Education Programs

- Since 2003, TRWD has provided the "Learning to Be Water Wise" curriculum to the Fort Worth and Arlington Independent School Districts at no cost. In 2007, the city of North Richland Hills partnered with TRWD to provide the program in the Birdville ISD. The "Learning to Be Water Wise" curriculum includes student kits and activities to educate 5th grade students on the importance of water and the need for water conservation in their homes and communities. The kits contain water saving devices, which the students are encouraged to install in their own residences.
- From 2004 to 2008, the Water District was a sponsor of a regional Newspapers in Education program about water. More than 1,000 area teachers signed up to receive a free supplement entitled, "Water: From Here to Eternity and Back Again." It was customized to include topics that specifically related to water issues in North Central Texas.
- In 2005, TRWD began offering the "Major Rivers" curriculum to area school districts at no cost. The Arlington ISD was the first to adopt the program; the Fort Worth ISD began using it in 2007. "Major Rivers" is a curriculum designed to teach 4th grade students about Texas water resources, how water is treated and delivered to homes and schools, how to care for water resources, and how to use them wisely. A classroom package includes a teacher's guide with full color overhead transparencies, an introductory video, and full color student workbooks and home information leaflets. The Water District ordered teacher kits and replacement packages containing more than 9,000 student activity workbooks for the upcoming school year (2009-10).
- Since 2005, the Water District has supported the distribution of book covers with a water conservation message to middle schools in Azle, Eagle-Mountain-Saginaw, Decatur, and Birdville Independent School Districts at no cost.
- TRWD completed an interactive multi-media module in 2007 to educate students about its wetlands water reuse project. The product can be accessed online at www.trwd.com. The module blends short videos, panoramic photos and a game to teach school age children about wetland ecosystems and the environmental benefits of the water recycling project.
- In 2008, the Water District created a student activitiy workbook to complement the information featured in the online wetland media module. The workbook was provided to 6th graders at All Saints Episcopal School in Fort Worth. Plans are in the works to expand distribution to more students in the Water District's service area.

Water Efficient Landscaping

- In response to drought conditions in 2005 and 2006, TRWD began encouraging its primary customers to implement 10 a.m. to 6 p.m. outdoor watering restrictions. Arlington, Fort Worth, Mansfield and most of the Water District's indirect customers in Tarrant County now have year-round ten to six outdoor watering restrictions in place.
- TRWD was one of the original funding partners of the award-winning Texas SmartScape CD-ROM (originally released in May 2001). The Water District provided funding for the conversion of Texas SmartScape into an interactive Web site and for regional distribution of the CD version. Texas SmartScape is an educational tool designed to assist citizens with the design and development of landscaping using Texas native and drought tolerant plants.
- In a partnership with the City of Fort Worth, TRWD helped fund the creation of a water conservation demonstration garden. The garden located at the Fort Worth Botanic Gardens was completed in May 2005. It is designed to show area residents the benefits, both environmental and aesthetic, of using native and adapted drought tolerant plants in their own residential setting. Information signs emphasizing the responsible use of our water resources are being developed.
- Through a grant provided by the Texas Water Development Board, TRWD partnered with the city of Arlington in 2008 to develop another water conservation demonstration garden at the Southwest Branch Library. As a condition for grant funding, TRWD and the city coordinated workshops directed towards landscape professionals, builders, and developers on ways to design and install water efficient landscapes. Several more public workshops on waterwise landscaping were conducted spring 2009.

Internet

- Beginning in 2007, TRWD began producing an online water conservation newsletter, available at its Web site (www.trwd.com). The "Supply Side" newsletter includes information about local water resources, trends in water use, and indoor and outdoor water saving suggestions.
- To go along with its 2009 save water public awareness campaign, the Water District is revamping the www.savetarrantwater.com Web site. This site offers another channel to disseminate water conservation information. Ideally it will be a place to:
    - Spotlight community conservation news and programs.
    - Promote local events and public workshops.
    - Feature stories and updates about water resources, water reuse, and conservation.
    - Dig deeper into the principles of waterwise landscaping.
    - Provide more in-depth and practical advice on how to save water.

- Discuss water efficient products and technology.

Community Group Presentations

- TRWD has prepared and presented programs to area cities, civic organizations and other groups concerning the need for water conservation and strategies that can be implemented on an individual and corporate level. Presentations have been made to Rotary Clubs, Lions Clubs, Garden Clubs, Tarrant County Master Gardeners, Chambers of Commerce, mayors, city councils, city staff, etc.

