# INTRODUCTION

Adequate water utilities are more important to a city's growth, health and well being, perhaps than all other aspects of planning. Development occurs where water lines are available, even if supplies are insufficient.

The growth and land use mix of development will determine the amount of water needed for an area. Because systems are generally planned for an ultimate residential population, variation from one land use to another requires reevaluation of the water system. It is essential, therefore, that a progressive city plan in advance to provide sufficient water services to its customers.

This Plan will outline the existing and future demands for water in Lucas. These future demands will be based upon the projected changes in population, the local economy, resources and land use. Once these demands are projected, they will be compared with the capabilities of the existing system. In this way, by balancing demand against supply, deficiencies and future needs can be determined. Implementation of the Water Plan will then become a method of eliminating these needs and deficiencies.

## WATER DEMAND

Within a community, the demand for water comes from many sectors: industrial, commercial, agricultural, recreational and domestic, among others. Many of these demands, such as agricultural and recreational, can often be economically met by natural water supplies such as precipitation and streams. However, many demands for water can only be met adequately by the construction of water supply and distribution systems. It is these demands that can only be met with constructed supply and distribution systems that this study is primarily concerned. Traditionally, this includes the demands of the domestic, commercial, industrial and public sectors of municipalities.

One of the most important factors in the domestic demand for water is that it is needed for human consumption. However, quantitatively, the amount of water thus used is relatively low. The average daily consumption of water as a beverage accounts for only one quart per person. Domestic water demands is approximately 10 to 20 gallons per

person per day once domestic uses are considered. Household appliances such as garbage disposals, washing machines and air conditioners have further increased the daily amount of water required per person. Thus, total domestic consumption averages from 35 to 55 gallons per capita per day.

The demands of the industrial and commercial sectors of a community can be quite important in the design of a water system. The type and number of these uses present determine their needs. Often, the only loads that they place upon water and sewer systems are those resulting from the beverage and personal sanitation uses of water. However, some activities that use water for processing and storage can place extremely heavy loads upon an otherwise adequate system. In developing industrial parks and seeking new businesses for the City, it should be remembered that a new activity may completely overload any existing facilities and result in a burden and hardship for all residents of the community. Often, separate water and sewer systems for an industrial park may be the best solution for the community as a whole.

Public buildings such as schools, jails and town halls as well as public services such as street cleaning and fire protection, require water for which a city may not be reimbursed. Generally, this water can amount to 10 to 15 gallons per capita per day. Water used extinguishing fires does not greatly affect the average consumption since such use is for only a short duration. However, when it does exist, the demand from fire fighting is quite large and it has a significant impact upon the peak demand of a water system.

Although not a demand in the same sense as domestic demand, water lost internally in the water works system is another demand upon the storage and supply facilities of the system. Leakage and other losses are generally about 10 to 15 percent of the water supplied to the system. In a poorly maintained system, or one that is not metered, this will be higher - possibly up to 50 percent.

Because many people make large peak demands upon water systems at common times such as early morning or evening and because the daily per capita use also varies with the seasons, the average daily per capita consumption can seldom be used

to design water supply and distribution systems. More appropriate are systems that are based upon peak daily use. Studies indicate that peak daily use averages about twice the average daily use.

## STATE WATER SUPPLIES

Texans have long recognized the importance of planning for the State's future water needs, primarily because of the frequency of droughts that have occurred and will continue to occur in Texas. However, a rapidly growing population and economy requiring reliable supplies and additional water to replace declines in the amount of water currently available, resulting from mining of aquifers and sedimentation in reservoirs, have also heightened our awareness of the need for good water planning.

Currently, groundwater and surface water resources each supply roughly equal shares in meeting the State's water needs. As a result of ground-water supply depletion, the TWDB predicts that by the year 2050, surface water use will meet about 69 percent of the State's water needs with the ground-water share of total statewide water supplies declining to about 31 percent.

According to the TWDB, a comparison of ground-water quality analysis to State drinking-water standards indicate that water from 32 percent of the wells sampled around the State contain one or more of the following constituents in excess of State drinking-water standards: dissolved solids, chloride, nitrate and/or fluoride. It is also estimated that about 1 to 2 percent of the State population had, at some time, used drinking water from ground-water sources that had one or more of these constituents in excess of Texas drinking-water standards.

## FUTURE DEMAND

By 2050, municipal water demand in Texas is projected to increase by 67 percent, serving a population that is projected to nearly double (90-percent increase). It can be expected, therefore, that per capita consumption will increase in Lucas. (The anticipated future growth patterns for Lucas are outlined in the Population Section of this Study).

At present, Lucas has an adequate existing system to supply its needs. An analysis of the effectiveness of the existing system at the present time and in 2025 is included later in this section. Also, included is an analysis of the effectiveness of the present system to handle fire flow requirements.

# WATER SYSTEM PLANNING

## WATER MANANAGEMENT

Water is a finite resource that requires careful and proactive management, and the era of plentiful and inexpensive water is rapidly ending. Water conservation, sound water management strategies, and efficient and adequate investment in a range of solutions are all essential to the development of the additional water supplies required to meet Texas' growing population and economic needs, including agriculture, and to protect our natural resources.

In order to assess the new water management needs of Texas, the TWDB prepares a "no action" scenario that portrays statewide demographic/economic growth occurring as anticipated with only currently available water supply infrastructure and no further improvement in water demand management. Their forecasts indicate that water shortage problems could blanket the entire State with every Texas county in deficit at some point in the next 50 years.

To properly plan a future water system capable of meeting the requirements of the projected community, it is necessary to evaluate the present system, including the water supply and distribution system network and its ability to provide service for present and projected demands. The City must have a dependable water supply that will provide for domestic, industrial, and commercial demands, as well as an allowance of about 25 percent for distribution system leakage, fire fighting and other un-metered uses. The present average usage throughout the United States is around 100 gallons per person per day.

In the past when resources were plentiful, the traditional response was to build a near-by lake or drill some wells, and decisions were less complex and more straightforward.

However, because the State is in an era of increasing resource scarcity, there is a more pronounced competition for those limited resources and a heightened environmental awareness. The older traditional methods or just building a new water supply are not only less politically and regulatively feasible, but increasingly more costly, and sometimes still insufficient to meet the full extent of anticipated water needs.

Today, and even more in the future, municipalities will have to utilize both traditional and more innovative management measures to not only meet the physical or volumetric aspects of these needs, but also the growing political and regulatory expectations that water is being managed and used wisely before new major development occurs.

