REGIONAL WATER SYSTEM STUDY

FOR

CITY OF DRIPPING SPRINGS

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General

The City of Dripping Springs (City) and surrounding area is growing in population at a rate that necessitates the planning and constructing of a regional water supply system to sustain the growth in the region. The planning phase of this project has been implemented due to the growing water quantity demands and the poor quality of existing water supplies. Previous reports by others have detailed the long-term inadequacy of groundwater as a source to meet the growth projections of the area. The City, recognizing the implications of future groundwater shortages, authorized the preparation of a utility master plan which recommended implementation of a surface water (Lake Travis) supply source for long-term growth needs. The master plan presented several courses of action and provided ranges of typical project construction costs based on assumed growth projections.

The following study is the summary of the subsequent planning phase of the project. A more exact determination of the required water system has been prepared based on an estimate of the initially anticipated system user base. The City has conducted a search to identify potential immediate service requirements. Landowners were contacted and asked to provide an estimate of immediate water usage requirements. Approximately 470 landowners responded, indicating a need to serve approximately 7,800 connections (single-family home equivalents) over the next ten-year period.

This phase of planning of a regional water system for the City of Dripping Springs has been jointly authorized and funded by the City and the Texas Water Development Board (TWDB). The scope of services authorized in the TWDB grant application approved in August 1986, included:

1. Assist the City in identifying area landowners to whom the provision of water service is feasible and practicable.
2. Prepare a preliminary utility system cost. The Planning Area will be studied to determine site locations for the intake structure, treatment plant, storage reservoirs, and locations of pipelines. A preliminary determination will be made of the sizes and capacities for each element of the system.
3. Prepare a financial and legal strategy for funding initial construction costs and annual operation and maintenance costs, including estimating tap fees and water rates.
4. Determine the most feasible institutional framework for structuring the operation and delivery of water to wholesale and retail customers of the system.
5. Identify the nature and scope of all necessary or desirable contractual relationships with other jurisdictions including the State of Texas, LCRA, WCIDs, MUDs, Cities, and other entities concerning financing, construction, participation, and operation of the water system.

6. Identify all necessary governmental approvals required for construction and operation of the project.
7. Assist the City in cooperating with the LCRA and other entities in the identification of legislation clarifying the authority of LCRA to provide water to the City to serve the Planning Area.
8. Assess the feasibility of expanding the water system facilities so as to integrate them with any system constructed to meet the needs of an Extended Planning Area.

The above tasks have been studied to address questions related to facility design, location, expansion capability, environmental design constraints, capital project funding, long-term user rates and system operation. Turner Collie & Braden Inc. has prepared the information pertaining to identification of participants and water system design and costs. Vinson and Elkins has prepared the information detailing possible financial and legal strategies and options.

As previously stated, the objective of this report is to develop a regional water system that meets the projected growth needs of the initial system users. The proposed system must be environmentally acceptable, provide cost-effective facilities, and be financially implementable. This report contains a description of the planning process, planning area, alternative

water system service plans, and a recommended water system including preliminary estimates of probable project costs.

Summary

The primary findings of this study are summarized as follows:

1. The recommended regional wholesale water system will draw surface water from Lake Travis and provide treatment through a water treatment plant process.
2. The initial planning area to be served is approximately 100 square miles in land area primarily located in Hays County. Approximately 7,000 connections are planned to be served within this area.
3. The regional water supply system will consist of a 6.1 million-gallon-per-day (mgd) intake structure, a 24-inch raw water transmission line, 6.1 mgd water treatment plant, two booster pump stations, and two elevated storage tanks. Approximately 25 miles of transmission lines in sizes of 12-inch through 24-inch will convey water to the supply facilities.
4. The total estimated probable cost of the Lake Travis wholesale water system alternative is $19,405,600 ($2,800 per connection).
5. Retail water system costs vary significantly within the study area. Retail water system costs range up to $13,700 per customer based on the location of the customer to the wholesale system. The average per

connection cost for the retail system is approximately $4,500.

6. No unusual governmental approval process is required for this project. Necessary approvals should not hinder the success of the project.

Planning Area

The planning area is generally defined by area roads and property boundaries. The geographical area (Exhibit 1) for the water supply system consists of the region from F.M. 150, located south of the City, to approximately Hamilton Pool Road. The westerly limits are located along County Roads 187 and 188, and the easterly limits are located in the general vicinity of Fitzhugh Road and F.M. 1826. The planning area consists of approximately 100 square miles. This area is predominantly located within Hays County and includes the corporate boundaries of the City of Dripping Springs.

The planning area was defined to encompass each of the properties which requested service through the regional water system. The planning area boundaries have been generally limited to exist within the extra-territorial jurisdiction of the City.

Soils

The strata found throughout the planning area consists of Brackett series and Volente series soils with an underlying material consisting of interbedded limestone and marl. Brackett series soils are prevalent in areas of hilly terrain, while the Volente series soils are principally found in stream valleys.

The typical Brackett series soils have a surface layer of light brownish-gray clay loam about six inches thick which is located over a layer of very pale brown clay loam. The underlain clay loam contains scattered soft limestone in places which are about 12 inches thick. Brackett series soils are found on slopes which are gently undulating to steep. Rock outcrops make up about 20 percent of this series.

The typical Volente series soils have a surface layer of dark grayish-brown silty clay loam about 22 inches thick. The next layer is brown silty clay that extends to a depth of about 46 inches. The underlying material, to a depth of about 54 inches, is reddish yellow clay loam. Volente series soils are calcareous and moderately alkaline. They are moderately slowly permeable, and the available water capacity is high.

Groundwater

The principal water-bearing unit underlying the planning area is the Trinity Group. The Trinity Group is organized into three aquifer units. The lower Trinity aquifer comprises the

Sligo and Hosston members of the Travis Peak Formation. The middle Trinity aquifer consists of the lower member of the Glen Rose Formation. The upper Trinity aquifer comprises the upper member of the Glen Rose Formation and the Paluxy Formation.

As reported in the Water and Wastewater Master Plan for the City of Drippings Springs and Surrounding Area by Engineering Science, 1985, the upper member of the Glen Rose Formation outcrops over a majority of the service area. This formation consists of alternating beds of blue shale, marl, and limestone. The impermeable beds of shale retard vertical movement of groundwater in the limestone strata. Lateral movement along the limestone bedding can be aided or prevented by faults in the service area.

Current estimates from published reports of groundwater yield of the Trinity aquifer establish a sustained yield capable of serving approximately 6,100 connections. The majority of the wells located in or near the planning area yield approximately 10 to 60 gallons per minute (gpm) based on published information. A few areas will produce wells yielding up to 200 gpm. These estimates are based on a uniform dispersal of groundwater demand throughout the planning area.

The quality of water from the Trinity group is generally fresh to slightly saline and has high hardness, sulfate,

flouride, and total dissolved solids levels. Available reports indicate that wells drawing from the middle Trinity aquifer to the south and east of Dripping Springs yield small quantities of water, satisfying the Texas Department of Health (TDH) quality requirements for community water systems. Wells located north and east of Dripping Springs produce water of unsatisfactory quality, exceeding TDH limits for mineral and dissolved solids concentrations. Aquifers within the planning area cannot be anticipated to produce individual wells capable of yielding large quantities of high quality water.

Archaeology

The Texas Archaeological Research Laboratory has located several archaeological sites within the planning area. The various sites date back to the Prehistoric and Middle-to-Late Archaic eras.

The Prehistoric sites consist of campsites and workshop sites. The sites are located adjacent to drainageways and have been partially disturbed by erosion and flooding. The sites identified as existing in the Archaic era generally consist of quarry areas and rock middens (eating/cooking areas). These areas exist both adjacent to creekbeds and in upland areas. One recent historic farmstead, including the chimney and house foundation, has also been located. Several of the located sites have been recorded as being archaeologically significant. In general,

existing or as yet undiscovered historical or archaeological sites will be located in areas suitable as campsites. Locations of sites are, therefore, predominantly found adjacent to water (creeks, streams, etc.) and have sufficient tree cover, caves, or other areas suitable for living purposes.

The planned locations of proposed water supply facilities avoid the locations of known historical sites. Historical sites are protected by law and their locations were not published in this report to avoid any pilfering of the sites by trespassers. Interested landowners may review site locations at the office of the Engineer.

Planning Population

The planning population for the regional water system is based on the landowners that have petitioned the City for service. To date, a total of 7,831 requests for service connections have been made to the City.

The distribution of the service connections is mostly concentrated in currently developing or planned subdivisions. Approximately 30 percent of the connections are located in the vicinity of the Ranch Road 12 and Hamilton Pool Road intersection. Areas located east and southeast of the City include approximately 60 percent of the service connections. Approximately 10 percent of the connections are located west of

the City. A list of the system landowners is shown in Table 1.

As shown in Table 1, the requested service consists of both individual properties and requests from large land tracts. Approximately 2,230 connections (28%) consist of property requests of from one to 75 connections. Approximately 5,600 connections (72%) have been requested from 17 landowners. This group of large property owners has been identified as major system participants and is shown in Table 2.

For purposes of this study, the planning population has been based on 7,000 connections (24,500 persons). It is anticipated that approximately 10 percent of the current participants will not continue with the project through implementation.

Water Demand

The projected average per capita water demand for the planning area was determined by studying the water used in 1985 of several mid-size water supply systems in and nearby the City. These systems are listed as follows:

	Number of Connections	Average Daily Use Per Connection	Peak Daily Use Per Connection
Drippings Springs WSC	617	470	980
Lakeway M.U.D.	1,980	460	1,090
Leisurewoods Water Co.	330	510	2,350
City of Kyle	860	600	1,000

The average daily use is 510 gallons per connection and is equivalent to 145 gallons per capita per day (gpcd). An average daily per capita water demand of 150 gpcd was selected for the planning area. Maximum daily water use is defined as the usage during the one day of largest use. Maximum daily use is normally projected as a function of average usage. Maximum daily demand usage will vary dependent on land-use type (residential, commercial, etc.) and land-use mix. The maximum day to average day demand factor of the water systems listed above ranges from 1.7 to 4.6. For the planning area, a factor of 2 was selected to be consistent with previous studies. A maximum daily demand factor of 2 should provide a reasonable value for the proposed uses within the planning area.

Peak hour water use is the highest one hour of peak usage during the year. The peak hour to average day demand factor recommended in the City of Austin Water and Wastewater Master Plan (Metcalf & Eddy, 1982) for southwest Austin ranges from 6 to 7. The City of Dripping Springs Water and Wastewater

Master Plan (Engineering Science, 1985) uses a peak hour to average day demand factor of 6.67. A peak hour to average day factor of 6 is used in this study.

Based on the selected per capita water use, the projected water demand for the planning population (24,500 persons) was calculated. The average day water demand is 3.68 million gallons per day (mgd). The maximum daily water demand is 7.35 mgd and the peak hour demand is 22.05 mgd.

Pressure Zones

Natural ground elevations within the planning area range from 900 feet mean sea level (msl) along the eastern boundary to 1,500 feet (msl) along the western boundary. To maintain water system service pressures within a suitable operating range, the planning area was divided into three pressure zones. Each zone is defined in terms of its hydraulic grade line (HGL). The hydraulic grade line is generally referenced in terms of the operating pressure maintained by the supply facilities in that zone.

Most of the planning area is located in two pressure zones. The hydraulic grade line of these two pressure zones have been set at 1,410 feet and 1,240 feet (msl). A third pressure zone is located along the west side of the planning area and has a hydraulic grade line of 1,580 feet above (msl).

The pressure zones of the region are described as follows:

Pressure Zone	Low Elevation (feet)	High Elevation (feet)	Hydraulic Grade Line (feet)
Northern	900	1,160	1,240
Central	1,160	1,330	1,410
Western	1,330	1,500	1,580

General

Water supply facilities consist of those components which provide treatment and pressure through the system. The supply facilities include the raw water intake structure, water treatment plant, booster pumping facilities, and storage reservoirs for each pressure zone within the system. The water distribution system consists of the transmission and distribution mains which convey the water to each supply facility and service connection.

The primary objective in the planning of this regional water system is to develop alternatives to provide a water supply and distribution system capable of producing and conveying potable water to customers in adequate quantities at sufficient pressure. Three alternative water supply systems have been investigated. Alternative 1 consists of obtaining raw water from Lake Travis and constructing a treatment facility. Alternative 2 consists of obtaining potable water through extension of City of Austin water system facilities. Alternative 3 includes using potable water from The Uplands subdivision water system. Provision of service through each alternative will be discussed below.

Design Criteria

The design criteria selected for the proposed system meet the TDH "minimum requirements" for water systems. Usage of the "minimum requirements" should minimize the initial water system

capital cost. Minimum criteria will provide a reliable, safe, long-term solution for potable water to this region. The TDH "minimum requirements" are as follows:

Intake Structure

The raw water pumps at the intake structure will have a firm capacity equivalent to 0.6 gpm per connection. Firm capacity is defined as the facility capacity with the largest unit out of service.

Treatment Plant

The treatment plant will supply a quantity of potable water equivalent to 0.6 gpm per connection under normal rated design capacity. The quality of the treated water will meet the criteria of the TDH.

Storage Facilities

The minimum amount of total storage capacity (ground and elevated) will be based on 200 gallons per connection. Elevated storage in the amount of 100 gallons per connection will be provided for each pressure zone.

Pumping Facilities

Each pumping facility will have two or more pumps to supply each pressure zone of the distribution system having a rated capacity of 2.0 gpm per connection or total capacity of 1,000 gpm and able to meet peak demand, whichever is less.

Water system facilities will further be able to maintain a minimum residual pressure of 20 psi and a minimum normal residual pressure of 20 psi and a minimum normal operating pressure of 35 psi.

Wholesale Water System Alternatives

Alternative 1 - Lake Travis

Facilities proposed within a water system are dependent on the distribution of the requested service connections throughout the study area. The location of the service connections within the pressure zones will determine the allocation of booster pumping and storage capacity at each supply facility. Of the 7,000 connections studied, approximately 5,550 connections (19,425 persons) exist within the 1,410 foot pressure zone and 1,450 connections (5,075 persons) are located within the 1,240-foot pressure zone. The 1,580 foot pressure zone contains less than 10 percent of the requested service connections and therefore this zone does not appear to have a sufficient number of customers to warrant further study. Table 3 contains the required capacities of water supply facilities within each pressure zone based on the distribution of the requested service connections.