Special Events

- TRWD participates in several special events providing opportunities distribute water conservation information to the public:
  - The Water District sponsors a 2000-$ft^2$ landscape demonstration garden at Mayfest, a four-day outdoor community festival in Fort Worth. The event gives visitors an opportunity to see firsthand the beauty and water saving benefits of a Texas SmartScape. Master Gardeners of the Tarrant County Extension Office are on hand to educate the public about climate-appropriate landscaping. TRWD's participation as an exhibitor at Mayfest began in 2001.
  - The Water District also sponsors four lake and river cleanups annually – two in the spring and two in the fall. These special events provide excellent opportunities to emphasize the importance of protecting and conserving water resources. On average, a total of more than 2,000 volunteers join TRWD each year to clean the watersheds of Eagle Mountain Lake, Lake Bridgeport, the Trinity River, and Cedar Creek Reservoir. The first cleanup effort – the Trinity River Trash Bash – was started in 1992.

Indirect Water Reuse

- TRWD is taking a lead role in water reuse by recycling return flows in the Trinity River. Return flows are a renewable resource; they are made up of water discharged by wastewater treatment plants in Fort Worth-Dallas area. A large portion of those flows originate from reservoirs managed by the Water District.

  The first of TRWD's two planned indirect reuse projects began operations in spring 2009. The George Shannon Wetlands Water Recycling Facility is located adjacent to Richland-Chambers Reservoir. Over the next five years, the Water District plans to recycle enough water from the Trinity River to make up approximately two percent of its raw water supplies. That adds up to about 10 million gallons per day (MGD) eight months of the year.

Water Conservation Workshops

- In 2007, the Water District held a water conservation symposium for its customer cities. The program was designed to show customers strategies that they could use to save water, save money, and reduce demands. Speakers from across the nation were invited to share their experience and expertise. Discussions centered on key

elements of successful water conservation programs. The symposium is now an annual event and jointly coordinated by the region's three major water providers – TRWD, North Texas Municipal Water District, and the city of Dallas.

- In addition to the symposium, the Water District joined other North Texas water suppliers, and the Dallas and Fort Worth Chambers of Commerce to coordinate a Legislative Summit in October 2008 for state and local lawmakers. The event, which focused on water supply and conservation issues impacting North Texas, was repeated in December for water utility managers and their staff.

- In summer 2008, TRWD held its first Water Conservation Coordinator Committee meeting. The meetings are held quarterly and offer representatives from many of the larger Tarrant County communities an opportunity to share water saving ideas and strategies. This is an effort by the Water District to regionalize approaches to water conservation.

Model Water Conservation and Drought Contingency Plans

- Based on input from its primary customers, TRWD developed a model drought contingency plan for its direct and indirect customers in 2007. A model water conservation plan is in the process of being finalized.

## III. TARGETS

**A.** Provide the **specific and quantified five and ten-year targets** as listed in water conservation plan for previous planning period. The numbers represent total gallons per person per day (total gpcd)

5-Year Specific/Quantified Target: 177
Date to achieve target: 2009

10-Year Specific/Quantified Target: 169
Date to achieve target: 2014

**B.** State if these targets in the water conservation plan are being met.

No. Using a five year rolling average, these goals have not been met. See below for an explanation.

**C.** List the **actual amount of water saved.**

The actual amount of water saved is difficult to quantify. However, the Water District has observed a decline in anticipated water demands of approximately 10 billion gallons annually since the implementation of 10 a.m. to 6 p.m. outdoor

watering restrictions among many of its direct and indirect customers beginning in 2006.

An indirect reuse project at Richland-Chambers Reservoir, which began operations in spring 2009, will lead to additional water savings in the future. The Water District plans to recycle return flows in the Trinity River to supplement its water deliveries by approximately two percent. On average, the facility will recycle about 10 MGD during eight months of the year.

**D.** If the targets are not being met, provide an explanation as to why, including any progress on the targets.

As stated above, using a five year rolling average, we did not meet our target of 177 total gallons per capita per day in 2009. There are two primary reasons the goals were not achieved: (1) they were based on a single year of water use and (2) drought conditions in 2005 and 2006.