PLANNING GUIDELINES

Effective February 1, 1998, the Texas Department of Insurance implemented Insurance Services Office's Fire Suppression Rating Schedule and the Public Protection Classification System. The Key Rating System, which has been repealed, uses population as the primary basis for determining fire protection requirements. Key rates were based on a time when Texas cities had a single core area business district. The new rating system should not be used for purposes other than insurance rating. Since Lucas better fits the Key Rate System identity, it is still a good measure and useful for planning purposes. Planning for the water system must take into account the basis on which this key rate is computed as affected by the entire water system which includes pumping facilities, fire flow pressures, water supply, ground level storage, elevated storage, fire hydrants, water distribution and pumping facilities.

The Texas Commission on Environmental Quality (TCEQ) has also set guidelines for the location, installation and operation of water lines and all other water works utilities. In planning for a growing city, consideration must be given to the extension of the utility system into new areas as building construction progresses. Unless utility expansion is orderly and adequate, city growth into new areas cannot and will not occur. Building may not be completely stopped by failure to extend service into the new areas, but the character of the development, which does occur, is likely to be inferior and have an adverse effect on the city as a whole.

# WATER SYSTEM INVENTORY

## PREVIOUS STUDIES

An Impact Fee Assessment Study was completed by Hunter and Associates in 2001. This study included an assessment of the existing and future water system.

## SYSTEM INVENTORY

The water supply distribution system serving the City of Lucas is owned and operated by the City. The system is divided into two (2) pressure planes, the northwest and southeast. There are currently 1,461 connections on the system, 50 of which are outside the city limits.

Treated water is obtained from the North Texas Municipal Utility District NTMWD and delivered to the system at two points (North Country Club and West Lucas Road). The City is currently constructing a new delivery point, located east of Farm to Market 2551 between Estates Parkway and McGarity Lane, which will contain: a new elevated storage tank, a new ground storage tank, and a new pump station. The purpose of the this delivery point will be to serve the northwest pressure plane and to supplement up to 50% of the maximum day water demands for the southeast plane being served by the existing delivery point #2. Once constructed, delivery point #2 will be phased out within a year. The project is scheduled for completion in the winter of 2005.

The City currently has a long range contract with NTMWD for purchase of an annual supply of 337,693,000 gallons of water (925,186 gallons per day) at a rate of .05 cents per 1,000 gallons above that rate established for Member Cities of NTMWD, but in no event less than .50 cents per 1,000 gallons. Any water delivered in excess of the amount allowed for the annual minimum will be purchased at a rate of .05 cents per 1,000 gallons above the mount charged NTMWD Member Cities for excess water.

Water consumption and rates are depicted in Table 9.1.

TABLE 9.1

# CITY OF LUCAS

FISCAL YEAR 2002/2003 WATER CONSUMPTION & REVENUES

| | |
|---|---|
| Total Water Purchased | 287,145,000 gallons |
| Estimated Water System Losses | 10,601,165 gallons |
| Total Annual Water Consumption | 276,543,835 gallons |
| Annual Water Cost to City (excluding depreciation) | $617,674 |
| Average Annual Cost Per Thousand Gallons (including est. loss) | $2.15 |
| Average Annual Cost Per Customer | $422.77 |
| Annual Water Revenues | $1,252,642 |
| Average Annual Revenue Per Thousand Gallons | $4.36 |
| Average Annual Revenue Per Customer | $857.39 |
| Average Monthly Revenue Per Customer | $71.45 |
| Approximate Cost to Customer for 1,000 gallons | $4.36 |
| Approximate City Cost to Produce 1,000 gallons | $2.15 |

Source: City of Lucas

As illustrated in table 9.1, the cost to produce 1,000 gallons ($2.15) and revenue generated from 1,000 gallons ($4.36) reveals that the City water system operates at a financial gain of approximately $2.21 per 1,000 gallons which is used for water system maintenance.

## EXISTING FACILITIES

In February 2004, an inventory of the existing facilities was completed to identify the water system in and around the City of Lucas. The results of the inventory are graphically depicted in Figure 9.1. Water system capacities are also indicated in Table 9.2. Pipe diameter ranges in size from 2 -inch to 16-inches.

TABLE 9.2

# CITY OF LUCAS

2004 WATER SYSTEM INVENTORY

| FACILITY | CAPACITY |
|---|---|
| Elevated Storage (Winningkoff) | 300,000 Gallons |
| Elevated Storage (Lucas) | 50,000 Gallons |
| Elevated Storage (McGarrity) – On Line in 2005* | 300,000 Gallons |
| Ground Storage Tank (Lucas) | 100,000 Gallons |
| Ground Storage Tank (County Club) | 500,000 Gallons |
| Ground Storage (McGarrity) – On Line in 2005* | 200,000 Gallons |
| Delivery Pump (Lucas) | 500 gpm |
| Delivery Pump (Lucas) | 750 gpm |
| Delivery Pump (County Club) | 1,000 gpm |
| Delivery Pump (County Club) | 1,000 gpm |
| Delivery Pump (County Club) | 900 gpm |
| Delivery Pump (McGarrity) – On Line in 2005* | (2 pumps ) - 750 gpm |

Source: City of Lucas

It should be noted that there is also an abandoned elevated storage tank on White Rock trail.

OPERATIONAL STANDARDS

The TCEQ requires that properly trained and certified operators run public water systems. These requirements have been illustrated in Table 9.3:

TABLE 9.3

# CITY OF LUCAS

OPERATOR STANDARDS

| SYSTEM SIZE | CERTIFIED OPERATORS |
|---|---|
| 250 Connections or fewer | One (1) Class “D” |
| 250 Connections or more | One (1) Class “C” or higher |
| 1,000 Connections or more * | Two (2) Class “C” or higher |

* Applicable Rule to Lucas System

The City currently has one (1) Class “B” Certified Operator, which complies with TCEQ requirements. Daily operation and maintenance of the water facilities should consist of the following:

1. Check chlorine residual;
2. General maintenance as needed and required;
3. Checking water Ph; and
4. Checking water alkalinity.

With respect to system standards and design criteria, the TCEQ has developed specific minimum guidelines. These guidelines can be found in the TCEQ Manual RG 195 “Rules and Regulations for Public Water Systems” and the Texas Engineering Extension Training Manual “Operators Certification Manual for Distribution System Operators”. These standards are less than those required for an approved public water supply. They provide a basis for evaluation, however.

Additional standards for water systems are those set forth in the Texas Department of Insurance “Key Rating System”. While no longer used to determine insurance rates, this system still provides a good guideline for distribution lines and fire hydrants for smaller cities. Specifically, the system sets forth standards requiring minimum line sizes in residential areas be not less than 6-inches in diameter. In addition, all lines must be looped to ensure uninterrupted service should a line break occur. In commercial areas, 8-inch lines must be installed. No 6-inch dead-end water mains should extend beyond 1,800 feet.