The proposed water system layout is shown on Exhibit 2. Water will be supplied through a raw water intake structure. Raw water will be withdrawn from the lake and conveyed to a treatment plant. High service booster pumps at the treatment

plant will transmit water to Booster Pump Station No. 1. This pump station serves the portion of the 1410 HGL pressure zone located near Hamilton Pool Road and Ranch Road 12. A pressure reducing valve is proposed near the intersection of Ranch Road 12 and Fitzhugh Road to reduce the system operating pressure from the 1410 HGL to the 1240 HGL pressure zone. Booster Pump Station No. 2 raises the operating pressure from the 1240 HGL to the 1410 HGL. Table 4 shows the proposed capacities of each of the referenced facilities. Following is a description of each of the supply system components.

Intake Structure

The intake structure will pump raw water from Lake Travis to the treatment plant. Three configurations were considered for the intake structure:

1. Submersible pumps in a slide/trolley configuration.
2. Conventional platform supported vertical turbine pumps.
3. Modified platform supported vertical turbine pumps where the platform-supporting legs also serve as casing pipes for the pumps.

Each configuration is sufficiently flexible to accommodate future expansion. The submersible pump configuration is the most cost-effective system and is recommended for use on this

project. A schematic of the proposed structure is shown on Exhibit 3. As shown, the intake structure consists of pipe segments which can be added or deleted to adjust the depth of the pumps to the varying water level of the lake.

The required firm capacity of the intake structure is 4,200 gpm (6.1 mgd). A series of four 1,400 gpm pumps are proposed at the intake structure.

The recommended location of the intake structure, pending further site investigation, is at the north end of Lakehurst subdivision. This location appears suitable for several reasons:

1. It is located on the main body of Lake Travis.
2. It is accessible by public roads.
3. There are existing electrical transmission lines in the vicinity.
4. The natural ground slope to the lake edge appears to be compatible for the submersible pumps in a slide trolley configuration.

Water Treatment Facilities

The recommended facilities to be located at the treatment plant consist of treatment facilities, clearwell storage, and high service distribution pumps. The proposed treatment plant process is based on treating raw water from Lake Travis. Table 5 contains the raw water constituent parameters. A process

flow schematic for the treatment plant is shown on Exhibit 4.

The water treatment plant will provide the following processes:

1. Disinfection before treatment using chlorine.
2. Addition of coagulants to enhance turbidity removal in the raw water. Aluminum sulfate (alum) and polymer are proposed.
3. Rapid mixing to disperse disinfection chemicals and coagulants.
4. Flocculation and clarification using an upflow sludge blanket process reactor.
5. Filtration using a dual media of anthracite and sand arranged in a flow splitting, variable rate filtration operation.
6. Disinfection following treatment using chlorine.
7. Hydraulic detention time for disinfection in covered clearwell storage.
8. High service pumping to the distribution and storage systems.
9. Filter backwash waste storage system.
10. Gravity sludge thickener system.
11. Sludge holding tank.
12. Sludge dewatering system using vacuum-assisted sludge drying beds following polymer addition for sludge conditioning.

The average design and peak design capacities for the recommended treatment facilities are 3.7 million gallons per day and 6.1 million gallons per day, respectively. The facilities layout and design will allow future expansion of the treatment processes. Table 6 contains proposed capacities of the process units comprising the water treatment plant.

The recommended location of the treatment plant pending further investigation is at the intersection of State Highway 71 and Bob Wire Road. This location appears to be suitable for several reasons:

1. The site is readily accessible by public roads.
2. There are existing electrical transmission lines in the vicinity which can provide power to the facility.
3. Available land area exists to adequately accommodate future expansion of the treatment plant.
4. Groundslopes are suitable for construction.
5. The site is not heavily wooded and there are not any archaeological sites which would be disturbed.

Booster Pump Stations

Booster pumping facilities are used in the regional system to establish the operating pressures within each pressure zone. Due to the location of the pressure zones, two individual pumping station facilities are proposed. Booster Pump Station 1 will be located on Reimers Peacock Road approximately 2,500 feet north

of Hamilton Pool Road. This station will house a series of booster pumps, with a total capacity of 14,000 gpm and a 50,000 gallon ground storage tank. The pumps will maintain a total dynamic head of 190 feet at their rated capacity. Booster Pump Station 2 will be located on Trautwein Road approximately 7,500 feet north of U.S. Highway 290. This station will contain a series of booster pumps with a total capacity of 6,500 gpm and a 500,000 gallon ground storage tank. The pumps will maintain a total dynamic head of 190 feet at their rated capacity.

Elevated Storage Reservoirs

Two elevated storage reservoirs are proposed. Both serve the 1,410 foot pressure zone. A 350,000 gallon tank (ET 1) will be located at the intersection of Ranch Road 12 and Hamilton Pool Road. A 250,000 gallon tank (ET 2) will be located on Highway 290 approximately 9,500 feet west of Trautwein Road. The required storage for the 1,240 foot pressure zone (ground and elevated) will exist within the ground storage tank located at Booster Pump Station 2.

Electrical Power Source

The electrical power source for the intake structure, water treatment plant, and pumping facilities will be the Pedernales Electric Cooperative, Inc. There are existing electrical transmission and distribution lines in the vicinity for each of these

facilities. The Pedernales Electric Cooperative, Inc. will construct any necessary additional power lines to the site. Facilities requiring greater than 10,000 kW (kilowatts) of power will be serviced directly through transmission lines. Those facilities needing less than 10,000 kW will be supplied by distribution lines.

Water Transmission Mains

A 24-inch raw water main of approximately 21,000 feet is proposed from the intake structure to the water treatment plant. The treated water transmission mains in the system will consist of approximately 76,500 feet of 24-inch water main and approximately 36,000 feet of 16-inch main. As shown on Exhibit 2, the recommended location of the 24-inch transmission main, extending south of the treatment plant is on Reimers Peacock Road. This main is then located on Hamilton Pool Road and along Ranch Road 12 to Fitzhugh Road. Then along Fitzhugh Road to Trautwein Road, and along Trautwein Road to Highway 290. A 16-inch waterline is proposed along Highway 290 from the eastern corporate limits of Dripping Springs to County Road 163.

Cost Estimates

The total probable cost for the Lake Travis water supply alternative is $19,405,600 and is presented in Table 7. The costs are based on current contractor bid prices from similar

construction projects. Also included is a cost of 25 percent for engineering and contingencies.

Alternative 2 - City of Austin

A second water supply alternative considered included the feasibility of obtaining water from the City of Austin (COA). The COA has recently completed the construction of facilities located within one mile of the planning area boundary. These facilities are located along FM 1826 and consist of a 6 mg Southwest "A" reservoir, a pump station, elevated storage tank, and a 36-inch water transmission main as shown on Exhibit 5. The 36-inch main along FM 1826 ends at the location where the proposed Arterial 11 will intersect with FM 1826. The 36-inch main is operated on the COA Southwest "B" pressure zone (1140 HGL).

The COA facilities have been designed and are being constructed to include capacity for future growth in the COA service area. This alternative can either serve as a long term solution or an interim service alternative to the Dripping Springs area until the COA needs the capacity to provide water service to their own customers.

The system consists of three booster pump stations, two elevated storage tanks, and transmission mains ranging in size from 16 inches to 24 inches. Treated water will be drawn from the existing COA 36-inch main located along FM 1826 and

transferred to a storage reservoir at Pump Station 1 located within the planned Friendship Ranch subdivision. Booster Pump Station No. 1 will raise the operating pressure from the 1140 HGL to the 1240 HGL and transfer water to a storage reservoir at Pump Station 2 located near the intersection of County Road 163 and U.S. Highway 290. Booster Pump Station No. 2 will raise the operating pressure from the 1240 HGL to the 1410 HGL. This pump station will convey water to a storage reservoir at Pump Station 3 along Ranch Road 12 near the southerly boundary of Deer Creek Ranch. A pressure-reducing valve is proposed along Trautwein Road near the Sunset Canyon subdivision to reduce the system operating pressure from the 1410 HGL to the 1240 HGL pressure zone. Booster Pump Station No. 3 will raise the operating pressure from the 1240 HGL to the 1410 HGL to serve the area located near the intersection of Ranch Road 12 and Hamilton Pool Road.

The sizes and locations of the City of Austin water transmission main alternative have been selected to be compatible with those shown with the Lake Travis water system alternative. Transmission mains along Trautwein Road, Fitzhugh Road, and Ranch Road 12 will be the same size mains as required at these locations for the Lake Travis alternative. The reasoning for this planning is to avoid the cost of having to duplicate facilities at some future date if the Dripping Springs water supply

system is required to change over to the Lake Travis water supply.

The total probable construction cost for the COA water supply alternative is $12,415,600 and is presented in Table 8. Service through the COA would include other additional costs. The City of Austin currently charges a fee at the time of construction of each service connection entitled the Capital Recovery Fee. This fee is used to fund water and wastewater utility facilities. The current fee is $1,141 per connection. Based on 7,000 service connections, this fee totals approximately $7,987,000. The total estimated water service cost at this time through the COA is therefore $20,402,600. The Capital Recovery Fee, however, is a cost which is funded at the time of actual water usage. This fee, which is not a capital expenditure, causes the City alternative to represent the lowest construction cost of the three water supply alternatives.

The COA may require the City of Dripping Springs to make system improvements (such as pump station expansions) within the COA system to accommodate the water demands of the Dripping Springs planning area. The exact nature of system costs associated with service from the COA will require future negotiation between the two cities.

Alternative 3 - The Uplands

The Uplands is a planned 3,240-acre development located at the intersection of SH 71 and RM 2244. The Uplands water system currently includes a 1.8 MGD intake structure on Lake Austin, a 30-inch raw water transmission main, and a 1.8 MGD water treatment plant on RM 2244, approximately 0.5 miles north of SH 71. The ultimate maximum day water demands for The Uplands service area is estimated to be 18.0 MGD. The water supply obtained from The Uplands for the Dripping Springs Regional Water Supply System would have to be designed to serve both the current Uplands service area and participants in the Dripping Springs system.

The proposed water system necessary to serve the Dripping Springs area is shown in Exhibit 6. The system consists of two booster pump stations, two elevated storage tanks, and transmission mains ranging in size from 16 inches to 24 inches. An additional raw water intake structure will be required adjacent to the existing intake structure, which is only expandable to 14.4 MGD. A 24-inch raw water transmission main will be required parallel to the existing 30-inch raw water tranmission main. The existing main only has enough available capacity for the current Uplands service area at their ultimate build-out. The existing treatment plant would have to be expanded by an additional 6.1 MGD capacity.

High service pumps located at the treatment plant will raise the system operating pressure to the 1,240 HGL and transfer water to a ground storage tank located at Pump Station 1 along Hamilton Pool Road, approximately 14,000 feet east of Ranch Road 12. Booster Pump Station No. 1 will raise the operating pressure from the 1240 HGL to the 1410 HGL and transfer water to a ground storage reservoir located along Trautwein Road approximately 7,500 feet north of U.S. Highway 290. A pressure-reducing valve is proposed along Fitzhugh Road at Ranch Road 12 to reduce the system operating pressure from the 1410 HGL to the 1240 HGL pressure zone. Booster Pump Station No. 2 will raise the operating pressure from the 1240 HGL to the 1410 HGL.

The total probable cost for The Uplands water supply system alternative is $19,318,800 and is presented in Table 9. In addition to the construction costs shown in Table 9, use of the Uplands water system may entail purchase or lease of the existing facilities. Due to the lengthy nature of negotiations which may be required between the City of Dripping Springs and The Uplands Company, this possible cost has been omitted but should be investigated during a subsequent planning phase if this alternative is recommended.

Wholesale System Recommendation

Of the three alternative wholesale water systems presented, the recommended system is the Lake Travis supply system. The

Lake Travis alternative does not contain undefined costs such as those discussed for the City of Austin or the Uplands water system alternatives. The City of Austin alternative could possibly become the recommended water supply option when the unidentified costs were determined. Further negotiation with the City of Austin is recommended in future project phases to identify this potential cost. A second advantage of the Lake Travis alternative is that operational authority belongs to the City of Dripping Springs, unlike the other options which are dependent on the future plans of other entities.

SECTION III - MISCELLANEOUS CONSIDERATIONS

Retail System

A retail system will be required to convey treated water from the wholesale water supply facilities to the consumer. The retail system will consist of two components; an approach main (if required) and a network of looped distribution lines constructed internal to a subdivision. An approach main is a water main and its associated facilities (i.e. pressure regulating valves, fire hydrants, etc.) required to extend service from the wholesale water supply facilities to a retail service provider (i.e. WCID, MUD, etc.). Properties located immediately adjacent to the wholesale water supply facilities will not need approach main facilities. Internal distribution lines are usually located within street right-of-ways of subdivisions and generally range

in size from 6 inches to 8 inches.

The retail system will have to be constructed, operated, and maintained by a retail provider which can be in the form of a Water Control and Improvement District (WCID), Municipal Utility District (MUD), private water supply corporation, City, or any other entity which is approved by the State. A retail provider may but is not required to acquire a Certificate of Convenience and Necessity (CCN) from the Texas Water Commission. The applicant of a CCN is required to identify the boundaries of the retail service. There are currently four entities located in the planning area which have existing CCN's. These entities include Deer Creek Ranch, Saddletree Ranch, Friendship Ranch, and the Dripping Springs Water Supply Corporation.

Exhibit 7 identifies possible boundaries of retail service areas within the project planning area. A service area may encompass one or several properties. Properties which are receiving water service from the same approach main were included in one service area. Properties which will not need approach mains are placed into service areas based upon their general geographical proximity.

Wholesale System Expansion

The water system has been planned such that the first phases of the system are cost effective to the initial funding participants. The system also maintains the flexibility for future

expansion to meet the needs of added growth. To acheive these goals the water system was considered as consisting of two components; water supply and water conveyance (transmission).