The targets listed in the Water District's 2005 Water Conservation and Drought Contingency Plan were based on a water use for a single year – 2004. The goals were essentially a snapshot of water use during a wet year, when water demands were lower than normal due excess rainfall. They were not representative of overall water use trends within the TRWD service area.

In addition, drought conditions in 2005 and 2006 led to an increase in per capita water use within the TRWD service area. In 2005, North Texas experienced the fifth driest year on record. Only 18.57 inches of rain was recorded at DFW International Airport. That's about half of what we normally receive. In 2006, more than 40 percent of the rain we received fell September through December. The rains did not provide much relief until after the peak in summertime irrigation.

However, when it comes to water use among the Water District's primary customers and their successive customers, we are seeing some positive trends and an overall decline in water use on a per capita basis. TRWD's primary customers are located in Tarrant County and include the cities of Arlington, Fort Worth, Mansfield and the Trinity River Authority (Bedford, Colleyville, Euless, Grapevine, and North Richland Hills). They are the recipients of approximately 90 to 92 percent of all TRWD water deliveries. A list of all direct and indirect customers is included in Section 3 of this Water Conservation and Drought Contingency Plan.

The declines in per capita demands can be observed when comparing total water use in years with similar climatic conditions. The discussion that follows is based on information in Table 4.1.

Looking at water use comparisons between two wet years (2004 and 2007), TRWD water deliveries remained essentially unchanged at 282,700 and 284,343 acre-feet, respectively. However, the estimated population of our primary customers increased by approximately 113,000 or 7.6 percent. The result was more people using about the same amount of water, which can be observed by the drop in demands – from 170 to 158.9 total gpcd in 2004 and 2007, respectively. The average reduction of 11.1 gallons per person per day represents a decline in consumer demands of about 6.5 percent.

The decline is not so dramatic when comparing two moderately dry years (2003 and 2008). Per capita water use decreased slightly between those years from 186.0 to 184.6 total gpcd in 2003 and 2008, respectively; population increased by approximately 12.8 percent, while the amount of water supplied to our primary customers increased 12.0 percent. It doesn't look like much of a change on the surface, but the real story lies in the difference between the amounts of precipitation received during the summer (when water use is at its peak). In 2003, North Texas received more than twice the rainfall (June through September) than it did in 2008.

A better comparison might be to look at water use between 2006 and 2008. Precipitation amounts in each of those years were very similar, especially during the summer months with an observed difference of only 0.07 inches. Drought conditions were also prevalent in each year. Despite the similar climatic conditions and a 4.3 percent increase in population, water consumption was much lower in 2008. Total gpcd declined from 206.8 to 184.6 in 2006 and 2008, respectively – a decrease of nearly 11 percent.

It's hard to pinpoint the exact reasons for the reductions we are observing in water consumption on a per capita basis. However, we are confident that some of the lower demands are due to the water conservation strategies being put into effect. We feel like the 10 to 6 outdoor watering restrictions are making a difference. Regionalizing our conservation efforts is also important. That's why the Water District is striving to build partnerships with its customers and other water providers throughout North Texas. Teaming up with the city of Dallas to share costs and encourage responsible water use through the "Save Water – Nothing can replace it" outreach campaign is a great example.

Based on our observations, conservation is gaining traction in North Texas. Water use on a per capita basis is decreasing and the Water District is taking steps to increase the likelihood that the trend will continue.

**If you have any questions on how to fill out this form or about the Water Conservation program, please contact us at 512/239-4691.**

Individuals are entitled to request and review their personal information that the agency gathers on its forms. They may also have any errors in their information corrected. To review such information, contact us at 512-239-3282.

# APPENDIX E

# LETTERS TO REGION C AND REGION D WATER PLANNING GROUPS

# APPENDIX E

## Letters to Region C and Region D Water Planning Groups

Date

Mr. Jim Parks
Chair, Region C Water Planning Group
North Texas Municipal Water District
P.O. Box 2408
Wylie, TX 75098

Dear Mr. Parks:

Enclosed please find a copy of the recently adopted water conservation and drought contingency plan for the Tarrant Regional Water District. I am submitting a copy of this plan to the Region C Water Planning Group in accordance with the Texas Water Development Board and Texas Commission on Environmental Quality rules. The Board of the Tarrant Regional Water District adopted the attached plan on _____.