Additionally, standard three-way fire hydrants require a 6-inch or larger diameter water main with a minimum of 5-inch valve openings. Fire hydrants are to be located every 300 feet in commercial areas and every 600 feet in residential areas so that every building in the city limits will be within 500 feet of a standard city fire hydrant. Fire hydrants on mains less than 6 inches are not recognized as providing effective fire protection. As illustrated in Figure 9.1, there are areas of the City in need of additional fire hydrants.

The Texas Commission of Fire Protection (TCFP) recommends 54.2 gallons of elevated water storage per capita, in addition to required ground level water storage of 130 gallons per person served by the water system. These standards are found in the Standards Manual for the TCFP. A penalty is charged for the deficiency in a lesser storage capacity.

Current and future data from the Lucas water system, as compared with TCEQ, TDI and TCFP standards, are indicated in Table 9.4. As shown, the City's standards with regard to line size and elevated water storage standards are currently, or will be, out of compliance with the TDI and TCFP.

TABLE 9.4

# CITY OF LUCAS

WATER SYSTEM STANDARDS

| **FACILITY CAPACITY** | **TCEQ** | **Lucas (2004)** | **Lucas (2025)** |
|---|---|---|---|
| Total Storage – (1,450,000 gallons) | 200 gallons per connection | 992 gallons per connection | 330 gallons per connection |
| Elevated Storage – (650,000 gallons) | 100 gallons per connection | 445 gallons per connection | 148 gallons per connection |
| Minimal Residual Pressure | 20 psi | 40 psi | 40 psi |
| Normal Operating Pressure | 35 psi | 60 psi | 60 psi |
| | **TDI** | | |
| Minimum Water Main Size | 6-inch | **(2)** | **(2)** |
| | **TCFP** | | |
| Total Storage – (1,450,000 gallons) | 54.2 gallons per capita | 502 gallons per capita | 167 gallons per capita |
| Elevated Storage – (650,000 gallons) | 130 gallons per capita | 225 gallons per capita | **(75 gallons per capita)** |

* Calculations included new tank which is currently under construction.

TCEQ = Texas Commission on Environmental Quality

TDI – Texas Department of Insurance

TCFP – Texas Commission on Fire Protection

**( ) = Out of compliance**

Total System Connections/Population:

- 1,461 existing connections citywide and a service population of 2,890
- 4,391 future connections citywide and a service population of 8,695

As illustrated in Table 9.5, there are a sufficient number of available connections to support some future population growth.

TABLE 9.5

## CITY OF LUCAS

POTENTIAL WATER SERVICE CAPACITY

| FACILITY | MAXIMUM CONNECTIONS | APRIL 2004 CONNECTIONS | AVAILABLE CONNECTIONS | CONNECTIONS NEEDED IN 2025 |
|---|---|---|---|---|
| Total Storage – 1,450,000 gallons | 7,250 | 1,461 | 5,789 | 2,930 |
| Elevated Storage 650,000 gallons | 6,500 | 1,461 | 5,039 | 2,930 |

Based Upon:

Total System Connections/Population:

- 1,461 existing connections citywide and a service population of 2,890
- 4,391 future connections citywide and a service population of 8,695

# WATER SYSTEM ANALYSIS

### REGIONAL INFORMATION

The City of Lucas is located in the North Central Texas region of the State, which includes 21 counties. Both the 1997 and 2002 Texas Water Development Board Plans discuss this region in detail. As such, copies of this information have been included as part of this study and are attached as Appendix 9.1 and 9.2 respectively.

### STATE REQUIREMENTS

As mentioned earlier, the Texas Department of Insurance “Key Rating System” requires a minimum line size of 6-inches for residential areas and 8-inches for commercial and industrial areas. Many of the water lines in the Lucas water system do not meet these criteria. All future water system line expansions should continue to comply with Texas Department of Insurance “Key Rating System” standards. Smaller lines should be

installed as service lines only. Also, as water lines are replaced, the appropriately sized lines should be installed.

According to the TCEQ, as of September 1, 2000, all public water systems must accommodate drought contingencies and conservation practices. Additionally, all water systems serving fewer than 3,300 retail connections must develop a drought contingency plan. This plan is designed to combine strategies to achieve lasting, long-term improvements in water use efficiency with response measures aimed at avoiding, minimizing or mitigating the risks and impacts of drought-related water shortages and other emergencies. The plan adopted by the provider should ensure its capability of providing water under drought conditions. The City of Lucas has developed and adopted such a plan in accordance with guidelines set forth by the TCEQ.

WATER SUPPLY

The overall quality of the water supplied to the City's water system is of good quality. Water demand in the Lucas water system has been listed in Table 9.6. As shown, the City is in compliance with the TCEQ rules 290.45, section B, relating to water production standards.

TABLE 9.6

## CITY OF LUCAS

WATER PRODUCTION

| TCEQ STANDARDS | .6 gpm / connection |
|---|---|
| MAXIMUM PUMPING CAPACITY – 2,083 gpm | 1.43 gpm / connection<br>or<br>3,000,000 gpd |
| PEAK DEMAND | 3,000,000 gpd |
| AVERAGE DEMAND | 700,000 gpd |
| DEMAND DURING TIMES OF DROUGHT | 3,000,000 gpd |

Based on TCEQ Minimum Acceptable Standards, current Lucas data and 1,461 connections citywide. Includes existing pumping facilities only.

## WATER RATES

The current water rates for all customers as adopted by the City of Lucas have been listed in Appendix 9.3.

## FACILITY OPERATION

Presently, operation of the City's water system facilities is adequate with maintenance conducted on a regular basis. However, there are sections of old line which are no longer in use that continue to have water fed through them. These lines need to be terminated.

This project has allowed for the production of improved computer mapping in color showing an accurate display of the City's distribution system. With the assistance of this study, locating necessary elements of the water system will be easier. As updates are made, a more effective approach can be achieved in evaluating future projects.

## WATER SYSTEM OVERVIEW

The water system is currently meeting the majority of the City's needs. However, if population grows as projected during the remainder of the planning period, the system may require major upgrades. Generally, the critical elements of the system where deficiencies exist are:

- Water continues to flow through some abandoned sections of line;
- There is inadequate pressure in parts of the system due to insufficient line size and inadequate elevated storage;
- Old, dilapidated and undersized lines exist throughout the system;
- A few sections of non-looped lines exist in the system;
- There is a lack of complete fire protection in the system.