Water supply facilities proposed for this project have been configured as "modules" or standardized units which can be expanded to meet future water supply projections shown in the City of Dripping Springs Water and Wastewater Master Plan. In particular, the raw water intake structure and water treatment plant can be expanded through addition of future modules to meet the year 2010 water demand projections of approximately 15.0 mgd. Sufficient site area for these two structures has been identified and costs for construction of components such as access roads, onsite piping systems, and electrical systems have been included in the initial cost estimate to facilitate future expansions.

Water transmission system components have not specifically been planned to serve more than the initial 7000 unit customer base. Operationally, however, the transmission main system can serve additional customers. The ultimate capacity of the transmission main system is a function of the nature of future users (i.e. single-family or commercial) and their location (points of water withdrawal). The transmission main system has been planned such that added system capacity and enhanced reliability should occur upon addition of future mains which will create a looped system network. Detailed investigation of future system

extensions should be coordinated so as to maximize capacity availability of the transmission system.

Operation and Maintenance Costs

Operation and maintenance (O&M) costs have been estimated to be $716,000 per year for a 3.7 mgd average day plant capacity. These costs include the cost of labor, chemicals, electricity, supplies, and repairs for operating and maintaining the intake structure, water treatment plant, high service lift booster pump stations, storage tanks, and transmission mains in the wholesale water supply system. Electrical costs are estimated for raw water pumps at the intake structure, high service lift pumps at the treatment plant and booster pump stations, electrical motors and pumps required at the treatment plant, lighting and miscellaneous fixtures. Chemical costs are included for alum, chlorine, and polymer which is anticipated to be required for water treatment purposes. Labor costs were estimated based on three full-time employees. Costs estimated for repairs, supplies, and miscellaneous items include painting structures, overhauling pumps and other equipment, work truck, materials required for repair of waterlines, sludge disposal, and other miscellaneous maintenance items. An itemized cost estimate for O&M costs is provided in Table 10.

Connection Cost

Based on 7,000 participants, the per connection cost for the recommended Lake Travis alternative wholesale system will be approximately $2,800 if an initial capital charge is used to fund the project.

The retail system cost will consist of the cost of planning, designing, and constructing water distribution facilities required to serve each tract (or participant) from the regional water supply system. The estimated average cost within typical subdivisions in the vicinity of the planning area for internal distribution systems is $1,700.00 per connection. Estimated costs of approach mains vary for each property requesting service and range up to approximately $12,000.00 per connection for properties located long distances from the wholesale system. The average price of approach mains within the retail areas is approximately $2,800.00. Tables 11 through 18 show the range of approach main costs for the major participants located within the planning area.

Total probable system costs (wholesale and retail) range from $4,500.00 per connection to $16,600.00 per connection, with an average per connection cost of approximately $7,300.00.

Overview

The various legal and financial institutional frameworks for providing regional water service, listed in order from most feasible to least feasible, are judged to be as follows:

(1) A water district could be created encompassing all or part of the planning area to serve all or part of the area. It would be controlled by resident voters in the district and could issue bonds backed by taxes, revenues or a pledge of both taxes and revenues. Tax revenues would significantly enhance the feasibility of the project.

(2) The City of Dripping Springs (the "City") could own and operate the regional water system. The City would need to acquire the water system inside the city limits in order to own and operate the regional system outside the city limits. The City could finance the system through the issuance of revenue bonds payable from the proceeds of payments made by the users of the system under "take-or-pay" contracts. Note that the City is controlled by voters in the city limits, not the users of the regional system.

(3) A joint effort of the Lower Colorado River Authority ("LCRA") and the Guadalupe-Blanco River Authority ("GBRA") could accomplish the project with revenue bonds backed by "take-or-pay" contracts. Note that these river authorities are controlled by an appointed board, not the users of the regional system.

(4) A non-profit corporation could be established to construct and finance the regional system. It could be controlled by the persons who are users of the system. It would have the power to issue revenue bonds backed by "take-or-pay" contracts.

(5) A for-profit entity could be organized to serve the planning area although regulation of rates by the Texas Water Commission (the "Commission") might limit the incentive for such a corporation.

(6) The City of Austin ("Austin") could provide wholesale or retail water service to all or a part of the planning area. Austin could finance the system with a combination of revenue bonds and user fees. However, because the planning area lies almost exclusively within the extraterritorial jurisdiction of Dripping Springs, Austin is

perceived to be unlikely to commit extensive resources to serve the area.

Water District

A water district could be created by the Legislature, the Commission or the Hays County Commissioners Court to construct, finance and operate the regional water supply system. A water district is a body politic and corporate and a political subdivision of the state and typically has taxing power. The most frequently used water districts are water control and improvement districts (Chapter 51, Texas Water Code), fresh water supply districts (Chapter 53, Texas Water Code), and municipal utility districts (Chapter 54, Texas Water Code). The creation would normally be subject to a confirmation election.

Being political subdivisions, all water districts are controlled by the voters in the district. Thus, persons residing in the district boundaries would control the decisions of the regional entity as opposed to the actual users of the system. An immediate question would arise as to what should be the boundaries of the district - should it include all property in the planning area or only those tracts whose owners want to be served by, and included

within, the district? Such questions would have to be resolved on a political basis.

The taxing power of a water district greatly enhances the feasibility of the project and is the prime reason why this institution is considered the most feasible. Water districts are typically authorized to levy an unlimited tax for debt service. Additionally, water districts can tax for operation and maintenance purposes, and may, subject to the approval of the Texas Water Commission under certain circumstances, levy a standby fee on persons whose property has water service available but who are not actually using water. Because the proposed system is projected to have few customers actually using water initially, these powers would greatly enhance the financial viability of the project. A tax based on ad valorem use would shift a portion of the cost of the system to property owners who may or may not be receiving a benefit from the system proportionate to their tax levy in any given year. Tax bonds of a district could be issued only with an election. A typical tax bond issue for the Lake Travis Alternative for a wholesale system is described on Table 19 (bond issue with capitalized interest) and Table 20 (bond issue without capitalized interest).

District bonds could, alternatively, be supported by a pledge of system revenues. System revenues would probably be an insufficient pledge to support the issuance of bonds absent some type of "take-or-pay" contract with users. A take-or-pay contract would require users to pay a water rate component covering the cost of debt service on any bonds issued by a water district to construct or finance the regional water supply system whether or not water was actually provided to the purchaser. Securing these payments with an irrevocable, unconditional letter of credit issued by a creditworthy lending institution would probably make the bonds marketable under usual appropriate market conditions. Revenue bonds can typically, although not always, be issued without an election. An example of take-or-pay fees which would be required to accomplish the Lake Travis Alternative for a wholesale system is attached as Table 21.

Alternatively, a water district could issue bonds backed by a combination of taxes and revenues. In this manner, any combination of ad valorem tax rate or "take-or-pay" contract revenues could be accommodated. In such event, the tax rate would be less and the relative burdens of paying for the project could be shifted between property owners and users in any manner deemed appropriate.

Maintenance taxes and standby fees authorized to be charged by water districts could also be useful in financing the regional water system in early years. Both of these mechanisms provide an opportunity for the district to acquire income from persons or entities who are entitled to receive capacity from the system or who benefit from the system but who are not actually receiving water service. Both sources of income can be used to defray operation and maintenance expenses. It would be most appropriate to use this income to defray operational and maintenance expenses which are fixed in nature regardless of the amount of water actually consumed from or produced by the system. Maintenance taxes would have to be authorized at an election. Standby fees would have to be approved by the Commission if, and only at such time as, the district's ratio of assessed valuation to outstanding bonded indebtedness exceeded 15 to 1.

Required permits for a water district to construct and operate the project include:

a. The district would not be required to obtain a certificate of convenience and necessity except in areas where another entity has a certificate already. However, it might want to obtain a

certificate for all or part of the planning area to include all areas served or to be served by the regional system. Such an application would have to be filed with and approved by the Commission.

b. Rates of the district would be subject to review by the Commission upon complaint by any user.

c. The Commission would have to approve any bonds issued by the district.

d. The Attorney General of Texas would have to approve any bonds issued by the district.

e. If water is purchased from LCRA, a copy of the contract would have to be filed with the Commission.

f. The Texas Department of Health would need to approve the plans and specifications for the project.

Required contracts would include:

a. Take-or-pay contracts or other agreements, as appropriate, with all wholesale customers of the system requiring such customers to pay tap fees and other charges at times and in amounts sufficient to pay any debt service obligations of the district and any maintenance and operation expenses.

b. The district would need to enter into a raw water supply contract with LCRA or some other wholesale water provider.

c. The district would be required to enter into one or more construction contracts with construction companies to construct the project.

d. The district would enter into contracts with engineering, financial and legal consultants to assist in constructing, financing and permitting the project.

e. The district would enter into a contract to sell bonds to finance the system.

f. The district would either have to hire employees to operate the system or contract with an operating company.

g. The district would need to contract for insurance on the water system.

The City of Dripping Springs

The City is a general law city. The City was originally incorporated under Chapter 11, Title 28, V.A.C.S. By ordinance dated August 3, 1982, the City accepted the

provisions of Chapters 1-10, Title 28, V.A.C.S. Art. 1015(30), V.A.C.S., clearly authorizes the City

> to provide, or cause to be provided, the city with water; to make, regulate and establish public wells, pumps and cisterns, hydrants and reservoirs in the streets or elsewhere within said city or beyond the limits thereof, for. . . the convenience of the inhabitants. . .

However, the case of City of Paris v. Sturgeon, 110 S.W.2d 459 (Civ. App., 1908) no writ history, and City of Sweetwater v. Hamner, 259 S.W.2d 191 (Tex. Civ. App.--1923) writ dism'd, held that Art. 1015, V.A.C.S., authorized the City only to provide water service to inhabitants within the city limits and not to provide water service to areas outside the city limits.

In light of the ruling referenced above, the Legislature passed Art. 1108, V.A.C.S., Section 3 of which was intended to reverse the holdings in Paris and Sweetwater by providing that any town or city organized under the general laws which owns or operates a waterworks shall have the power

> to extend the lines of such [system] outside of the limits of such [city] and to sell water. . . or service to any person or corporation outside of the limits of such. . . [city] or permit them to connect therewith under contract with such. . . city under such terms and conditions as may appear to be for the best interest of such. . . city. . .

The case of City of Texarkana v. Wiggins, 246 S.W.2d 622 (Tex. 1952) confirmed that Art. 1108, V.A.C.S., was intended to reverse earlier law. Id. at Page 627.

It should be noted, however, that Art. 1108(3) does not, per se, authorize cities to be regional water providers. Rather, the clear intent of Art. 1108 is to provide authority for the City, if it owns a waterworks system providing service within the city limits, to "extend" the lines of the system outside of the city limits and to sell water service to persons outside of the city limits.

Art. 1108(2) further authorizes the City

> to purchase, construct and operate water. . . systems inside or outside of such. . . city limits and regulate and control same in a manner to protect the interest of such. . . city.

Again, although this particular section would seem to provide specific authority to the City to acquire existing water utility systems both within and without the limits of the City, when read as a whole Art. 1108 does not in and of itself clearly and specifically authorize a city to be a regional water utility provider simply for the sake of being a regional water utility provider.

In fact, the Attorney General of Texas recently took the position that Art. 1108 does not provide blanket authority to cities to become regional utility providers. The Attorney General argued that statutes granting powers to cities should be strictly construed and that Art. 1108 should be interpreted to provide authority to a city to serve outside of its city limits only as an adjunct to a city's right and responsibility to provide utility service to inhabitants of the city.

The Attorney General's opinion in this regard was formulated in connection with a bond validation suit filed by the City of Johnson City, Texas. Johnson City desired to issue bonds to construct a regional electric utility. Only 2% of the electric producing capacity of the system would have been used within the corporate limits of Johnson City; 98% would have been used by persons residing outside of the city limits, most of whom were far outside that city's extraterritorial jurisdiction. The Attorney General concluded that Art. 1108 (which has similar provisions for providing electric service outside of the city limits as for providing water service) did not authorize Johnson City to construct or acquire the contemplated project. The lawsuit was settled without the court's rendering any decision as to

whether or not the Attorney General's position was correct. However, the important fact is that the Attorney General took the position that such action by Johnson City was "ultra vires."

Several facts distinguish Dripping Springs' situation from that of Johnson City. First, assuming the City of Dripping Springs provides water to the inhabitants of the City, then it is likely that as much as 10% of the water supply will be for the City inhabitants as opposed to 2% of the electric utility supply in the Johnson City case. Second, Dripping Springs' ETJ is significantly larger than Johnson City's ETJ and encompasses nearly all of the territory in the planning area. A city has certain powers and responsibilities for protecting and preserving the public health and welfare of its citizens and for promoting orderly growth in its extraterritorial jurisdiction. It may also annex land in its extraterritorial jurisdiction. Dripping Springs should be able to extend regional water service to its extraterritorial jurisdiction in order to assure comprehensive planning and provision of utility service for areas which are capable of being annexed to the City in future years.

Given the judicial and legislative history concerning the authority of a city to provide water utility service outside its corporate limits, the City's water system to serve users outside of the city limits should be part of a system to provide service to City residents. It is likely that the Attorney General or a court will require that the City actually own its own system to provide retail service to inhabitants within the city limits if it also wants to be a regional supplier.

Art. 1015(30), V.A.C.S., clearly authorizes the City to own a waterworks system, including wells, pumps, cisterns, hydrants and reservoirs within or beyond the city limits. Although seeming to require that a city first own a water system in order to be able to purchase one, Arts. 1108 and 1111, V.A.C.S., when read together with Art. 1015(30) authorizes a city to "purchase, construct and operate water. . . systems inside or outside. . . [the] city limits." The City clearly has the power to acquire an existing water system by purchase.