Sincerely,

James M. Oliver
General Manager
Tarrant Regional Water District

Date

Mr. Jim Thompson
Chair, Region D Water Planning Group
C/O Northeast Texas Municipal Water District
P.O. Box 955
Kilgore, TX 75656

Dear Mr. Thompson:

Enclosed please find a copy of the recently adopted water conservation and drought contingency plan for the Tarrant Regional Water District. I am submitting a copy of this plan to the Region D Water Planning Group in accordance with the Texas Water Development Board and Texas Commission on Environmental Quality rules. The Board of the Tarrant Regional Water District adopted the attached plan on _____.

Sincerely,

James M. Oliver
General Manager
Tarrant Regional Water District

# APPENDIX F

# TRWD CUSTOMER
# WATER CONSERVATION REPORT

**APPENDIX F**
**Customer Water Conservation Report**
**Due May 1 of Every Year**

**Name of Entity:** _____

**Address & Zip:** _____

**Telephone Number:** _____ **Fax:** _____

**Form Completed By:** _____

**Title:** _____

**Signature:** _____ **Date:** _____

Name and Phone Number of Person/Department responsible for implementing a water conservation program:

_____

## UTILITY PROFILE

## I. POPULATION CUSTOMER DATA

### A. Population and Service Area Data

1. Attach a copy of your service area map.
2. Service area size (square miles): _____
3. Current population of service area: _____
4. Current population served by utility:
   a: water _____
   b: wastewater _____

5. Population served by water utility service area for the previous five years:

| Year | Population |
|---|---|
| _____ | _____ |
| _____ | _____ |
| _____ | _____ |
| _____ | _____ |
| _____ | _____ |

6. Projected population for in the following decades:

| Year | Population |
|---|---|
| 2010 | _____ |
| 2020 | _____ |
| 2030 | _____ |
| 2040 | _____ |
| 2050 | _____ |

7. List specific source(s)/method(s) for the calculation of current and projected population:

_____

_____

_____

_____

## B. Active Connections

1. Current number of active connections by user type. Check whether multi-family service is counted as Residential ___ or Commercial ____ .

| Treated water users | Metered | Not-metered | Total |
|---|---|---|---|
| Residential | | | |
| Commercial | | | |
| Industrial | | | |
| Public | | | |
| Other | | | |

2. List the net number of new connections per year for most recent three years:

| **Year** | _____ | _____ | _____ |
|---|---|---|---|
| Residential | _____ | _____ | _____ |
| Commercial | _____ | _____ | _____ |
| Industrial | _____ | _____ | _____ |
| Other | _____ | _____ | _____ |

## C. High Volume Customers

List annual water use for the five highest volume customers (indicate if treated or raw water delivery). Provide date of most recent water use audit – if never audited, please indicate so.

| | Customer | Use (1,000 gallons / year) | Treated / Raw Water | Date of Last Water Use Audit |
|---|---|---|---|---|
| (1) | | | | |

| | | | | |
|---|---|---|---|---|
| (2) | | | | |
| (3) | | | | |
| (4) | | | | |
| (5) | | | | |

## II. WATER USE DATA FOR SERVICE AREA

### A. Water Accounting Data

1. Amount of water use for previous five years (in 1,000 gal.):

   Please indicate: Diverted Water _____

   Treated Water _____

| **Total Diverted and Treated Water Deliveries and Sales by Month** | | | | | |
|---|---|---|---|---|---|
| **Month** | **Year** | | | | |
| | | | | | |
| **January** | | | | | |
| **February** | | | | | |
| **March** | | | | | |
| **April** | | | | | |
| **May** | | | | | |
| **June** | | | | | |
| **July** | | | | | |
| **August** | | | | | |
| **September** | | | | | |
| **October** | | | | | |
| **November** | | | | | |
| **December** | | | | | |
| **Total** | | | | | |

Indicate how the above figures were determined (e.g., from a master meter located at the point of a diversion from the source or located at a point where raw water enters the treatment plant, or from water sales).