The City has both replaced and abandoned several sections of line in the system. However, in some sections of abandoned line, water continues to flow, uncontrolled. Because of the age and condition of some of these lines, there is a high likelihood that water will leak from them, unnecessarily wasting water. In addition, these lines could

fail, causing interruptions to the system and possibly contaminating the system. These lines need to be terminated.

A second issue is that significant parts of the system do not have adequate pressure. This is particularly evident in the northern and southern sections of the City. A major cause of this problem stems from the lack of sufficiently sized water transmission mains running from the storage tanks. A large, 12-inch line extending from an elevated tank, for example, is quickly tied into lines, 6-inches or less. Once the line size is decreased, the amount of potential pressure is reduced, and cannot be regained without the aid of a booster pump. A second factor contributing to poor water pressure is a lack of adequate elevated water storage. As illustrated earlier, the system is divided into two pressure planes. The addition of the new elevated storage tank, currently under construction, will provide needed elevated storage to the entire system. However, additional elevated storage will still be needed in the southeastern zone. To adequately address these problems, major water transmission mains will need to be upsized and additional elevated storage provided.

In addition to undersized transmission lines, there are a large number of existing water lines in the City over 50 years old with diameters as small as 2-inches. These small lines limit system pressures in some areas of the City, below that necessary for fire protection. These lines need to be upsized.

Not only are many of these lines severely undersized, but many are in poor condition. Comprised of primarily of asphalt concrete pipe, these lines can break, interrupting service. Other lines in the system are at “dead-ends” which allows water to stagnate, thereby creating the possibility of foul tasting and smelling water. Older lines causing problems in the system should be replaced with newer, Poly Vinyl Chloride lines. In addition, all lines in the system should be looped.

A final problem is a lack of complete fire protection. As illustrated in Figure 9.1, there are large areas of the City without adequate fire protection. Additional fire hydrants need to be installed.

LOCALLY IDENTIFIED PROBLEMS

Based on input from the public, staff and City Council, the following problems were developed and ranked according to the perceived need of the water system of Lucas:

1. All inactive lines need to be located and terminated.
2. Inadequate pressure exists in several areas of the City.
3. Additional elevated water storage needs to be provided to the southern section of the City.
4. Distribution lines throughout the City need to be increased in size, looped and updated to provide adequate water service and fire protection.
5. Fire hydrants need to be installed in all areas of the City to ensure residents have adequate fire protection.
6. The City should strive to keep water cost as low as possible.

No other problems are perceived as being in need of resolution.

# GOALS AND OBJECTIVES

**GOAL 1: OPERATE THE CITY'S WATER SYSTEM USING THE MOST EFFICIENT AND COST-EFFECTIVE METHODS.**

OBJECTIVE 1:1

Throughout the planning period, provide and document preventative maintenance of all facilities.

OBJECTIVE 1:2

Throughout the planning period, replace undersized and dilapidated lines rather than repairing them.

**GOAL 2: PROVIDE RESIDENTS WITH CLEAN, SAFE, POTABLE WATER THROUGH A CITYWIDE WATER SYSTEM.**

OBJECTIVE 2:1

Ensure water has been cut off to all abandoned lines.

OBJECTIVE 2:2

Throughout the planning period, continue maintaining and repairing the existing system.

OBJECTIVE 2:3

Provide and document professional inspection of all facilities according to a regular schedule, at least once a year.

**GOAL 3: ENSURE ADEQUATE WATER PRESSURE AND SUPPLY FOR GENERAL USE AND FIRE PROTECTION.**

OBJECTIVE 3:1

Throughout the planning period, upgrade old and undersized lines wherever they do not meet minimum state standards.

OBJECTIVE 3:2

Increase elevated storage in southeastern zone of the City.

OBJECTIVE 3:3

Continue adding fire protection as needed to stay in compliance with the TCEQ and the TDI.

OBJECTIVE 3:4

Throughout the planning period, eliminate dead end lines by looping them into the system.

OBJECTIVE 3:5

Throughout the planning period, expand the system by adding new lines as needs arise.

# SYSTEM PLAN

A phased action plan, listing priorities, estimated costs, and possible funding sources, has been developed in strict accordance with criteria established by the TCEQ, TWDB and TDI. Each phase, with its respective improvement, represents a priority of the water system plan. The physical aspects of the plan are graphically presented in Figure 9.2.

In order to bring the City's water system into compliance with TCEQ and Texas Department of Insurance standards, recommended improvements should be an integral part of an overall five-year Capital Improvements Program. To avoid unnecessary street repairs, it is recommended that, where possible, new utility lines be located along roadways rather than beneath them.

**PHASE I**

Cut off water to the following sections of inactive line:

| SECTION | FROM | TO |
|---|---|---|
| "A" | Existing ROW – Valve on Estates PKWY., 290' East of Park Lane | Approximately 2,870' S |
| "B" | South side of Section "A" | East to County Club Road |
| "C" | East side of Section "B" | South 2,000' |
| "D" | South side of Section "C" | West 2,200' |

This project will require the reconnection of several services along with highway road bore.

Cost: $10,000

**PHASE II**

Increase pressure in the north eastern portion of the City by replacing undersized transmission lines. Construction activities should include planning, funding and installing new, 12-inch PVC water transmission main in the following locations:

| SECTION | FROM | TO |
|---|---|---|
| All | Along Country Club Road from Blondy Jhune Road | Rock Ridge Road |

Cost: $275,000

**PHASE III**

Plan, fund and install new, 8-inch PVC water main to replace existing undersized, dilapidated line in the following locations:

| SECTION | FROM | TO |
|---|---|---|
| "A" | East Along East Lucas Road from Winningkoff | Existing road bore, east of Lakeview Drive |
| "B" | Along Brockdale Park Road from East Lucas Road | South Approximately 3,000' |

Construction activities should also include the installation of ten (10) fire hydrants.

Cost: $260,000

**PHASE IV**

Plan, fund and install a new, elevated storage tank to serve the southeastern pressure plane and replace existing undersized, dilapidated line along Stinson Road. Construction activities should also include the installation of 18 fire hydrants.

Cost: $775,000

POSSIBLE FUNDING SOURCES

The existing financial condition of the City is such that assistance for the aforementioned system improvements would be required in the form of low-interest, long-term loans or a grant program. The following options, therefore, are available to the City.

- ✓ The Texas Community Development Program (TCDP) – The recommended funding source for qualified improvements would be through a grant from TCDP as administered by the Office of Rural and Community Affairs (ORCA). This program allows for some repairs and upgrades to water systems. While funding is available annually from the program year allocations, competitions are conducted bi-annually. Under this fund, each of the 24 planning regions receives an allocation from the funds available that year. Applications are accepted from non-entitlement communities and are scored both on a regional and state level. Grants through this program are typically $250,000 or less with a minimal match requirement (typically 15% or less).