The City clearly has authority to finance the regional water system by issuing bonds payable from taxes in order to construct or acquire a waterworks system. Art. 1027,

V.A.C.S. authorizes general law cities having a population of less than 5,000 to tax up to $1.50 per $100 assessed valuation for the purposes of erection, construction or purchase of public buildings, streets, sewers, and other permanent improvements within the limits of such city or town. Art. 823, et seq., V.A.C.S., authorizes issuance of tax bonds for construction of waterworks improvements within the city limits. The Attorney General has adopted a policy of approving bonds issued by a general law city under 5,000 in population for such purposes provided the tax rate to support all bonds issued by such a city will not exceed $1.00 per $100.00 of assessed valuation. Since the city limits contain such a small portion of the entire planning area, however, issuance of City tax bonds to finance the regional system does not seem practical or feasible.

Revenue bonds are debt obligations payable solely from an identified stream of revenues. The Attorney General of Texas has long refused to approve revenue bonds for utility system purposes of towns and villages operating under Chapter 11 of Title 28, V.A.C.S. See Morrow, Financing of Capital Improvements by Texas Cities and Counties, 25 Southwestern Law Journal 373 (1971) at Page 381. However, cities operating under the provisions of Chapters 1-10,

Title 28, V.A.C.S., clearly have the power to issue water utility revenue bonds to purchase or construct water systems and to build, improve, enlarge, extend or repair such systems. Art. 1112, V.A.C.S. provides that such revenue bonds may be issued without an election for "acquisition, extension, construction, improvement or repair of such system. . .".

The City has the power to sell water service to persons within and without the city limits under such terms and conditions as may appear to be for the best interest of the City. Art. 1108, V.A.C.S. The rates must, with certain exceptions, be equal and uniform. Art. 1113, V.A.C.S. The City has power to establish rules and regulations governing the furnishing of service and the payment for same. Art. 1116, V.A.C.S. Where the city owns the plant, the city has the power to set the rates. Art. 1123, V.A.C.S. The rates may include payment of debt service on any revenue bonds. Art. 1107, et seq., V.A.C.S. Such statutes, taken together, appear to authorize the City to enter into take-or-pay contracts with users to pay debt service on bonds issued by the City. Any contract entered into between the user and the City could require the purchaser to provide to the City a letter of credit to ensure payment of the

purchaser's obligations in the event of default by purchaser. Being revenues of the system, such funds could be pledged to the payment of the bonds.

If the City constructs the project by the issuance of revenue bonds, the pertinent approvals necessary in order to construct, finance and operate the project would be as follows:

a. The City would not be required to obtain a certificate of convenience and necessity except in areas where another entity already had one. However, it might want to obtain a certificate for all or part of the planning area to include all areas served or to be served by the regional system. Such an application would have to be filed with and approved by the Commission.

b. Rates charged by the City to political subdivisions purchasing water on a wholesale basis would be subject to review by the Commission upon complaint.

c. The Attorney General of Texas would have to approve any bonds issued by the City.

d. If water is purchased from LCRA, a copy of the contract would have to be filed with the Commission.

e. The Texas Department of Health would have to approve the plans and specifications for the project.

In accomplishing the regional system, the City would likely enter into the following contractual relationships with other entities:

a. Take-or-pay contracts with all wholesale customers of the system requiring such customers to pay tap fees or other charges at times and in amounts sufficient to pay any debt service obligations of the City and any maintenance and operation expenses.

b. A raw water supply contract with LCRA or some other wholesale water provider.

c. One or more construction contracts with construction companies to construct the project.

d. Contracts with engineering, financial and legal consultants to assist in constructing, financing and permitting the project.

e. A contract to sell bonds to finance the system.

f. Either a contract to hire employees to operate the system or a contract with an operating company.

g. A contract for insurance on the water system.

LCRA-GBRA

The regional system could also be a joint effort of LCRA and GBRA. LCRA's enabling legislation does not appear to authorize it to own and operate facilities for the provision of water service outside of its boundaries. Its boundaries do not include any territory in Hays County. Section 2 of the Authority's enabling legislation, Article 8280-107, V.A.C.S. states that LCRA has the authority to "control, store and preserve, within the boundaries of the [LCRA], the waters of the Colorado River and its tributaries. . . for any useful purpose, and to use, distribute and sell the same, within the boundaries of the [LCRA], for any such purpose." However, LCRA has taken the position that, subject to availability, water could be sold for the regional system provided such sale took place within the Colorado River Watershed.

GBRA's act is broader and clearly authorizes GBRA to own facilities and provide water service both within and

without its boundaries. Thus, GBRA could clearly purchase water from LCRA to distribute throughout the planning area.

Neither LCRA or GBRA has taxing powers and thus any such project would have to be revenue supported. Financing could be similar to that described heretofore with take or pay contracts. Required permits would be:

a. GBRA would not be required to obtain a certificate of convenience and necessity except in areas where another entity already had a certificate. However, it might want to obtain a certificate for all or part of the planning area to include all areas served or to be served by the regional system. Such an application would have to be filed with and approved by the Commission.

b. If water is purchased from LCRA, a copy of the contract will have to be filed with the Commission.

c. The Texas Department of Health would have to approve plans and specifications for the project.

Required contracts would include:

a. Take-or-pay contracts with all wholesale customers of the system requiring such customers to pay tap

fees or other charges at times and in amounts sufficient to pay any debt service obligations and any maintenance and operation expenses.

b. The river authorities would need to enter into a raw water supply contract with the LCRA selling water to GBRA.

c. One or more construction contracts with construction companies would be required to construct the project.

d. The entities would enter into contracts with engineering, financial and legal consultants to assist in constructing, financing and permitting the project.

e. The entities would enter into a contract to sell bonds to finance the system.

f. The entities would either have to hire employees to operate the system or contract with an operating company.

g. The entities would need to contract for insurance on the water system.

Non-Profit Water Supply Corporation

A non-profit water supply corporation controlled by the members/users could be incorporated under Article 1434a,

V.A.C.S. Membership in the new corporation could be structured to accomplish equity in the distribution of power between all customers of the regional system. The nonprofit corporation would be required to obtain a certificate of convenience and necessity from the Commission for areas where the corporation would actually provide service.

The corporation would not have taxing powers and would, therefore, be limited to revenue bonds to finance the system. However, rates of the corporation would not be subject to regulation by the Commission except upon complaint. Sections 11.036-11.041, 12.013 and 13.002(3), Texas Water Code. Revenue bonds based on "take-or-pay" contracts could be structured very similarly to those described heretofore.

Required permits would be as follows:

a. The corporation would be required to obtain a certificate of convenience and necessity for all or part of the planning area to include all areas served or to be served by the regional system. Such an application would have to be filed with and approved by the Commission.

b. If water is purchased from LCRA, a copy of the contract would have to be filed with the Commission.

c. The Texas Department of Health would have to approve the plans and specifications for the system.

Required contracts would be as follows:

a. Take-or-pay contracts with all wholesale customers of the system requiring such customers to pay tap fees or other charges at times and in amounts sufficient to pay any debt service obligations of the corporation and any maintenance and operation expenses.

b. The corporation would need to enter into a raw water supply contract with LCRA or some other wholesale water provider.

c. The corporation would be required to enter into one or more construction contracts with construction companies to construct the project.

d. The corporation would enter into contracts with engineering, financial and legal consultants to assist in constructing, financing and permitting the project.

e. The corporation would enter into a contract to sell bonds to finance the system.

f. The corporation would either have to hire employees to operate the system or contract with an operating company.

g. The corporation would need to contract for insurance on the water system.

For-profit Entity

A private, for-profit water entity (corporation, partnership or sole proprietorship) could be structured to accomplish the regional water system. It is felt that the regulation of rates by the Commission makes this alternative less feasible than the ones listed heretofore. Required permits would include:

a. The entity would be required to obtain a certificate of convenience and necessity for all or part of the planning area to include all areas served or to be served by the regional system. Such an application would have to be filed with and approved by the Commission.

b. If water is purchased from LCRA, a copy of the contract would have to be filed with the Commission.

c. The entity's water rates must be approved by the Commission.

d. The Texas Department of Health would have to approve the plans and specifications for the project.

Required contracts would include:

a. The entity would need to enter into a raw water supply contract with LCRA or some other wholesale water provider.

b. The entity would be required to enter into one or more construction contracts with construction companies to construct the project.

c. The entity would enter into contracts with engineering, financial and legal consultants to assist in constructing, financing and permitting the project.

d. The entity would either have to hire employees to operate the system or contract with an operating company.

e. The entity would need to contract for insurance on the water system.

Typical extension of service to such an area by Austin would entail Austin's charging the following fees:

1. A capital recovery fee (presently approximately $1,280 per connection).
2. An "approach main" fee equal to each user's share of the cost of any approach main required to extend service to the area.
3. If service was provided on a wholesale basis, Austin would also typically charge a "multiplier" of 1.25 times its inside-city residential rates as a per thousand gallon operating charge.

Required permits would be as follows:

a. Austin would not be required to obtain a certificate of convenience and necessity unless it wanted to serve in areas already certificated to another utility. However, it might want to obtain a certificate for all or part of the planning area to include all areas served or to be served by the regional system. Such an application would have to be filed with and approved by the Commission.

b. Rates set by Austin for sales to another political subdivision would be subject to review by the Commission upon complaint.

c. The Attorney General of Texas would have to approve any bonds issued by Austin.

d. The Texas Department of Health would have to approve plans and specifications for the project.

Required contracts would be as follows:

a. Contracts with all customers of the system.

b. The City might be required to enter into one or more construction contracts with construction companies to construct the project.

c. The City might enter into contracts with engineering, financial and legal consultants to assist in construction, financing and permitting the project.

d. The City would enter into a contract to sell bonds to finance the system.

e. The City would have to hire additional employees to operate the system or contract with another entity to operate the system.

f. The City might want to acquire insurance on the system.

The primary thrust of the City's efforts have been to determine the feasibility of providing a wholesale surface water supply system to the planning area. The City has also briefly considered the problems associated with providing retail service to the planning area. However, the problems involved are significant and not easily resolved and, consequently, only certain general problems and principles can be outlined.

Most concerns involved in providing retail service to the planning area stem from the fact that the area is both large and diverse. For example, some portions of the planning area are extremely distant from the source of surface water supply whereas other areas are close. How should these differences be reflected in the provision of and pricing of retail water utility service? Second, the different geographical and other characteristics of certain subdivisions will mean that the retail components of the water utility system will cost different amounts per customer to construct. Determining allocation of these different costs will be difficult. Third, there may be different growth rates and different demands for water on a retail basis in certain parts of the planning area compared to other parts of the planning area. The implications of these

different demands will impact the overall costs of the retail system and will have to be allocated among customers. Finally, there are already certain existing retail utilities in the area providing service under certificates of convenience and necessity from the Commission or under other legal authority. The service area rights of these existing entities will have to be recognized in determining provision of retail service within the planning area.

There are enumerable possible solutions to the problems presented in providing retail water utility service to the service area. Obviously, if the existing utilities agreed, it is possible, although Commission approval would be needed and many questions would arise, that the regional supplier could be responsible for all retail service. Alternatively, the regional supplier could be responsible for providing all retail service outside of the service areas of existing retail utilities. Third, the regional supplier could encourage the existing retail utilities to provide as much service within their immediate vicinities as practicable, and the regional supplier could provide service to all other areas. Fourth, the regional supplier could simply leave the question of retail utility service up to other entities.

The following is suggested as an approach to providing retail service within the planning area. First, the regional entity should encourage all existing retail utilities to continue to provide retail service within their existing service areas. Second, the regional entity should encourage each existing retail utility to serve adjacent customers within the planning area who can reasonably be served by an extension of the retail utility's lines. A map delineating the boundaries of these suggested retail service areas is shown on Exhibit 5. Third, in proposed retail service areas where no retail utility presently exists, the regional entity should encourage the formation by users within that service area of a retail utility. Finally, if no retail entity is formed in a service area, the regional entity would provide retail service in that area.

No matter what entity provided retail service in a service area, that retail utility should apply the following principles to extending service:

1. Approach main facilities should be sized at least to serve presently committed customers and could be oversized to the extent other funds were available to pay for the oversizing (from taxes or third-party contributions).

2. Approach main facilities could be constructed in segments so long as no undersizing occurred. Customers not immediately served would be required to either pay at the time of construction for their capacity in the approach main facilities or customers who would benefit immediately from the segment of the approach main being constructed would pay for the entire capacity and have a portion of their money refunded to the extent capacity would be utilized later by other customers.
3. Apportionment of an approach main's cost would be on a "used and useful" basis, with each customer paying for its prorata share of capacity in each segment of an approach main.
4. Initial capacity in the system would be reserved for the initially committed users and later customers would be allowed to use the system only after building additional facilities, unless engineering considerations would allow delay of such construction. In any event, capacity reserved for the initially committed customers would have to be adequately protected from interference or overcommitment to later users.

5. Transfers of committed service would be granted to subsequent owners of the same property to which service has been previously committed. Transfers to other property would be allowed only if no engineering or legal considerations prevented such a transfer.
6. A master meter would be placed at each wholesale customer's location. Retail utilities would be responsible for the water after it reached the meter.

EXPANDABILITY OF SYSTEM

In general, it can be stated that use of a water district to provide regional service would allow for expansion of the system with comparative ease. Obviously, issuance of tax bonds by such a district to support a project could also be used to expand the project. Persons who wanted service outside of the initial boundaries of the district could be added by a petition filed by the landowners and an order of the district annexing the land. Thus, the new land could be subject to taxation providing additional assessed valuation for issuance of additional bonds to construct improvements. However, two political problems might arise: (1) if the land to be annexed is within a city's extraterritorial jurisdiction, the city must

consent to the annexation, and (2) both the newly-annexed areas and the original district areas may be reluctant to share the tax burden of a common utility system.

Having either a water district or the City issue revenue bonds backed by take-or-pay contracts with a letter of credit would not be as practicable a way to accommodate expansion of the system. The original users signing take-or-pay contracts would be reluctant to sign a contract which would obligate them to pay debt service other than for the debt issued to originally construct the regional system. Thus, any subsequent bond issue would likely be supported by totally new take-or-pay contracts and letters of credit structured with new users. Thus, each bond issue would have to stand on its own, making each bond issue less feasible than if the entire system revenues supported the payment of the system's debt. In actuality, it is not unlikely that revenue bond financing backed by take-or-pay contracts and letters of credit would be replaced over a period of time by debt supported solely by revenues and user fees, but without a pledge of take-or-pay contracts and letters of credit. This type of pure revenue financing would be similar to that of the City of Austin. This system of financing is easily usable for expansions but requires a sufficient customer base to support subsequent debt issuance.