_____

_____

_____

2. Amount of water (in 1,000 gallons) delivered (sold) as recorded by the following account types for the past five years.

| Year | Account Type | | | | | |
|---|---|---|---|---|---|---|
| | **Residential** | **Commercial** | **Industrial** | **Wholesale** | **Other** | **Total Sold** |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

Residential: Single + multifamily residences

Commercial: Restaurants, retail, office

Industrial: Large manufacturing

Wholesale: Deliveries to successive customers

Other: Uses not included in above categories.
Please describe:_____

3. List previous five years records for water loss (the difference between water diverted (or treated) and water delivered (or sold)). The goal for percent of unaccounted for water is 12%.

| **Year** | **Amount (gal.)** | **% of Total Water Diverted or Treated** |
|---|---|---|
| _____ | _____ | _____ |
| _____ | _____ | _____ |
| _____ | _____ | _____ |
| _____ | _____ | _____ |
| _____ | _____ | _____ |

4. List previous five years records for water reuse. Reuse is the authorized use for one or more beneficial purposes of use of water that remains unconsumed after the water is used for the original purpose of use and before that water is either disposed of or discharged or otherwise allowed to flow into a watercourse, lake or other body of state-owned water.

| **Year** | **Amount (gal.)** | **% of Total Water Diverted or Treated** |
|---|---|---|
| _____ | _____ | _____ |
| _____ | _____ | _____ |
| _____ | _____ | _____ |
| _____ | _____ | _____ |
| _____ | _____ | _____ |

5. Municipal per capita water use (in gallons per day) for previous five years. Municipal per capita water use is the sum total of water diverted into a water supply system for residential, commercial, and public and institutional uses divided by total population served. GPCD includes water losses.

| **Year** | **Population** | **Total Water Diverted (or Treated)(1,000 gal.)** | **Municipal Per Capita Use (GPCD)** |
|---|---|---|---|
| _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ |

Source of Population data: _____

_____

**B. Projected Water Demands**

Attach projected water supply demands for next ten years using information such as population trends, historical water use, and economic growth in the service area and any additional water supply requirement for such growth.

# APPENDIX G

# TARRANT REGIONAL WATER DISTRICT BOARD RESOLUTION ADOPTING THE WATER CONSERVATION AND DROUGHT CONTINGENCY PLAN

## APPENDIX G

### Tarrant Regional Water District
### Board Resolution Adopting the Water Conservation and Drought Contingency Plan

**WHEREAS**, Tarrant Regional Water District, a Water Control and Improvement District (the "District"), as a wholesale water supplier, is required by the Texas Commission on Environmental Quality to develop (a) a water conservation plan pursuant to Title 30, Part 1, Chapter 288, Subchapter A, Rule 288.5 of the Texas Administrative Code and (b) a drought contingency plan pursuant to Title 30, Part 1, Chapter 288, Subchapter B, Rule 288.22 of the Texas Administrative Code; and

**WHEREAS**, the District recognizes the importance of a long-term approach to conserving water supplies by reducing the volume of water withdrawn from its reservoirs, reducing the loss or waste of water, improving water use efficiency, and increasing the recycling and reuse of water; and

**WHEREAS**, the plan provides significant benefits to the District, its customers, and the public they serve through the implementation of year-round water saving strategies to increase District reservoir storage volumes during wet or dry weather conditions.

**NOW, THEREFORE**, be it resolved by the Board of Directors of the District that the Water Conservation and Drought Contingency Plan attached hereto as Exhibit A is adopted as the controlling policy of the District.

TARRANT REGIONAL WATER DISTRICT, a
Water Control and Improvement District

By: _____

Victor W. Henderson
President, Board of Directors

ATTEST:

_____

Jack R. Stevens
Secretary, Board of Directors

# APPENDIX H

# RESULTS OF CLIMATIC MODELING STUDY BY HYDROSPHERE RESOURCE CONSULTANTS TO PREDICT IMPACTS ON TRWD WATER SUPPLIES AND PROJECTED WATER SAVINGS OF THE CONSERVATION AND DROUGHT CONTINGENCY PLAN

# APPENDIX H

## Results of climatic modeling study by Hydrosphere Resource Consultants to predict impacts on TRWD water supplies and projected water savings of the water conservation and drought contingency plan

Background

Tarrant Regional Water District made a decision to review its current water conservation and drought contingency plan after experiencing one of the worst two-year droughts in North Texas history. The extended period of dry weather, which lasted from winter 2005 to spring 2007, offered TRWD an opportunity to observe the effectiveness of the current plan under severe drought conditions. The goal was to determine what effect the plan would have on extending water supplies for the 1.7 million people who ultimately rely on TRWD for their water.