- ✓ STEP Program – This program is a branch of the TCDP and functions similar to it. A significant difference, however, is that an applicant must provide at least 50% of the labor for the project from volunteers, and only supplies, engineering and administration are eligible expenses. Applications are accepted throughout the year, or until all available funds have been exhausted.

- ✓ The Texas Capital Fund (TCF) – These program funds are available on a quarterly basis for economic development funding for project, which primarily create or retain permanent employment opportunities. The various forms of assistance available under this fund include: grants for infrastructure improvements; grants for real property or acquisition, construction, reconstruction, or rehabilitation of public facilities; grants for the acquisition, construction or rehabilitation or real estate and to provide public improvements of non-profit incubator sponsors. Applications are accepted from non-entitlement

cities/counties who apply in conjunction with a private business. Applications for such funds are often structured with no City matching requirements.

- ✓ Texas Water Development Board (TWDB) State Revolving Fund (SRF) – Another funding option is the TWDB SRF program. Funds from this source are in the form of a loan financed for 20 years and offered at an interest rate of .7% below the rate the borrower would receive on the open market at the time the loan closes. It can be expected to take at least a year before results would be seen from such an application. Engineering costs are generally higher with this program due to extensive reporting and environmental assessments which are required during the application process.

- ✓ Rural Economic Community Development (RECD) – This program can generally provide financing over a longer term (20 – 30 years) for economically depressed communities. RECD offers possible partial grant funding for projects if the applicant city's median income is low compared to the average median income, and if the project will require a relatively high impact on user rates. Like the TWDB SRF program, time involved in processing an RECD application usually exceeds that involved in most grant programs, taken at least 18 months before results would be realized. Engineering costs are generally higher with this program as application requirements are similar to the TWDB SRF program.

- ✓ General Obligation Bonds – Debt ceiling permitting and with approval of registered voters, this funding option can raise large amounts of capital, usually carrying the lowest available interest rates. Capital costs are shared by current and future users, both of whom will benefit from the improvements.

- ✓ Revenue Bonds – This option usually demands higher interest rates than general obligation bonds. However, this method does not require voter approval and is not subject to legislative limits. Debt service is paid by user fees, rather than from general revenues. Unless the City has a local bank which is interested in purchasing the bond, either of these bonding options would require the City to

obtain an investment grade bond rating. This rating would be required to market the bond nationally. Such rating is quite difficult for most small rural communities to obtain. If a local bank is interested in purchasing the bond, maturation schedules are typically less than 10 years. If this relatively short timetable does not overextend the City financially, it may be a viable option.

- ✓ City Water and Sewer Fund – A final financing option includes increasing water rates to customers. This option would provide a greater income to the fund and should make more funds available for operational and maintenance improvements.

Additionally, adopting a pay-as-you-go policy could be used.

With the completion of the action plan, a significant portion of the water system of Lucas will be upgraded, bringing the system closer to compliance with TCEQ and State Board of Insurance requirements. For the remainder of the planning period and to accommodate existing development with capacity to serve additional residents, the City will need to continue replacing undersized line, installing additional fire hydrants until there is one within 500 feet of all buildings in the city limits, installing new valves and continue to keep water cost as low as possible.

APPENDIX 9.1

NORTH CENTRAL TEXAS REGION

1997 TEXAS WATER DEVELOPMENT BOARD STATE PLAN

## North Central Texas Region

### Location Of Region

Counties in Region:
Collin, Cooke, Dallas, Denton, Ellis, Grayson, Hood, Jack, Johnson, Kaufman, Montague, Parker, Palo Pinto, Rockwall, Tarrant, Wise

### 1995 and 2050 Population Estimates and Projections for Major Centers

| City | 1995 Est./1 | 2050 Proj./2 |
|---|---|---|
| • Dallas | 1,048,882 | 1,266,225 |
| • Fort Worth | 473,291 | 645,074 |
| • Arlington | 286,545 | 413,986 |
| • Garland | 189,816 | 217,564 |
| • Irving | 169,265 | 279,929 |

/1 State Data Center /2 TWDB

**Major Water-Using Industries**
- Transportation Equip.
- Food and Kindred
- Electronic & Other Equip.
- Stone, Clay & Glass

**Major Irrigated Crops**
- Pecans
- Peanuts
- Hay
- Alfalfa

Figure 3-20

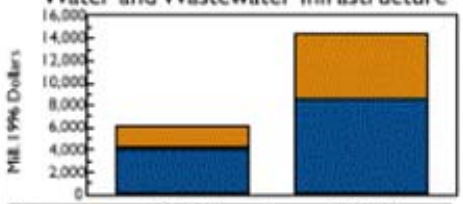
### Historical and Projected Population and Water Use

| Category | 1990 | 2010 | 2030 | 2050 | % CHANGE 1990-2050 |
|---|---|---|---|---|---|
| Population | 4,124,183 | 5,726,911 | 7,485,748 | 9,046,600 | 119.4% |
| % of State Total | 24.28% | 24.38% | 24.40% | 24.67% | ——— |
| Municipal Water Use | 848,437 | 1,192,786 | 1,376,184 | 1,632,599 | 92.4% |
| Industrial Water Use/1 | 137,515 | 180,310 | 215,615 | 263,552 | 91.7% |
| Agricultural Water Use/2 | 30,132 | 31,067 | 30,938 | 30,842 | 2.4% |
| Irrigation Adjustment /3 | 0 | 0 | 0 | 0 | ——— |
| Total Water Use (ac-ft) | 1,016,084 | 1,404,163 | 1,622,737 | 1,926,993 | 89.6% |
| % of State Total | 6.46% | 8.87% | 10.99% | 12.92% | ——— |

### Municipal Water Use Projections for Selected Cities (in acre-feet)

| City | 2000 | 2050 |
|---|---|---|
| Dallas | 313,668 | 353,170 |
| Fort Worth | 112,370 | 127,788 |
| Denton | 18,220 | 26,875 |
| Irving | 46,989 | 61,771 |
| Waxahachie | 5,634 | 8,157 |
| Sherman | 5,010 | 4,679 |
| Denison | 4,113 | 3,575 |

### Projected Capital Expenditures for Regional Water and Wastewater Infrastructure




| | 1996-2020 | 2021-2050 |
|---|---|---|
| Water /1 | $4,106.6 | $8,564.0 |
| Wastewater | $1,988.0 | $5,897.4 |
| Total | $6,094.6 | $14,461.4 |

/1 Includes estimate of community owned water supply infrastructure, reservoirs, reallocation and modification, major conveyance, and chloride control.