DRIP:49

TABLE 1 - SYSTEM PARTICIPANTS

Property Owner	No. Connections
4-J Land Company, Inc.	9
Acosta, Lupe	1
Adair, William	1
Agnell, Col Peter W.	75
Alexander, John W.	1
Alexander, Robin R.	2
Amerson, Gary	1
Anderson, Gus F.	1
Andrewartha, Richard	1
Andrus, James	1
Appelt, Howard G.	1
Balke, Ted	1
Bankston, C. E.	1
Barber, Joe	2
Barqmann, Will	1
Bauerle, Travis D.	1
Bauerle, Dennis	3
Becker, Michael	1
Benck, Michael	1
Berg, Warren	1
Berry, Michael	1
Best, C. K.	3
Betts, Eugene	1
Biggs, William	3
Bisson, Augustin	1
Bleakley, Jack	1000
Boessling, Leroy	1
Bonham, Elbert	1
Booth, William	1
Booth, John S.	100
Botbol, Benjamin	1
Bowman, Nolan	1
Breed, J. S.	1
Brennan, James W.	1
Brown, Elbert E.	2
Brown, Daniel L.	1
Brown, Dr. James T.	1
Brown, Sidney L.	1
Brown, DeWayne G.	5
Brown-Karhan Facilities	2
Bryant, John M.	1
Bush, J. Leroy	5
Bush Jr., Claude F.	5
Buttrey, Jerrold	1
Byland, R. S.	1
Cook, John	56

Property Owner	No. Connections
Candelas, Michael	2
Canik, August J.	1
Canion, James B.	2
Cannon Investments	150
Cantrell, James E.	1
Carpenter, Ken	1
Cartwright, James W.	1
Cassell, Dwight E.	1
Cedar Valley Gro., Inc.	2
Chandler, E. A.	1
Chang, Hu-Shen	1
Checorski, Frank	10
Coleman, Ronald	1
Coleman, Lt. Col. Fred	1
Collins, Ralph	3
Connelly, Maj. Robert	2
Corbitt, Chris D.	1
Cortez, Isabel	1
Covington, James D.	2
Covington, Frank	1
Cox, Lt. Col. Joe C.	2
Crawford, Mary E.	1
Cross, Marian H.	1
Crumley, Marvin E.	5
Crumley, Vernon T.	50
Cruse, Jr., F. M.	1
Cummings, Bill P.	1
Cummings, Russell	2
Cunningham Cattle Co.	200
Curtis, Charles R.	1
Darden Hill Ranch School	1
Darden Hill Ranch School	1
Davis, Thomas M.	1
Davis, Fred E.	6
Davis, Tom H.	1
Davison, Anne E.	1
Dean Parrot Farm	2
Deer Creek Ranch, Inc.	1000
DeMoss, Edward E.	10
Denton, Mark H.	1
Dickson, John C.	1
Diehl, Philip	1
Diggs, Shirley A.	1
Dilley, Catherine	5
Dively, Reddy	2
Dodt Realty Co.Inc.	7

Property Owner	No. Connections
Dorman, David	1
Drane, D. C.	7
Duncan, Donald M.	1
Dunlap, Lee J.	2
E. F. L. Hwy. 290 Venture	10
Earle, C. C.	1
Eaton, Paula S.	3
Edwards, David	2
Ellis, Deborah A.	1
Ellison, Bill	1
Erickson, June	1
Escamilla, Roberto G.	1
Estrada, Jerry J.	1
Eubanks, Eddye	1
Evans, Rev. Gary	1
Farber, Kathy	1
Faust, A. R.	3
Fisher, Dale	1
Fisher, Dale	1
Fitzhugh Joint Venture	40
Forbis, Orie	4
Foster, Melvyn E.	5
Foster, Wilburn T.	2
Franco, Robert	1
Franklin, Floyd	1
Frederick, Ken	1
Frederick, Elden	1
Fuquay, J. Darryl	1
Gaines, Jimmy	90
Galbraith, Luella	3
Gandy, Robert M.	1
Gardner, A. P.	2
Garnett, Paul R.	1
Gee, Thomas G.	300
George, James K.	1
Gibson, John W.	1
Gibson, Arthur L.	1
Gill, Jerol D.	1
Givens, Gary D.	1
Gogonas, John	2
Goodman, Camille	1
Granowsky, Alvin	3
Gravenor, Charles A.	1
Green, Gary D.	2
Gregory, Pat	1
Gregory, John	1

Property Owner	No. Connections
Griffin, Clifton C.	1
Griffin, Della M.	1
Grosz, Reigh M.	8
Grumbles, Roy C.	1
Guenther, James E.	1
Hamilton Pool JV/Attn. C. Davis	10
Hammerdahl, George	2
Hannay, Chip	1
Hanson, Wilmer C.	1
Hargrave, Pauline E.	1
Harmon, Ray L.	1
Harner, David A.	3
Harris, Selby B.	1
Harriss, William B.	1
Hassman, Jeffrey	1
Hawkins, Jr., J. B.	2
Haydon, Wiley A.	30
Haynes, Donald P.	2
Heath, James b.	2
Hebert, Leonard	1
Hefley, Sheri J.	1
Hendon, Mark	2
Hill, John	100
Hillock, Larry	2
Hillock, Larry	1
Hinderer, Thomas	6
Hjornevik, Wesley L.	1
Holder, Robert H.	1
Holland, Dan N.	1
Homecraft So. Austin, Inc.	1000
Hoover, Randy	1
Hoover, Randy T.	1
Horn, Leonard H.	1
Hosman, Robert L.	1
Howell, Jack W.	1
Hudson, Olen L.	1
Huerta, David A.	1
Hughes, Camilla K.	1
Hunka, Ronald A.	1
Hutchinson, III, F. G.	1
Ice, Bryan W.	1
Ingram, Larry M.	1
Jablin, Dr. Fred	1
Jackson, Marion	2
Jackson, Clyde B.	1
Jackson Company	110

Property Owner	No. Connections
Jagger, J. W.	2
Janssen, Ted	1
Jarl, Duval	1
Jenschke, Teddy	2
Johns, Robert A.	1
Johnson, Gene L.	1
Johnson, Ronald W.	1
Johnston, R. Bruce	22
Jones, Donald K.	10
Jones, Lawrence	2
Kanetzky, Charles C.	1
Karhan, James R.	2
Kasson, William J.	1
Kasson, II, John Adam	1
Keele, Alvin W.	1
Kehrer, David R.	2
Kehrer, Clifford	2
Kelm, Wallace G.	1
Kemp, Willie	1
Kett, Robert J.	1
Key, Sandra	3
Key, Mary	2
Key, Glynn C.	1
Kieschnick, Randy	1
Kingston, Jr., Austin G.	3
Kirchner, H. E.	2
Kivlin, Sylvion	2
Koenig, Don W.	1
Koonce, Gene K.	1
Kristaponis, Donna H.	1
Krupp, Steven A.	1
La Valle, Gregory	1
Labenski, Robert	2
Lane, Jr., Robert	1
Lawless, Tommy	4
Lawson, Bob	3
LeBlanc, Ackney P.	1
LeBoeuf, David	1
Lewis, M. R.	1
Lewis, Richard W.	1
Lewis, Ronnie	1
Libersat, David	1
Lightsey, Ken	1
Lilly, Claude B.	1
Lilly, Byron	1

Property Owner	No. Connections
Lindsay, Bill	1
Loeffler, S. Lyn	1
Lowenthal, Eugene	1
Luedecke, Sue	3
Lunsford, Mark K.	1
Lysek, David A.	1
M.I.A.W. Joint Venture	50
MacDonald, Peggy	1
MacMorran, Thomas J.	1
Majetic, Richard	2
Majetic, Gabriele	1
Malkemus, Doug	1
Mann, A. E.	1
Mann, James E.	2
Mann, Gerald E.	34
Markley, Gregory	2
Martin, Jerry L.	1
Martinek, Jr., Thomas	1
Matheney, Richard	1
Maxson, Page	1
Mayo, Jr., Brady B.	1
McAlister, Charles K.	2
McAlister, Charles K.	1
McBee, K. D.	1
McCarthy, Joseph	1
McCartney, Barney C.	1
McClusky, Charles E.	1
McClymond, J. L.	3
McCowan, Jack M.	1
McCoy, Jolie	1
McDonald, Charles	3
McDougal, Benny C.	1
McElfresh, Henry Evan	1
McIlvain, Stroud	1
McManus, Mark	3
McManus, Mark G.	1
McNair, Melvin L.	2
McWilliams, J. F.	1
Meadows, Billie Jean	1
Medley, E. J.	1
Mefferd, Frank H.	2
Mendez, Walter	1
Merlo, James A.	1
Merrill, Robert J.	2
Miller, Alvin e.	1
Mills, Dan H.	1

Property Owner	No. Connections
Milstead Motors	1
Minard, Roger C.	1
Mitchell, Eric	1
Mitchell, Glenn W.	1
Moffett, M. L.	3
Molenaar, Russell	1
Monnig, Michael	1
Montague, Alene	1
Moore, Dr. E. Otis	1
Morse, Scott	5
Morse, Jerry L.	1
Murphy, Stuart T.	1
Murphy, Robert C.	2
Murphy, Marcus	250
Neill, Leslie M.	1
Neill, Leslie	1
Nelson, Stanley E.	1
Nesselhauf, Howard	2
Newberry, Gatewood	2
Nixon, Larry Jay	2
North, John W.	3
O'Daniel, Vivian R.	1
O'Day, W. K.	3
O'Dell, Michael	1
Oak Run West	20
Odem, W. R.	1
Oetzel, Brian	5
Olson, Richard	1
Orth, Jim	1
Ortosky, Mark F.	1
Oswald, Leonard I.	1
Overton, Jack	1
Palmer, Terry A.	1
Patteson, Byron E.	1
Pawlowski, Maj. Anthony	2
Payne, James E.	2
Payne, B. William	40
Peacock, Wayne W.	1
Pedernales Place	10
Peek, Michael A.	1
Pena, III Manuel	1
Penn, F. Walter	200
Penn Brothers Realty	600
Peterson, Joe W.	1
Phelan, James J.	2
Pinckney, Stephen Lee	1

Property Owner	No. Connections
Poplawski, Cas	1
Poston, Jesse C.	1
Potts, Clifford	1
Pouttu, Mauri E.	2
Prather, Don Alan	1
Price, Clayton	2
Priour, Eddie	2
Pruneda, Jose	3
Puryear, Odean	2
Putnam, Helen	5
Quiroz, Johnny	1
Ragsdale, Robert	1
Ramirez, David	1
Randall, Jerry	2
Rathbone, L. M.	3
Reagan, Gene A.	1
Redinger Const. Inc.	4
Rees, William I.	1
Reinhard, Jack E.	1
Reyes, Norberto	1
Rhodes, Alec	1
Rice, James W.	5
Riggs, Jim	1
Ritter, James Paul	1
Rivera, Adolfo	1
RLM Investments	240
Robb, Jean	3
Robbins, R. Robert	1
Roberts, Jerry L.	1
Roberts, David N.	1
Rogers, Jr. Frank	1
Ross, Fred C.	20
Roten, Alice L.	1
Rush, David T.	2
Russell Jr., M. D., William	2
Russell Jr., M. D., William	2
Ruthstrom, Carl R.	2
Ruyle, Don R.	2
Ryden, Michael L.	1
Saddletree Ranches, Inc.	700
Schenck, Richard A.	2
Schmidt, Catherine	1
Schoenfeld, Dennis R.	1
Schulz, Stanley	4
Scott, Spencer J.	5
Scott, Spencer J.	5

Property Owner	No. Connections
Searles, Don	1
Senn, Suzie	1
Sharp, Woody R.	1
Sheffield & Boortz Builders	1
Shelton, Clarence T.	2
Shelton Properties	5
Sheng, David	1
Sherrod, Lee	1
Sietsema, David K.	1
Sills, Larry	1
Sills, Gene	1
Silver Creek Ranch	3
Simon Jr., Martin H.	1
Simpson, Billy J.	1
Simpson, Worth	4
Smith, Rex D.	1
Smith, John A.	1
Smith, Lyndon J.	2
Smith, R. Matthew	1
Smith, Richard	2
Smith, Judy	3
Snider, Paul	2
Sobolik, Dean	1
Soper, Russell	10
Soward, Wamac F.	1
Spencer, James H.	1
Spraggins, Don	1
Sprague, Richard W.	3
Sprott, Rodney	3
Steitle, Mark	1
Steitle, Dale	17
Steitle, Dale	6
Stephens, L. Michael	2
Stewart, James M.	1
Stewart, Charles E.	1
Stranahan, Paul	1
Stuard, Robert L.	1
Sullivan II, Martin F.	2
SW Austin LTD	10
Swenson, A. J.	3
Taylor, John K.	2
Taylor, M. D.	1
Thames, Billie Sue	1
Thomas, Larry J.	1
Thompson, Margaret N.	1
Thongkhamsouk, Bouakeo	2

Property Owner	No. Connections
Thorkelsen, Arnold	1
Thornton, William J.	1
Thornton, Pat H.	1
Three D Investment Co.	1
Thurman, Kay	1
Thurman Jr., Will	150
Thurston, George B.	1
Tinsley, Maj. Danny E.	1
Tom, Gregory B.	5
Toms, Brian L.	1
Tortuga Land Co., Inc.	325
Toungate, R.	3
Toungate, Paul	5
Townes, Goss	50
Tsing, Kou	1
Turck, Florence	2
Uphoff, James E.	1
Vahrenkamp, Ferrell	1
Vandivier, Tom	1
Vast, Inc.	24
Velasquez,Marie L.	1
Voudouris, Irvin C.	2
Waldman, Laura R.	1
Ward, Madalyn	1
Wallace, Jon	1
Warlick, Wayne	4
Watts Jr., Fred	1
Weatherford, Doris	1
Webb, Mary	2
Weber, Andrew	3
Weekley, R. E.	1
Weekley, E. C.	1
Wegner, George W.	1
Welch, Mark	1
Wells, Willis E.	1
Wen, Michael	2
Werneski, Marshall	1
Werth, David	10
Werth Jr., Fred W.	10
Wheeler Jr., Carl F.	1
White, Betty L.	3
White, Robert B.	1
Whitefield, Bobby D.	1
Wiesner, Nina T.	1
Wilborn, Brock	1
Wilchar, Bruce	10
Wilkerson, Artis W.	1