The conclusions of an internal review of the current water conservation and drought contingency plan were disappointing. TRWD engineers determined that it had little effect on extending water supplies and that the plan made less than one percent (1%) difference in total storage volume of the TRWD reservoir system. The plan does not require the implementation of any mandatory water conserving measures until combined storage capacity in the TRWD reservoir system drops to 50%. After verifying the inadequate responses of the current plan, TRWD sought expert outside assistance to establish a realistic set of trigger points and responses that would significantly extend water supplies in times of drought.

The Study

Tarrant Regional Water District employed Hydrosphere Resource Consultants, an engineering firm in Boulder, Colorado, to evaluate the effectiveness of various water conservation and drought contingency strategies based on a series of simulated weather patterns. Hydrosphere examined hundreds of climatic scenarios to predict their impact on reservoir volumes within the TRWD system; to compare water savings of drought contingency plans at selected trigger points; and to determine the frequency that reservoir storage volumes would reach the drought stage triggers.

Hydrosphere based its statistical analysis of the effects of weather patterns on reservoir levels using the Monte Carlo method. The simulated climatic conditions randomly generated by the Monte Carlo technique were based on existing North Texas weather patterns from 1940 to 2002. Each weather pattern was classified as average, dry, or drought, with wet years included in the average group. The weather patterns consisted of rainfall and evaporation data. The climatic modeling was based on the cycle of average, dry, and drought years experienced over the 43-year period. The analyses produced robust estimates of reservoir volumes, the frequency of their occurrence, and the water savings that would be achieved by implementing drought stages based on reservoir capacities of 75, 60, and 45 percent.

The projected water savings is based on a reduction in water use achieved through the implementation of outdoor watering restrictions at each stage of the new water conservation and drought contingency plan. Here is a recap of the restrictions by drought stage:

- At 75% capacity (Stage 1, Water Watch) landscape watering would be reduced to twice per week.
- At 60% capacity (Stage 2, Water Warning) landscape watering would be reduced to once per week.
- At 45% capacity (Stage 3, Emergency Water Use) landscape watering would be banned.

The model produced by the Hydrosphere study assumed that demands would decrease by 10% under the twice per week outdoor watering schedule; consumption would drop an additional 10% with once per week watering; and that no outdoor watering would result in another 20% reduction in demands.

Study Results: Estimated Savings of the New Plan

The table below depicts the estimated savings that would be achieved once the trigger points are reached and the drought stages are activated. The volume of water saved is based on anticipated demands in 2010 and 2020, which are expected to average 29,000 and 35,000 acre-feet per month, respectively.

**Estimated Savings at Selected Trigger Points of Proposed Water Conservation and Drought Contingency Plan (in acre-feet)**

| Drought Stage | Percent conservation storage | 2010 demands | 2020 demands |
|---|---|---|---|
| Stage 1, Water Watch | Supply = 75% | 2,035 | 1,973 |
| Stage 2, Water Warning | Supply = 60% | 22,388 | 30,448 |
| Stage 3, Emergency Water Use | Supply = 45% | 43,788 | 58,548 |

- The estimated savings at each drought stage represents an increase in the amount of water available in the TRWD reservoir system under the new water conservation and drought contingency plan versus having no plan in place.
- When compared to the plan currently in effect, implementing the new plan would stretch available water supplies by almost two months under Stage 3 drought conditions. The savings is even more dramatic when both plans are compared under the worst anticipated drought conditions.

Study Results: Comparison of Current and New Plans Under Severe Drought Conditions

Under the current water conservation and drought contingency plan, once a week watering restrictions are not required until storage in the TRWD reservoir system reaches 50% maximum capacity; and outdoor watering is not banned until reservoirs bottom out at 25% maximum capacity. The table below compares the water savings that would be achieved by the current versus the new plan under the worst simulated drought conditions over a seven-year period.

| **Comparison of Water Savings (in acre-feet) Between the Current and New Water Conservation and Drought Contingency Plans Based on 2010 and 2020 Demands** | | |
|---|---|---|
| Year | Current Plan (Triggers = 50 and 25%) | New Plan (Triggers = 75, 60, 45%) |
| 2010 | 18,300 | 62,600 |
| 2020 | 22,000 | 98,500 |

- In the case of a severe drought, implementing the new water conservation and drought contingency plan will increase water supplies by a projected three to four times the amount that would have been available under the current plan.
- The water savings achieved by the current plan represents less than a one month supply of the demands anticipated in 2010 and 2020.