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### 3.2.3 North Central Texas Region

Regional Description. The North Central Texas Region consists of 16 counties located in portions of the Red, Brazos, Trinity, and Sabine River basins. As the most populous region in the State, North Central Texas contains approximately one quarter of the State's population. From 1980 to 1990, the population grew from 3.14 million to 4.12 million, a 31 percent increase. Rapid growth is anticipated for the region's future as population is projected to increase 119 percent by 2050 to reach nearly 9 million.

While the region makes up 24 percent of the State's population, it accounts for approximately 6 percent of State's annual water use. From 1990 to 2050, total water use in the region is expected to increase almost 90 percent from about 1.02 million acre-feet in 1990 to about 1.93 million acre-feet by 2050. Municipal is the largest water use category in the region, using more than 848,000 acre feet, or 84 percent of region's total water used in 1990. With continued population growth, municipal water use is anticipated to increase more than 92 percent over the 1990-2050 planning period. Water use by industry is also anticipated to increase rapidly.

By 2020, conservation practices incorporated into the municipal, manufacturing, and irrigation planning scenarios are projected to save approximately 263,000 acre-feet over scenarios with no conservation. By 2050, these savings could amount to approximately 465,000 acre-feet. Most of the water savings are expected to come from conservation efforts in the municipal sector. Such efforts include using more efficient plumbing fixtures, improved leak detection, and improved residential outside watering practices.

Regional Water-related Problems and Needs. Ground-water levels in the Trinity Aquifer have been lowered severely in the area due to prolonged usage, resulting in increasingly high pumping costs. In addition, the quality of groundwater has been deteriorating as water levels have declined. Surface water quality suffers from high urban use pressures including urban runoff and wastewater treatment plant discharge (problems related to dissolved oxygen content, suspended solids, phosphates, fecal coliform, algal blooms, and aquatic plants), and runoff from agricultural areas. High chloride concentrations in Lake Texoma preclude full utilization of this water resource.

Surface water development is near the maximum potential for the Upper Trinity River Basin and water is being imported from neighboring basins to the east. Regional initiatives to address watershed management and water conservation are underway in the Upper Trinity Basin.

Local Water-related Problems and Needs. A brief narrative of the Board's evaluation of the water resources of the major cities and large water utility suppliers in the region is described below. Also included are other entities that could affect the water supply resources of the region. Data on other cities and supplies may be obtained from the Board's files.

Tarrant Regional Water District (formerly Tarrant County Water Control and Improvement District #1). The District (TRWD) presently owns and operates four reservoirs: Eagle Mountain, Bridgeport, Cedar Creek, and Richland-Chambers, and has storage rights in Benbrook Reservoir. The District provides raw water to the cities of Arlington, Mansfield, and Fort Worth which in turn provide treated water to most of the cities in Tarrant County. TRWD also currently provides water and has contracts to sell additional future water to entities in Parker, Ellis, Wise, Jack, Henderson, and Kaufman counties. The District also provides water to the Trinity River Authority, which then sells treated water to the cities of Bedford, Euless, North Richland Hills, Grapevine, Colleyville, and several other small communities and water supply corporations. In addition, the District will augment the raw water supplies of Weatherford and Benbrook in the future. The development of additional supplies by the District will be required by the year 2030 in order to meet its customers' needs. Recommended projects include the diversion of Trinity River (wastewater) return flow from the Fort Worth area into the District's lower reservoirs, Richland-Chambers and Cedar Creek, anticipated during the 2025 to 2030 time period, and the eventual construction of the Tehuacana Reservoir project for use by the year 2050. The District began developing a pilot scale constructed wetlands facility adjacent to Richland Chambers Reservoir in 1992. The next anticipated phase of the reuse project is a 200 acre component of constructed wetlands, upon issuance of a permit by the TCEQ. If the Trinity River reuse project is proven infeasible, sufficient supplies could be obtained from the recommended Nichols I Reservoir project

located in the Sulphur River Basin. Construction of this project may depend on regional cooperation and/or resolving land-use conflicts.

North Texas Municipal Water District (NTMWD). The NTMWD currently provides approximately 180,000 acre-feet of water per year, supplying the water needs of nearly one million people in a service area which covers over 1,600 square miles. Supply sources for the District include three reservoirs, Lavon, Texoma and Cooper. The development of additional supplies and conveyance systems will be required by the year 2015 to meet demands by the District's member cities. Recommended projects include the construction of Parkhouse II Reservoir in the Sulphur River Basin and associated conveyances by the year 2015. The Nichols I Reservoir project, if constructed early and depending upon regional cooperation, could offset the need for the Parkhouse II Reservoir. If the Red River Chloride Control Project successfully increases the quantity of usable water supplies in Lake Texoma, then the reallocation and permitting of the unappropriated portion of Texas' share of Lake Texoma waters is recommended by 2050 in order to provide additional supplies to the District. This will also necessitate the construction of a new conveyance system to transport the additional water.

The District owns and/or operates more than a dozen regional and sub regional wastewater treatment and conveyance facilities in Collin, Dallas and Rockwall counties. Plano, McKinney, Mesquite and Rockwall are just a few of the cities served by these facilities. Growth in the area has led to expansion and upgrades to several of the plants serving the area over the last few years.

Dallas Water Utilities. Dallas Water Utilities (DWU) provides treated and raw water to over 30 municipalities and water supply corporations in Dallas, Denton and Collin counties. Water supplies for DWU are available from seven surface water reservoirs; Grapevine, Lewisville, Ray Roberts, Tawakoni, Ray Hubbard, Palestine, and Fork (transmission facilities are not yet constructed to Lake Palestine and Lake Fork). Total available supply to DWU is over 650,000 acre-feet. Projections for DWU include construction of transmission facilities from Lake Palestine to Dallas by about year 2015,

and from Lake Fork to Dallas by 2005. Other recommended projects include the construction of the Nichols I Reservoir which is expected to be needed by DWU customers by 2040. The City is currently examining the feasibility of other water supply projects and alternatives such as expanded reuse of treated effluent for supplementing the DWU existing water supplies.

DWU also operates two of the largest wastewater treatment facilities in Texas, the Dallas Central Plant with a 150 MGD treatment capacity, and the Southside Plant with a 90 MGD treatment capacity. Both plants have recently undergone extensive upgrading and modernization pro-grams. The City also maintains a collection system that transports wastewater to a treatment facility operated by the Trinity River Authority.