Property Owner	No. Connections
Wilkins, Herman L.	2
Williams III, Knox	2
Wilson, Larry A.	1
Wilson, Ronnie	2
Wilson, James T.	1
Wise, Steven	1
Witting, Gus A.	2
Womac, Bill M.	1
Wood, James T.	1
Woodbridge, Jane A.	3
Wright, John F.	1
Wyly, Dan C.	1
Yeaman, Jerry	3

TABLE 2 - MAJOR SYSTEM PARTICIPANTS

Participant	No. of Connections	Location
Friendship Ranch	1,000	Near U.S. Hwy 290 east of Dripping Springs
Deer Creek Ranch	1,000	Hamilton Pool Road at Ranch Road 12
Saddle Tree Ranch	700	Hamilton Pool Road at Ranch Road 12
Penn Tract	600	Just south of Dripping Springs
West Cave	325	Hamilton Pool Road at Ranch Road 12
Gee Ranch	300	East of Fitzhugh Road and Ranch Road 12 intersection
Vista Bell Ranch	250	Hamilton Pool Road near Ranch Road 12
Rooster Springs Ranch	240	Near U.S. Hwy 290 east of Dripping Springs
Petmecky Place	200	West of Fitzhugh Road and Ranch Road 12 intersection
Farley Ranch	200	U.S. Hwy 290 at County Road 187
Thurman Tract	150	U.S. Hwy 290 east of Dripping Springs
Berkley/Cannon/Scott Morris Tract	150	Just east of Dripping Springs
Sunset Canyon	110	U.S. Hwy 290 east of Dripping Springs
Double L Ranch	100	Just north of Dripping Springs

TABLE 2 - MAJOR SYSTEM PARTICIPANTS (cont.)

Participant	No. of Connections	Location
Jack Howell Property	100	Just east of Dripping Springs
Gaines Tract	90	West of Fitzhugh Road and Ranch Road 12 intersection
Agnell Tract	75	West of Fitzhugh Road and Ranch Road 12 intersection

TABLE 3 - SUPPLY SYSTEM FACILITY CAPACITIES

Facility Parameter	Proposed Service Connections	Raw Water Intake	Treatment Plant	Booster Pumping	Total Storage	Ground Storage	Elevated Storage
Total Required Capacity	7,000	4,200[1] gpm	4,200 gpm	14,000 gpm	1.40 mg	0.56 mg	0.84 mg
Total Proposed Capacity	7,000	5,600 gpm	4,200 gpm	14,000 gpm	1.45 mg	0.56 mg	0.89 mg
(1410') Northern Zone Required Capacity	5,500	-	-	11,100 gpm	1.11 mg	0.56 mg	0.55 mg
Northern Zone Proposed Capacity	5,500	-	-	11,100 gpm	1.16 mg	0.56 mg	0.60 mg
(1240') Central Zone Required Capacity	1,450	-	-	2,900 gpm	0.29 mg	-	0.29 mg
Central Zone Proposed Capacity	1,450	-	-	2,900 gpm	0.29 mg	-	0.29 mg

Note:

[1] Firm Capacity

TABLE 4 - PROPOSED SUPPLY FACILITIES FOR LAKE TRAVIS ALTERNATIVE

Item	Total Capacity	Proposed Facilities
Intake Structure	5,600 gpm	4-1,400 gpm pumps
Treatment Plant		
Intake Pumps	5,600 gpm	4-1,400 gpm pumps
High Service Pumps	14,000 gpm	4-3,500 gpm pumps
Clearwell Storage	300,000 gals	1-300,000 gal.ground storage reservoir
Booster Pump Station 1	14,000 gpm 50,000 gals.	4-3,500 gpm pumps 1-50,000 ground storage reservoir
Booster Pump Station 2	6,500 gpm 500,000 gals.	4-1,625 gpm pumps 1-500,000 ground storage reservoir
Elevated Storage	600,000 gals.	1-350,000 reservoir (ET 1) 1-250,000 reservoir (ET 2)

TABLE 5 - RAW WATER QUALITY

Alkalinity, mg/l $CaCO_3$	153
Calcium, mg/l	42
Chloride, mg/l	36
Color	0
Iron, mg/l	0.010
Potassium, mg/l	1.9
Magnesium, mg/l	26
Manganese, mg/l	0.004
Sodium, mg/l	35
pH	7.80
Sulfate, mg/l	39
TDS, mg/l	492
Turbidity, NTU	0.4

Note: Information taken from report on "Site Selection and Preliminary Design Report Water Treatment Plant No. 4" prepared by Lake Travis Consultants for the City of Austin.

TABLE 6 - WATER TREATMENT PLANT CONCEPTUAL DESIGN UNIT CAPACITY

1. Design Flows

Design Capacity:

Average daily flow	3.7 mgd
Peak daily flow	6.1 mgd
Firm capacity of intake pumps	6.1 mgd

2. Rapid Mixing

Number of units	2
Type	In-line static mixers
Sizes	1-20-inch diameter with multiple stages 1-18-inch diameter with multiple stages
Velocity gradient G	500-1,200
Minimum Reynolds number	300,000

3. Flocculation - Clarification

Number of units	2
Type of flocculation	Vacuum chambers operating on a pulsation cycle
Type of clarification	Sludge blanket with inclined plate settlers
Clarification surface area per unit	1,280 sq.ft.
Average surface overflow rate	1.09 gpm/sq.ft.
Peak surface overflow rate	1.77 gpm/sq.ft.
Average detention time	117 min.
Peak detention time	72 min.

4. Filtration

Number of filter cells	4
Total filter area	1,440 sq.ft.
Cell dimensions	18 ft. x 20 ft.
Cell surface area	360 sq.ft.
Media	18 in. Anthracite 12 in. Sand
Available filter head	4 ft.

Filter Rates:	3 cells operating	4 cells operating
Average	2.4 gpm/sq.ft.	1.9 gpm
Peak daily	4.0 gpm/sq.ft.	3.0 gpm/sq.ft.

TABLE 6 - WATER TREATMENT PLANT CONCEPTUAL DESIGN UNIT CAPACITY (cont.)

4. Filtration (cont.)

Backwash Rates:

Average water backwash	15 gpm/sq.ft.
Maximum water backwash	19 gpm/sq.ft.
Air scour backwash	5 cfm/sq.ft.

Special Features:

- Influent flow splitting using siphon system.
- Filter backwash waste discharge using siphon system.
- Variable filtering rates without rate-of-flow controllers.

5. Clearwell Storage

Number of units	1
Unit dimensions	100 ft. x 40 ft. x 10 ft. SWD
Unit volume	0.30 mg
Hydraulic detention time	
Average	1.96 hours
Peak	1.19 hours

Units are sized to provide adequate detention time for the chlorination disinfection process. Further analysis should be performed to determine whether the ammonification process is necessary to control the formation of trihalomethanes.

6. High Service Lift Pumps

Number of units	4
Type	Centrifugal, Vertical Turbine
Unit pump capacity	1,400 gpm
Firm pumping capacity	6.1 mgd

Pump capacities are sized to match the raw water intake pump capacities.

7. Backwash Waste Storage

Number of units	1
Unit volume	255,000 gal.
Estimated backwash/return flows	
Average	.39 mgd
Peak day	.76 mgd
Hydraulic detention time	
Average	15.7 hours
Peak Day	8.0 hours

TABLE 6 - WATER TREATMENT PLANT CONCEPTUAL DESIGN UNIT CAPACITY (cont.)

8. Sludge Handling

Estimated chemical sludge production	
Average	1,200 lbs/day
Peak Day	1,950 lbs/day
Unthickened sludge flow at 2,500 mg/l solids	
Average	58,000 gpd
Peak Day	94,000 gpd

9. Sludge Thickener

Number of units	1
Unit dimensions	22 ft.dia. x 12 ft. SWD
Sludge solids loading	
Average	3.2 lbs/sq.ft./day
Peak day	5.1 lbs/sq.ft./day
Thickened sludge flows at 2.0% solids concentration	
Average	7,200 gpd
Peak day	11,700 gpd

10. Sludge Holding Tank

Number of units	1
Unit dimensions	29 ft.dia. x 12 ft. SWD
Available storage detention	
Average	8.2 days
Peak day	5.0 days

11. Sludge Drying Beds

Use of four beds provides flexibility in operation and sludge hauling.

Type	Vacuum-assisted sludge drying beds
Number of beds	4
Unit surface area per bed	800 sq.ft.
Total surface area	3,200 sq.ft.
Sludge solids loading rate	1.5 lbs./sq.ft./cycle
Operating cycles per week	3
Sludge solids loading factor	4.5 lbs/sq.ft./week
Drying bed area requirements	
Average weekly (8,400 lbs. solids)	1,867 sq.ft.
*Maximum (9,900 lbs. solids)	2,200 sq.ft.
Dewatered solids concentration	10-15%
Polymer feed for sludge conditioning.	

* Maximum includes two peak days per week.

TABLE 6 - WATER TREATMENT PLANT CONCEPTUAL DESIGN UNIT CAPACITY (cont.)

12. Disinfection Chemical Feed Systems

Chlorine gas feed using multiple application points

Number of chlorinators	3
Total chlorine feed capacity	
Average	400 lbs./day
Peak	650 lbs./day

Remote vacuum chlorinators with variable dosage; flow proportional control at each application point.

13. Coagulant Chemical Feed System

Liquid alum storage and feed

35-36°Be[1] alum feed at 10-40 mg/l dosage	
Average feed rate	1,234 lbs./day
Peak feed rate	2,035 lbs./day
Liquid feed rates at 35°Be[1]	
Average	240 gpd
Peak	400 ggpd

Flow proportional control of Alum feed

Liquid storage volume	7,500 gal.

Polymer storage and feed	
Polymer feed at 0.25-2 mg/l dosage	
Average feed rate	62 lbs./day
Peak feed rate	102 lbs./day

TABLE 7 - PROBABLE SYSTEM COST ESTIMATE
LAKE TRAVIS WATER SUPPLY

Item	Quantity	Unit Cost	Total Cost
Raw Water Intake Structure	6.1 mgd	$ L.S.	$ 1,000,000
Water Treatment Plant	6.1 mgd	L.S.	4,195,000
Booster Pump Station No. 1	--	L.S.	365,000
Booster Pump Station No. 2	--	L.S.	496,000
Elevated Tank 1	350,000 gal.	0.85/gal.	297,500
Elevated Tank 2	250,000 gal.	0.85/gal.	212,500
24-Inch Raw Water Main	21,000 L.F.	70/L.F.	1,470,000
24-Inch Water Main	76,500 L.F.	70/L.F.	5,355,000
16-Inch Water Main	36,000 L.F.	45/L.F.	1,620,000
24-Inch Butterfly Valve	55	4,300 Each	236,500
24-Inch Pressure Regulating Valve	1	20,000 Each	20,000
16-Inch Gate Valve	25	4,400 Each	110,000
Fire Hydrants	60	1,200 Each	72,000
Telemetry System	--	L.S.	75,000
Subtotal			$15,524,500
Engineering & Contingencies (25%)			3,881,100
TOTAL			$19,405,600

TABLE 8 - PROBABLE SYSTEM COST ESTIMATE
CITY OF AUSTIN WATER SUPPLY

Item	Quantity	Unit Cost	Total Cost
Boster Pump Station No. 1	--	$ L.S.	$ 420,000
Booster Pump Station No. 2	--	L.S.	490,000
Booster Pump Station No. 3	--	L.S.	450,000
Elevated Tank 1	350,000 gal.	0.85/gal.	297,500
Elevated Tank 2	250,000 gal.	0.85/gal.	212,500
24-Inch Water Main	95,000 L.F.	70.00/L.F.	6,650,000
16-Inch Water Main	20,000 L.F.	45.00/L.F.	900,000
24-Inch Butterfly Valve	65	4,300.00 Each	279,500
24-Inch Pressure Regulating Valve	1	20,000.00 Each	20,000
16-Inch Gate Valve	15	4,400.00 Each	66,000
Fire Hydrants	60	1,200.00 Each	72,000
Telemetry System	1	L.S.	75,000
Subtotal			$ 9,932,500
Engineering & Contingencies (30%)			2,483,100
TOTAL Construction Costs			$12,415,600
Capital Recovery Fees	7,000 LUEs	1,141/LUE	7,987,000
TOTAL			$20,402,600

TABLE 9 - PROBABLE SYSTEM COST ESTIMATE
THE UPLANDS WATER SUPPLY

Item	Quantity	Unit Cost	Total Cost
Raw Water Intake Structure	6.1 mgd	$ L.S.	$ 1,000,000
Water Treatment Plant	6.1 mgd	L.S.	4,195,000
Booster Pump Station No. 1	--	L.S.	365,000
Booster Pump Station No. 2	--	L.S.	496,000
Elevated Tank 1	350,000 gal.	0.85/gal.	297,500
Elevated Tank 2	250,000 gal.	0.85/gal.	212,500
24-Inch Raw Water Main	10,400 L.F.	70/L.F.	728,000
24-Inch Water Main	85,800 L.F.	70/L.F.	6,006,000
16-Inch Water Main	36,000 L.F.	45/L.F.	1,620,000
24-Inch Butterfly Valve	60	4,300 Each	258,000
24-Inch Pressure Regulating Valve	1	20,000.00 Each	20,000
16-Inch Gate Valve	25	4,400 Each	110,000
Fire Hydrants	60	1,200 Each	72,000
Telemetry System	1	L.S.	75,000
Subtotal			$15,455,000
Engineering & Contingencies (25%)			3,863,800
TOTAL			$19,318,800

TABLE 10 - ESTIMATED PROBABLE ANNUAL O&M COST

Average Day Plant Capacity (mgd)	Electrical Costs	Chemical Costs	Labor	Repairs, Supplies, & Miscellaneous	Total O&M Costs	O&M Costs Per 1,000 Gallons
1.95	$250,000	$ 64,000	$ 82,000	$24,000	$420,000	$0.59
3.7	470,000	125,000	113,000	38,000	746,000	0.55

Note: Raw water costs are not included in the table above. Raw water estimated to be $0.21/1,000 gallons.