Study Results: Probability of Reaching Trigger Points with the New Water Conservation and Drought Contingency Plan in Effect

The table below shows the probability of reaching the combined TRWD reservoir storage capacities of 75%, 60%, and 45%.

| **Frequency or probability of combined TRWD reservoir storage capacities** | | | |
|---|---|---|---|
| Drought Stage | Percent conservation storage | 2010 demands | 2020 demands |
| Stage 1, Water Watch | Supply = 75% | 20% | 26% |
| Stage 2, Water Warning | Supply = 60% | 4% | 6% |
| State 3, Emergency Water Use | Supply = 45% | 0.3% | 0.6% |

- The Hydrosphere study concluded that the Stage 1 drought conditions would prevail roughly 20% of the time (or about once every five years) in 2010, and roughly 26% of the time (or an average of about once every four years) in 2020.

- Stage 2 drought conditions and the implementation of mandatory once a week outdoor watering restrictions would take place approximately once every 25 and 17 years, based on demands in 2010 and 2020, respectively.

- The odds of implementing the outdoor watering ban, which goes into effect with Stage 3 drought conditions, are once every 333 and 167 years, based on demands in 2010 and 2020, respectively.

Conclusion

Revising the current water conservation and drought contingency plan is necessary in order to achieve meaningful increases in TRWD reservoir storage volumes during extended periods of dry weather. Studies have shown that outdoor residential water use, especially in hot dry areas like Texas, can account for up to 50% or more of the total volume of water consumed annually per household. By establishing new trigger points before reservoirs drop to critical levels of 50% or less, TRWD and its customers are taking a proactive approach to preserving water supplies.

The outdoor watering restrictions called for in the first two stages of the new water conservation and drought contingency plan (reservoir storage capacities of 75 and 60 percent) should have a negligible impact on residential landscapes. They simply require residents to be more efficient in their outdoor water use. The ban on outdoor watering during a Stage 3 drought will likely have an impact on a majority of landscapes, especially during the summer, however landscapes with drought-tolerant plants will survive. More importantly, the plan will help maintain adequate water supplies for domestic water, sanitation, and fire protection needs in a manner that protects and preserves public health, welfare and safety.

In light of the projected increases in the North Texas population, there is a need to ensure water supplies will meet community needs not only during severe droughts, but over the long-term. The conservation lifestyle is not a choice anymore. It is an essential component of a paradigm shift in water use that will allow TRWD and its customers to achieve the goals set forth in the new water conservation and drought contingency plan:

- To conserve the available water supply in times of drought and emergency
- To minimize the adverse impacts of water supply shortages
- To reduce water consumption from the levels that would prevail without conservation efforts.
- To reduce the loss and waste of water.
- To improve efficiency in the use of water.

# APPENDIX I

# TEXAS WATER CODE SECTION 11.039

# APPENDIX I

## Texas Water Code Section 11.039

### § 11.039. Distribution of Water During Shortage

(a) If a shortage of water in a water supply not covered by a water conservation plan prepared in compliance with Texas Natural Resource Conservation Commission or Texas Water Development Board rules results from drought, accident, or other cause, the water to be distributed shall be divided among all customers pro rata, according to the amount each may be entitled to, so that preference is given to no one and everyone suffers alike.

(b) If a shortage of water in a water supply covered by a water conservation plan prepared in compliance with Texas Natural Resource Conservation Commission or Texas Water Development Board rules results from drought, accident, or other cause, the person, association of persons, or corporation owning or controlling the water shall divide the water to be distributed among all customers pro rata, according to:

(1) the amount of water to which each customer may be entitled; or

(2) the amount of water to which each customer may be entitled, less the amount of water the customer would have saved if the customer had operated its water system in compliance with the water conservation plan.

(c) Nothing in Subsection (a) or (b) precludes the person, association of persons, or corporation owning or controlling the water from supplying water to a person who has a prior vested right to the water under the laws of this state.

Amended by Acts 1977, 65th Leg., p. 2207, ch. 870, § 1, eff. Sept. 1, 1977.

Amended by Acts 2001, 77th Leg., ch. 1126, § 1, eff. June 15, 2001.

# Attachment 4

# Public Meeting Summaries

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Contact publicinfo.twdb.texas.gov for more information.