Trinity River Authority (TRA). The Trinity River Authority is the local sponsor of Joe Pool Reservoir and provides water to the Midlothian Water District. The TRA provides water to the cities of Corsicana, Waxahachie and other Ellis County communities through Lake Bardwell and Navarro Mills Reservoir. In addition, the TRA provides water to the cities of Bedford, Euless, North Richland Hills, Grapevine, and Colleyville through its contract with the TRWD.

The TRA is the State's largest operator of regional wastewater treatment works. The Central Plant (135 MGD capacity) and interceptor system serves 19 cities in the "mid-cities" area of Dallas and Tarrant counties, including portions of Fort Worth, Dallas, and D/FW Airport. In addition, the Ten Mile Creek Regional System (permitted capacity of 24 MGD) and the Red Oak Creek Regional System serve 12 cities in the Dallas and Ellis county area, and the Denton Creek Regional System serves another 5 cities and two Municipal Utility Districts, located in southern Denton County.

Upper Trinity Regional Water District (UTRWD). The Upper Trinity Regional Water District was created in 1989 to provide regional water and wastewater services for the Denton County area which is anticipated to be one of the fastest growing population areas in the State. The service area for the District, which includes nearly all of Denton County and a portion of Collin County, is within the water supply planning boundaries of

the City of Dallas Water Utilities. Since Dallas has planned future water supplies for the majority of Denton County, the District obtains a substantial portion of its water supply from Dallas Water Utilities out of Lake Lewisville. In addition, the District also contracts with the City of Commerce for a water supply out of Cooper Reservoir in the Sulphur River Basin and is cooperating with the City of Irving and NTMWD in the joint development of transmission facilities. Using $61 million in financial assistance from TWDB, the District, since 1992, has developed a regional water system to treat and deliver water to 12 cities with expansion capability to serve 25 cities. For future water sup-plies, the District plans to rely on water resources developed by the Dallas Water Utilities, and to cooperate with other regional entities in the development of the Nichols and Parkhouse II reservoir projects.

In 1996, Lake Cities Municipal Utility Authority transferred ownership of its wastewater treatment plant to the Upper Trinity Regional Water District. The District is expanding the plant from its current capacity of 1.038 MGD to 4.5 MGD, and plans to construct approximately four miles of wastewater force mains, two lift stations, and two miles of gravity sewer lines. The plant will serve as a regional wastewater collection and treatment system for the City of Highland Village, Lake Cities Municipal Utility Authority, the southeastern half of the City of Corinth, and possibly other cities in the area.

Fort Worth. The City of Fort Worth obtains raw water from the TRWD. The City owns and operates four water treatment plants; the North Holly, South Holly, Rolling Hills, and Eagle Mountain which provide treated water to more than 20 cities in Tarrant County. Combined treatment capacity is nearly 300 MGD and is adequate to meet the water needs of the City and all of its wholesale water customers through at least the year 2020.

Since the early 1990's, the City of Fort Worth has received over $90 million in State Revolving Fund (SRF) loan commitments for wastewater treatment improvements. Some of the projects funded have included expansion and upgrades to the City's Village Creek Wastewater Treatment Plant, which serves Fort Worth and 24 neighboring

communities in Tarrant and Johnson counties. The Village Creek plant recently underwent expansion from 120 MGD to a new treatment capacity of 144 MGD.

Greater Texoma Water Authority (GTWA). The GTWA has rights to about 70,000 acre-feet of water per year in Lake Texoma. GTWA has developed diversion facilities in conjunction with NTMWD, and provides water to the Sherman-Denison area.

Sherman-Denison. Since the completion of diversion and treatment facilities by the GTWA, the City of Sherman's water needs are being met from a combination of groundwater from the Trinity Aquifer and surface water from Lake Texoma. The City of Denison obtains groundwater from wells completed in the Woodbine Aquifer, and surface water from Lake Randall and Lake Texoma. Both cities plan to continue to use these supply sources through the foreseeable future, and projections indicate that future water needs will be met through the year 2050.

The Post Oak Creek wastewater treatment plant serves the City of Sherman. It has recently been expanded from a 12 MGD capacity to 16 MGD. The City of Denison operates two wastewater treatment facilities. The Paw Paw Creek WWTP has a capacity of 6 MGD and the Airport WWTP has a capacity of 0.4 MGD. Two pre-existing treatment facilities were consolidated into the Paw Paw Creek Plant.

Denton. The City of Denton currently obtains surface water from Lake Lewisville, Lake Ray Roberts, and from the City of Dallas. Total available supplies from the two reservoirs are estimated at nearly 40,000 acre-feet per year. Supplies are expected to meet projected demands through the 2050 planning year.

The City of Denton owns and operates a wastewater treatment facility recently upgraded and expanded to a permitted 15 MGD capacity. The City intends to expand the plant further to a capacity of about 20 MGD by the year 2010.

Irving. The City currently meets its water needs by purchasing necessary supplies from DWU, and also has contracts for about 40,000 acre-feet of water per year from Lake

Cooper. The City plans to develop transmission facilities in conjunction with NTMWD to deliver future water supplies to Irving, which are expected to meet demands through the year 2050.

The City contracts with the TRA for wastewater treatment services at the Central WWTP and plans to continue using the facility in the future.

Waxahachie. The City's present water needs are supplied from Lake Waxahachie and by the TRA from Lake Bardwell. Projections indicate that supplies will continue to meet demands for the City through the planning year 2050, with future supplies possibly coming from the TRA's Lake Joe Pool.

Weatherford. The water supply for the City is currently provided by Lake Weatherford, with minor amounts of groundwater from City wells completed into the Trinity Aquifer. Future supplies for the City will continue to be met from Lake Weatherford and from contracts with Tarrant Regional Water District through the 2050 planning year.

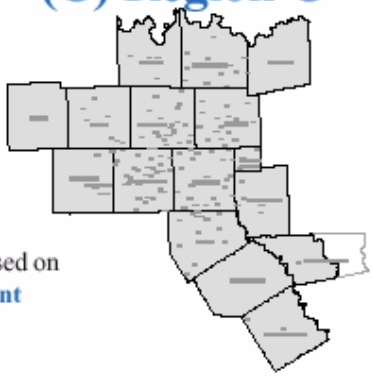
Plano. Water supplies for the City of Plano are obtained from the NTMWD. Projections indicate that future demands for the City will continue to be met by the NTMWD through the year 2050.

Arlington. The majority of the water needs for the City of Arlington are met by water provided by TRWD, with a smaller portion supplied by the City's Lake Arlington. Future demands will continue to be met by these supplies through the year 2050.

Flower Mound. The City obtains its water supply from DWU. Projections indicate that future demands will continue to be supplied from DWU through the year 2050.