Average Day Capacity	Annual Raw Water Cost	Annual Product Water Cost	Product Water Cost Per 1,000 Gallons
1.95 mgd	$150,000	$ 570,000	$0.80
3.7 mgd	284,000	1,027,000	0.76

TABLE 11A - SERVICE AREA NO. 1 APPROACH MAIN PROBABLE COSTS

Location: Fitzhugh Road and West of Ranch Road 12.

Description: 9,000 L.F. of 16-inch and 6,000 L.F. of 12-inch waterline

Participants:
1. Agnell Tract - 75 Connections
2. Gaines Tract - 90 Connections
3. Petmecky Place - 200 Connections
4. Douglas Estates - 25 Connections

Probable Cost Estimate:

Item	Quantity	Unit Cost	Total Cost
Segment 1			
16-Inch Waterline	9,000 L.F.	$ 45/L.F.	$405,000
16-Inch Gate Valve	6	4,400 Each	26,400
Drain Valve (FH)	5	1,200 Each	6,000
Sub-Total			$437,400
Engineering & Contingency (25%)			109,400
TOTAL			$546,800
Segment 2			
12-Inch Waterline	8,000 L.F.	$ 35/L.F.	$280,000
12-Inch Gate Valve	6	1,000 Each	6,000
Drain Valves (FH)	4	1,200 Each	4,800
Subtotal			$290,800
Engineering & Contingency (25%)			72,700
TOTAL			$363,500
GRAND TOTAL			$910,300

TABLE 11B - SERVICE AREA NO. 1 PROBABLE APPROACH MAIN COST PARTICIPATION

		Douglas Estates		Petmecky Place		Gaines Tract		Agnell Tract	
Segment	Estimated Cost	Pro-Rata Share	Cost Share	Pro-Rata Share	Cost Share	Pro-Rata Share	Cost Share	Pro-Rata Share	Cost Share
1	$546,800	6.41%	$35,050	51.28%	$280,400	23.08%	$126,200	19.23%	$105,150
2	363,500	13.16%	47,840	-0-	-0-	47.37%	172,190	39.47%	143,470
TOTAL	$910,300		$82,890		$280,400		$298,390		$248,620

TABLE 12A - SERVICE AREA NO. 2 APPROACH MAIN PROBABLE COSTS

Location: Ranch Road 12 from the intersection of Ranch Road 12 and Fitzhugh Road to a location 5000 feet south of Fitzhugh Road.

Description: 5,000 L.F. of 12-inch waterline

Participants:
1. Double L Tract - 100 Connections
2. Barton Creek Ranch - 17 Connections

Probable Cost Estimate:

Item	Quantity	Unit Cost	Total Cost
12-Inch Waterline	5,000 L.F.	$ 35/L.F.	$175,000
12-Inch Gate Valve	3	1,000 Each	3,000
Drain Valves (FH)	3	1,200 Each	3,600
Subtotal			$181,600
Engineering & Contingency (25%)			45,400
TOTAL			$227,000

TABLE 12B - SERVICE AREA NO. 2 PROBABLE APPROACH MAIN COST PARTICIPATION

	Double L Tract		Barton Creek Ranch	
Estimated Cost	Pro-Rata Share	Cost Share	Pro-Rata Share	Cost Share
$227,000	85.47%	$194,020	14.53%	$32,980

TABLE 13A - SERVICE AREA NO. 3 APPROACH MAIN PROBABLE COST

Location: East of Trautwein Road approximately 7,000 feet south of Fitzhugh Road

Description: 2,500 L.F. of 12-inch waterline

Participants:
1. Big Country - 25 Connections
2. Pauls Valley - 2 Connections

Probable Cost Estimate:

Item	Quantity	Unit Cost	Total Cost
12-Inch Waterline	2,500 L.F.	$ 35/L.F.	$ 87,500
12-Inch Gate Valve	3	1,000 Each	3,000
Drain Valves	2	1,200 Each	2,400
Subtotal			$ 92,900
Engineering & Contingency (25%)			23,200
TOTAL			$116,100

TABLE 13B - SERVICE AREA NO. 3 PROBABLE APPROACH MAIN COST PARTICIPATION

	Big Country		Pauls Valley	
Estimated Cost	Pro-Rata Share	Cost Share	Pro-Rata Share	Cost Share
$116,100	92.59%	$107,500	7.41%	$8,600

TABLE 14 - SERVICE AREA NO. 4 APPROACH MAIN PROBABLE COST

Location: Hwy. 290 from County Road 163 to Fitzhugh Road

Description: 8,000 L.F. of 12-inch waterline

Participants: Thurman Tract - 150 connections

Probable Cost Estimate:

Item	Quantity	Unit Cost	Total Cost
12-Inch Waterline	8,000 L.F.	$ 35/L.F.	$280,000
12-Inch Gate Valve	5	1,000 Each	5,000
Drain Valves	4	1,200 Each	4,800
Subtotal			$289,800
Engineering & Contingency (25%)			72,500
TOTAL			$362,300

TABLE 15A - SERVICE AREA NO. 5 APPROACH MAIN PROBABLE COSTS

Location: Along County Road 163 from Highway 290 to FM 1826 and along FM 1826 from County Road 163 to a location 6,000 feet east of County Road 163.

Description: 25,000 L.F. of 12-inch waterline

Participants:
1. Friendship Ranch - 1,000 Connections
2. Bear Creek Estates - 21 Connections
3. Bear Creek Oaks - 17 Connections

Cost Estimate:

Item	Quantity	Unit Cost	Total Cost
Segment 1			
12-Inch Waterline	19,000 L.F.	$ 35/L.F.	$ 665,000
12-Inch Gate Valve	20	1,000 Each	20,000
Drain Valve (FH)	10	1,200 Each	12,000
Sub-Total			$ 697,000
Engineering & Contingency (25%)			174,300
TOTAL			$ 871,300
Segment 2			
12-Inch Waterline	3,000 L.F.	$ 35/L.F.	$ 105,000
12-Inch Gate Valve	4	1,000 Each	4,000
Drain Valves (FH)	2	1,200 Each	2,400
Subtotal			$ 111,400
Engineering & Contingency (25%)			27,900
TOTAL			$ 139,300

TABLE 15A - SERVICE AREA NO. 5 APPROACH MAIN PROBABLE COSTS (cont.)

Segment 3			
12-Inch Waterline	3,000 L.F.	$ 35/L.F.	$ 105,000
12-Inch Gate Valve	4	1,000 Each	4,000
Drain Valves (FH)	2	1,200 Each	2,400
Subtotal			$ 111,400
Engineering & Contingency (25%)			27,900
TOTAL			$ 139,300
GRAND TOTAL			$1,149,900

TABLE 15B - SERVICE AREA NO. 5 PROBABLE APPROACH MAIN COST PARTICIPATION

		Friendship Ranch		Bear Creek Estates		Bear Creek Oaks	
Segment	Estimated Cost	Pro-Rata Share	Cost Share	Pro-Rata Share	Cost Share	Pro-Rata Share	Cost Share
1	$ 871,300	96.34%	$839,410	2.02%	$17,600	1.64%	$ 14,290
2	139,300	-0-	-0-	55.26%	76,980	44.74%	62,320
3	139,300	-0-	-0-	-0-	-0-	100.00%	139,300
TOTAL	$1,149,900		$839,410		$94,580		$215,910

TABLE 16 - SERVICE AREA NO. 6 APPROACH MAIN PROBABLE COST

Location: Along a county road located south of Highway 290 and 3 miles east of the Dripping Springs Corporate limits

Description: 6,000 L.F. of 12-inch waterline

Participants: Hays Country Acres - 27 Connections

Cost Estimate:

Item	Quantity	Unit Cost	Total Cost
12-Inch Waterline	6,000 L.F.	$ 35/L.F.	$210,000
12-Inch Gate Valve	7	1,000 Each	7,000
Drain Valves (FH)	4	1,200 Each	4,800
Subtotal			$221,800
Engineering & Contingency (25%)			55,500
TOTAL			$277,300

TABLE 17A - SERVICE AREA NO. 7 APPROACH MAIN PROBABLE COSTS

Location: Along Highway 290 from the proposed elevated storage tank to Ranch Road 12 and along Ranch Road 12 from Highway 290 to Ranch Road 150.

Description: 2,000 L.F. of 16-inch and 10,000 L.F. of 12-inch waterline

Participants:
1. Howell Tract - 100 Connections
2. Penn Tract - 600 Connections
3. Farley Ranch - 250 Connections

Cost Estimate:

Item	Quantity	Unit Cost	Total Cost
Segment 1			
16-Inch Waterline	2,000 L.F.	$ 45/L.F.	$ 90,000
16-Inch Gate Valve	2	1,000 Each	2,000
Drain Valve (FH)	2	1,200 Each	2,400
Sub-Total			$ 94,400
Engineering & Contingency (25%)			23,600
TOTAL			$118,000
Segment 2			
12-Inch Waterline	3,000 L.F.	$ 35/L.F.	$105,000
12-Inch Gate Valve	3	1,000 Each	3,000
Drain Valves (FH)	2	1,200 Each	2,400
Subtotal			$110,400
Engineering & Contingency (25%)			27,600
TOTAL			$138,000

TABLE 17A - SERVICE AREA NO. 7 APPROACH MAIN PROBABLE COSTS

Segment 3			
12-Inch Waterline	7,000 L.F.	$ 35/L.F.	$245,000
12-Inch Gate Valve	8	1,000 Each	8,000
Drain Valves (FH)	4	1,200 Each	4,800
Subtotal			$257,800
Engineering & Contingency (25%)			64,500
TOTAL			$322,300
GRAND TOTAL			$578,300

TABLE 17B - SERVICE AREA NO. 7 PROBABLE APPROACH MAIN COST PARTICIPATION

Segment	Estimated Cost	Farley Ranch Pro-Rata Share	Farley Ranch Cost Share	Howell Tract Pro-Rata Share	Howell Tract Cost Share	Penn Tract Pro-Rata Share	Penn Tract Cost Share
1	$ 118,000	26.32%	$ 31,050	10.53%	$12,420	63.16%	$ 74,530
2	138,000	-0-	-0-	14.29%	19,720	85.71%	118,280
3	322,300	-0-	-0-	-0-	-0-	100.00%	322,300
TOTAL	$ 578,300		$ 31,050		$32,140		$515,110

TABLE 18 - SERVICE AREA NO. 8 APPROACH MAIN PROBABLE COSTS [1.]

Location: Along Highway 290 from Ranch Road 150 to a county road located approximately 3.5 miles west of Ranch Road 150.

Description: 19,000 L.F. of 16-inch waterline.

Participants: Farley Ranch - 200 Connections

Cost Estimate:

Item	Quantity	Unit Cost	Total Cost
16-Inch Waterline	19,000 L.F.	$ 45/L.F.	$ 855,000
16-Inch Gate Valve	15	4,400 Each	66,000
Drain Valve (FH)	10	1,200 Each	12,000
Sub-Total			$ 933,000
Engineering & Contingency (25%)			233,300
TOTAL			$1,166,300

1. Some of the connections may exist within the 1580 foot pressure zone. Service to these connections would require additional booster pumpage and storage capacity. More detailed analysis should be performed within this area.

TABLE 19

Scenario 1

Bond Issue Requirements

Construction Costs	$20,000,000
Nonconstruction Costs	
Legal	790,500
Fiscal	263,500
Bond Discount	527,000
Capitalized Interest	4,743,000
Cost of Issuance	26,000
Total Nonconstruction Costs	$6,350,000
TOTAL BOND ISSUE REQUIREMENTS	$26,350,000

DATE	PRINCIPAL	RATE	INTEREST	P & I	ANNUAL INTEREST	ANNUAL P & I
01-Mar-88			1,185,750.00	1,185,750.00		
01-Sep-88			1,185,750.00	1,185,750.00	2,371,500.00	2,371,500.00
01-Mar-89			1,185,750.00	1,185,750.00		
01-Sep-89			1,185,750.00	1,185,750.00	2,371,500.00	2,371,500.00
01-Mar-90			1,185,750.00	1,185,750.00		
01-Sep-90			1,185,750.00	1,185,750.00	2,371,500.00	2,371,500.00
01-Mar-91			1,185,750.00	1,185,750.00		
01-Sep-91			1,185,750.00	1,185,750.00	2,371,500.00	2,371,500.00
01-Mar-92			1,185,750.00	1,185,750.00		
01-Sep-92			1,185,750.00	1,185,750.00	2,371,500.00	2,371,500.00
01-Mar-93			1,185,750.00	1,185,750.00		
01-Sep-93	900,000.00	9.000	1,185,750.00	2,085,750.00	2,371,500.00	3,271,500.00
01-Mar-94			1,145,250.00	1,145,250.00		
01-Sep-94	975,000.00	9.000	1,145,250.00	2,120,250.00	2,290,500.00	3,265,500.00
01-Mar-95			1,101,375.00	1,101,375.00		
01-Sep-95	1,075,000.00	9.000	1,101,375.00	2,176,375.00	2,202,750.00	3,277,750.00
01-Mar-96			1,053,000.00	1,053,000.00		
01-Sep-96	1,150,000.00	9.000	1,053,000.00	2,203,000.00	2,106,000.00	3,256,000.00
01-Mar-97			1,001,250.00	1,001,250.00		
01-Sep-97	1,275,000.00	9.000	1,001,250.00	2,276,250.00	2,002,500.00	3,277,500.00
01-Mar-98			943,875.00	943,875.00		
01-Sep-98	1,375,000.00	9.000	943,875.00	2,318,875.00	1,887,750.00	3,262,750.00
01-Mar-99			882,000.00	882,000.00		
01-Sep-99	1,500,000.00	9.000	882,000.00	2,382,000.00	1,764,000.00	3,264,000.00
01-Mar-2000			814,500.00	814,500.00		
01-Sep-2000	1,650,000.00	9.000	814,500.00	2,464,500.00	1,629,000.00	3,279,000.00
01-Mar-2001			740,250.00	740,250.00		
01-Sep-2001	1,775,000.00	9.000	740,250.00	2,515,250.00	1,480,500.00	3,255,500.00
01-Mar-2002			660,375.00	660,375.00		
01-Sep-2002	1,950,000.00	9.000	660,375.00	2,610,375.00	1,320,750.00	3,270,750.00
01-Mar-2003			572,625.00	572,625.00		
01-Sep-2003	2,125,000.00	9.000	572,625.00	2,697,625.00	1,145,250.00	3,270,250.00
01-Mar-2004			477,000.00	477,000.00		
01-Sep-2004	2,325,000.00	9.000	477,000.00	2,802,000.00	954,000.00	3,279,000.00
01-Mar-2005			372,375.00	372,375.00		
01-Sep-2005	2,525,000.00	9.000	372,375.00	2,897,375.00	744,750.00	3,269,750.00
01-Mar-2006			258,750.00	258,750.00		
01-Sep-2006	2,750,000.00	9.000	258,750.00	3,008,750.00	517,500.00	3,267,500.00
01-Mar-2007			135,000.00	135,000.00		
01-Sep-2007	3,000,000.00	9.000	135,000.00	3,135,000.00	270,000.00	3,270,000.00
	26,350,000.00		34,544,250.00	60,894,250.00	34,544,250.00	60,894,250.00