*Water for Texas*

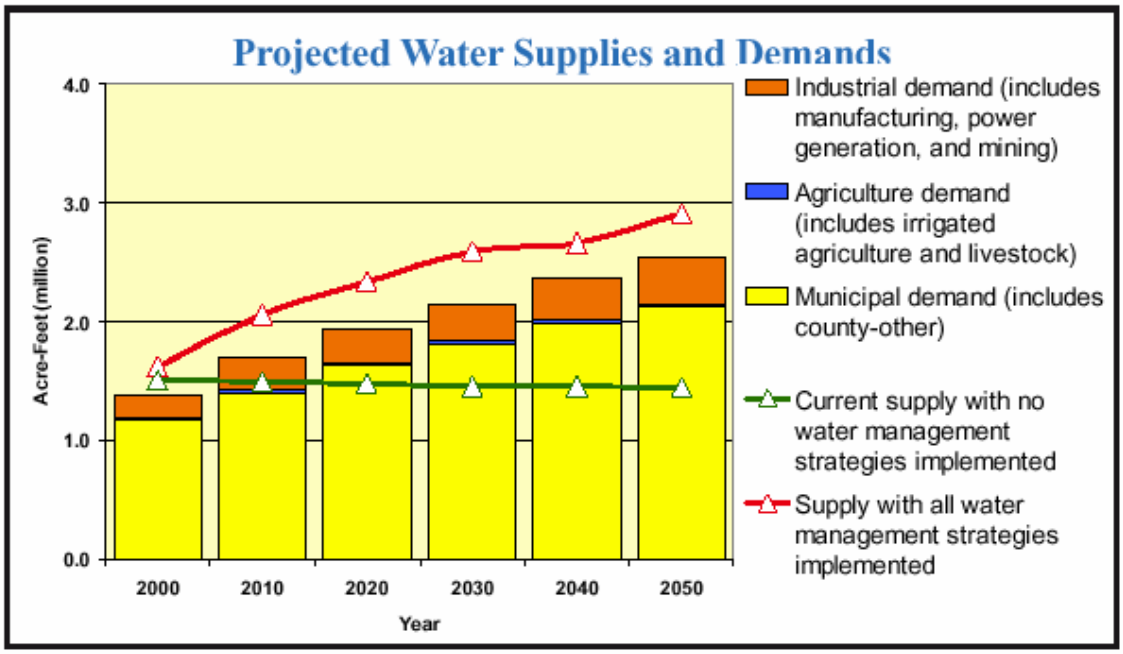
## (C) Region C

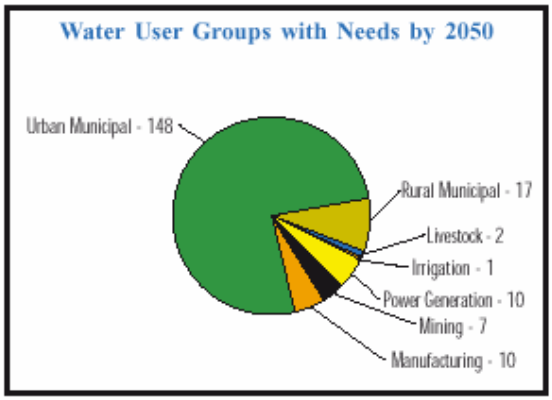


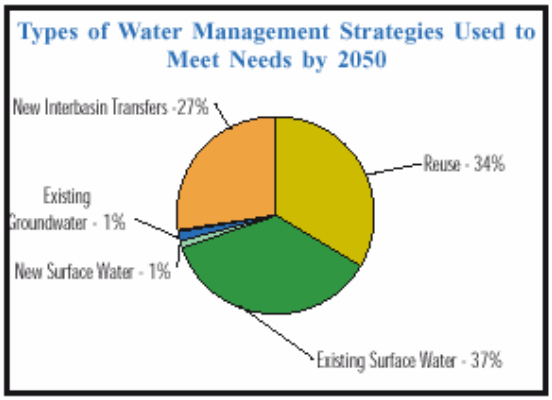
Cities with needs based on comparison of **current** water supplies with **projected** demands.

### KEY POINTS

- **Total capital cost: $6,161 million**
- One new major reservoir and one new minor reservoir to meet needs
- Strategies to meet all municipal needs occurring by 2050
- 195 water user groups with projected water needs by 2050
- Includes 12 of the 20 fastest-growing communities in Texas
- Significant cooperation to obtain additional Region D water.




C

**Summary of Region C**

Total capital costs of strategies are estimated at $6.162 billion. Selected examples of costs include: Marvin Nichols I Reservoir ($1,625,190,000), Lake Fork Connection ($288,000,000), Trinity River reuse ($75,168,000), Lower Bois d'Arc Creek Lake/transmission system for North Texas Municipal Water District ($167,324,000), Ellis County water project ($65,945,000), Cooke County water supply project ($26,785,000), Denton County Water Treatment Plant expansions and related costs for Upper Trinity Regional Water District ($479,157,000), Fannin County water system ($52,358,000), Grayson County surface water supply system ($94,316,000), reuse from Garland wastewater in Kaufman County ($18,497,000), treated water delivery lines from Weatherford ($7,164,000), and new groundwater wells in Wise County ($544,000).

Within Region C, Lower Bois d'Arc Creek Reservoir is proposed in Fannin County, with an estimated yield of 123,000 AFY. Additionally, Muenster Reservoir is proposed in Cooke County. This proposal would be an impoundment of 4,700 AFY with a diversion of 500 AFY.

The plan recommends water management strategies to meet all municipal needs by 2050. Most water supplied in Region C is provided by five major water providers in the region: Dallas Water Utilities, Tarrant Regional Water District, North Texas Municipal Water District, Fort Worth Utilities, and Trinity River Authority. Consequently most municipal needs will be met by one of these providers.

The significant regional needs result primarily from a large and expanding population base. In 1998 the region included 38 communities having 20,000 or more in population. The region has 12 of the 20 fastest-growing communities in Texas. Judging from census figures released after plan adoption, regional population appears to be growing even more rapidly than anticipated.

Although some expansion of supply can occur within the region, the Planning Group also considered other areas for future supplies. Region C and the North East Texas Region formed the Sulphur River Task Group to address issues of importance to both

regions. The Marvin Nichols I Reservoir was proposed to be located on the Sulphur River primarily in Red River and Titus Counties in the North East Texas Region. Eighty percent of the estimated yield of this reservoir would be conveyed to Region C.

Oklahoma water is recommended as a water management strategy for the North Texas Municipal Water District and Tarrant Regional Water District. Several entities in the region have been engaged in negotiations to purchase water from Oklahoma.