BOND YEARS	383,825.000	INT. START DATE	01-Sep-87
AVG.LIFE	14.566 YRS.	DELIVERY DATE	01-Sep-87
AVG.COUPON	9.0000 %	ACCRUED INTEREST	$0.00
N.I.C.	9.0000 %	PREMIUM	$0.00

PREPARED BY: Texas Capital Markets, Inc.
05-May-87

[Table 19 continued]

DSWD TR3

DRIPPING SPRINGS WATER DISTRICT
(Projected Tax Rate Proforma)

Fiscal Year	Assessed Valuation (1)	Debt Ser. Tax Rate (per $100)	Tax Coll. @ 90%	Capital. Interest (2)	District funds Available	Projected Debt Serv. Require. $26,350,000 SER. 1988 (3)	Available Funds after Debt Ser.	Accum. Fund Balance
1988	348,162,812	0.82	2,569,442	4,743,000	7,312,442	2,371,500	4,940,942	4,940,942
1989	365,570,953	0.82	2,697,914		2,697,914	2,371,500	326,414	5,267,355
1990	383,849,500	0.82	2,832,809		2,832,809	2,371,500	461,309	5,728,664
1991	403,041,975	0.82	2,974,450		2,974,450	2,371,500	602,950	6,331,614
1992	423,194,074	0.82	3,123,172		3,123,172	2,371,500	751,672	7,083,287
1993	444,353,778	0.82	3,279,331		3,279,331	3,271,500	7,831	7,091,117
1994	466,571,467	0.82	3,443,297		3,443,297	3,265,500	177,797	7,268,915
1995	489,900,040	0.82	3,615,462		3,615,462	3,277,750	337,712	7,606,627
1996	514,395,042	0.82	3,796,235		3,796,235	3,256,000	540,235	8,146,863
1997	540,114,794	0.82	3,986,047		3,986,047	3,277,500	708,547	8,855,410
1998	567,120,534	0.82	4,185,350		4,185,350	3,262,750	922,600	9,778,009
1999	595,476,560	0.65	3,483,538		3,483,538	3,264,000	219,538	9,997,547
2000	625,250,388	0.65	3,657,715		3,657,715	3,279,000	378,715	10,376,262
2001	656,512,908	0.65	3,840,601		3,840,601	3,255,500	585,101	10,961,362
2002	689,338,553	0.65	4,032,631		4,032,631	3,270,750	761,881	11,723,243
2003	723,805,481	0.65	4,234,262		4,234,262	3,270,250	964,012	12,687,255
2004	759,995,755	0.08	547,197		547,197	3,279,000	(2,731,803)	9,955,452
2005	797,995,543	0.00	0		0	3,269,750	(3,269,750)	6,685,702
2006	837,895,320	0.00	0		0	3,267,500	(3,267,500)	3,418,202
2007	879,790,086	0.00	0		0	3,270,000	(3,270,000)	148,202

(1) Assessed Valuations are as of January 1 of the previous year, and are assumed to grow at a rate of 5% per year.

(2) The District will capitalize two years of interest on the Bonds.

(3) Interest has been calculated at a rate of 9.00% for purposes of illustration.

05-May-87

Table 19 continued

DRIPPING SPRINGS INDEPENDENT SCHOOL DISTRICT
OVERLAPPING TAXES

Taxing Jurisdiction	1986 TAX RATES		
Dripping Springs I.S.D.	$1.160	$1.160	$1.160
Hays County	0.228	-	0.228
Travis County	-	0.191	-
Springlake Subdivision Road District	-	-	0.750
Northwest Hays County Fire Prevention District	0.030	0.030	0.030
TOTAL OVERLAPPING TAX	$1.418	$1.381	$2.168

[Table 19 continued]

TABLE 20

Scenario 2
Bond Issue Requirements

Construction Costs	$20,000,000
Nonconstruction Costs	
Legal	639,750
Fiscal	213,250
Bond Discount	426,500
Capitalized Interest	0
Cost of Issuance	45,500
Total Nonconstruction Costs	$1,325,000
TOTAL BOND ISSUE REQUIREMENTS	$21,325,000

DATE	PRINCIPAL	RATE	INTEREST	P & I	ANNUAL INTEREST	ANNUAL P & I
01-Mar-88			959,625.00	959,625.00		
01-Sep-88			959,625.00	959,625.00	1,919,250.00	1,919,250.00
01-Mar-89			959,625.00	959,625.00		
01-Sep-89			959,625.00	959,625.00	1,919,250.00	1,919,250.00
01-Mar-90			959,625.00	959,625.00		
01-Sep-90			959,625.00	959,625.00	1,919,250.00	1,919,250.00
01-Mar-91			959,625.00	959,625.00		
01-Sep-91			959,625.00	959,625.00	1,919,250.00	1,919,250.00
01-Mar-92			959,625.00	959,625.00		
01-Sep-92			959,625.00	959,625.00	1,919,250.00	1,919,250.00
01-Mar-93			959,625.00	959,625.00		
01-Sep-93	725,000.00	9.000	959,625.00	1,684,625.00	1,919,250.00	2,644,250.00
01-Mar-94			927,000.00	927,000.00		
01-Sep-94	800,000.00	9.000	927,000.00	1,727,000.00	1,854,000.00	2,654,000.00
01-Mar-95			891,000.00	891,000.00		
01-Sep-95	850,000.00	9.000	891,000.00	1,741,000.00	1,782,000.00	2,632,000.00
01-Mar-96			852,750.00	852,750.00		
01-Sep-96	925,000.00	9.000	852,750.00	1,777,750.00	1,705,500.00	2,630,500.00
01-Mar-97			811,125.00	811,125.00		
01-Sep-97	1,025,000.00	9.000	811,125.00	1,836,125.00	1,622,250.00	2,647,250.00
01-Mar-98			765,000.00	765,000.00		
01-Sep-98	1,125,000.00	9.000	765,000.00	1,890,000.00	1,530,000.00	2,655,000.00
01-Mar-99			714,375.00	714,375.00		
01-Sep-99	1,225,000.00	9.000	714,375.00	1,939,375.00	1,428,750.00	2,653,750.00
01-Mar-2000			659,250.00	659,250.00		
01-Sep-2000	1,325,000.00	9.000	659,250.00	1,984,250.00	1,318,500.00	2,643,500.00
01-Mar-2001			599,625.00	599,625.00		
01-Sep-2001	1,450,000.00	9.000	599,625.00	2,049,625.00	1,199,250.00	2,649,250.00
01-Mar-2002			534,375.00	534,375.00		
01-Sep-2002	1,575,000.00	9.000	534,375.00	2,109,375.00	1,068,750.00	2,643,750.00
01-Mar-2003			463,500.00	463,500.00		
01-Sep-2003	1,725,000.00	9.000	463,500.00	2,188,500.00	927,000.00	2,652,000.00
01-Mar-2004			385,875.00	385,875.00		
01-Sep-2004	1,875,000.00	9.000	385,875.00	2,260,875.00	771,750.00	2,646,750.00
01-Mar-2005			301,500.00	301,500.00		
01-Sep-2005	2,050,000.00	9.000	301,500.00	2,351,500.00	603,000.00	2,653,000.00
01-Mar-2006			209,250.00	209,250.00		
01-Sep-2006	2,225,000.00	9.000	209,250.00	2,434,250.00	418,500.00	2,643,500.00
01-Mar-2007			109,125.00	109,125.00		
01-Sep-2007	2,425,000.00	9.000	109,125.00	2,534,125.00	218,250.00	2,643,250.00
	21,325,000.00		27,963,000.00	49,288,000.00	27,963,000.00	49,288,000.00

BOND YEARS	310,700.000	INT. START DATE	01-Sep-87
AVG.LIFE	14.570 YRS.	DELIVERY DATE	01-Sep-87
AVG.COUPON	9.0000 %	ACCRUED INTEREST	$0.00
N.I.C.	9.0000 %	PREMIUM	$0.00

PREPARED BY: Texas Capital Markets, Inc.
05-May-87

[Table 20 continued]

DSWD_TR4

DRIPPING SPRINGS WATER DISTRICT
(Projected Tax Rate Proforma)

Fiscal Year	Assessed Valuation (1)	Debt Ser. Tax Rate (per $100)	Tax Coll. @ 90%	District funds Available	Projected Debt Serv. Require. $21,325,000 SER. 1988 (2)	Available Funds after Debt Ser.	Accum. Fund Balance
1988	348,162,812	0.67	2,099,422	2,099,422	1,919,250	180,172	180,172
1989	365,570,953	0.67	2,204,393	2,204,393	1,919,250	285,143	465,315
1990	383,849,500	0.67	2,314,612	2,314,612	1,919,250	395,362	860,677
1991	403,041,975	0.67	2,430,343	2,430,343	1,919,250	511,093	1,371,770
1992	423,194,074	0.67	2,551,860	2,551,860	1,919,250	632,610	2,004,380
1993	444,353,778	0.67	2,679,453	2,679,453	2,644,250	35,203	2,039,584
1994	466,571,467	0.67	2,813,426	2,813,426	2,654,000	159,426	2,199,010
1995	489,900,040	0.67	2,954,097	2,954,097	2,632,000	322,097	2,521,107
1996	514,395,042	0.67	3,101,802	3,101,802	2,630,500	471,302	2,992,409
1997	540,114,794	0.55	2,673,568	2,673,568	2,647,250	26,318	3,018,727
1998	567,120,534	0.55	2,807,247	2,807,247	2,655,000	152,247	3,170,974
1999	595,476,560	0.55	2,947,609	2,947,609	2,653,750	293,859	3,464,833
2000	625,250,388	0.55	3,094,989	3,094,989	2,643,500	451,489	3,916,322
2001	656,512,908	0.50	2,954,308	2,954,308	2,649,250	305,058	4,221,380
2002	689,338,553	0.50	3,102,023	3,102,023	2,643,750	458,273	4,679,654
2003	723,805,481	0.50	3,257,125	3,257,125	2,652,000	605,125	5,284,779
2004	759,995,755	0.50	3,419,981	3,419,981	2,646,750	773,231	6,058,009
2005	797,995,543	0.27	1,939,129	1,939,129	2,653,000	(713,871)	5,344,139
2006	837,895,320	0.00	0	0	2,643,500	(2,643,500)	2,700,639
2007	879,790,086	0.00	0	0	2,643,250	(2,643,250)	57,389

(1) Assessed Valuations are as of January 1 of the previous year, and are assumed to grow at a rate of 5% per year.

(2) Interest has been calculated at a rate of 9.00% for purposes of illustration.

05-May-87

[Table 20 continued]

DRIPPING SPRINGS INDEPENDENT SCHOOL DISTRICT
OVERLAPPING TAXES

Taxing Jurisdiction	1986 TAX RATES		
Dripping Springs I.S.D.	$1.160	$1.160	$1.160
Hays County	0.228	-	0.228
Travis County	-	0.191	-
Springlake Subdivision Road District	-	-	0.750
Northwest Hays County Fire Prevention District	0.030	0.030	0.030
TOTAL OVERLAPPING TAX	$1.418	$1.381	$2.168

[Table 20 continued]

TABLE 21

DRIPPING SPRINGS REGIONAL WATER SYSTEM

Revenue Bond Analysis

Scenario 1*

	Annual Interest		No. of Taps		Months		
Monthly Debt Service Fee***	$ 2,371,000	÷	7000	÷	12	=	$28/MO

	Bond Principal		No. of Taps		
Tap Fee****	$26,350,000	÷	7000	=	$3,764/TAP

Scenario 2**

	Annual Interest		No. of Taps		Months		
Monthly Debt Service Fee***	$ 1,919,250	÷	7000	÷	12	=	$23/MO

	Bond Principal		No. of Taps		
Tap Fee****	$21,325,000	÷	7000	=	$3,046/TAP

*From Table 19

**From Table 20

***Monthly Debt Service Fee paid only until Tap Fee paid to retire principal of bond issue

****Tap Fee Paid at times appropriate to retire bond principal

TABLE 22

DRIPPING SPRINGS REGIONAL WATER SYSTEM

Combination Ad Valorem Tax/Tap Fee Revenue Bonds

	1996 Tax Rate With Tap Fees (350 Taps)****
Scenario 1*	
Ad Valorem Tax Rate***	$ .49/$100 AV
Scenario 2**	
Ad Valorem Tax Rate***	$ .40/$100 AV

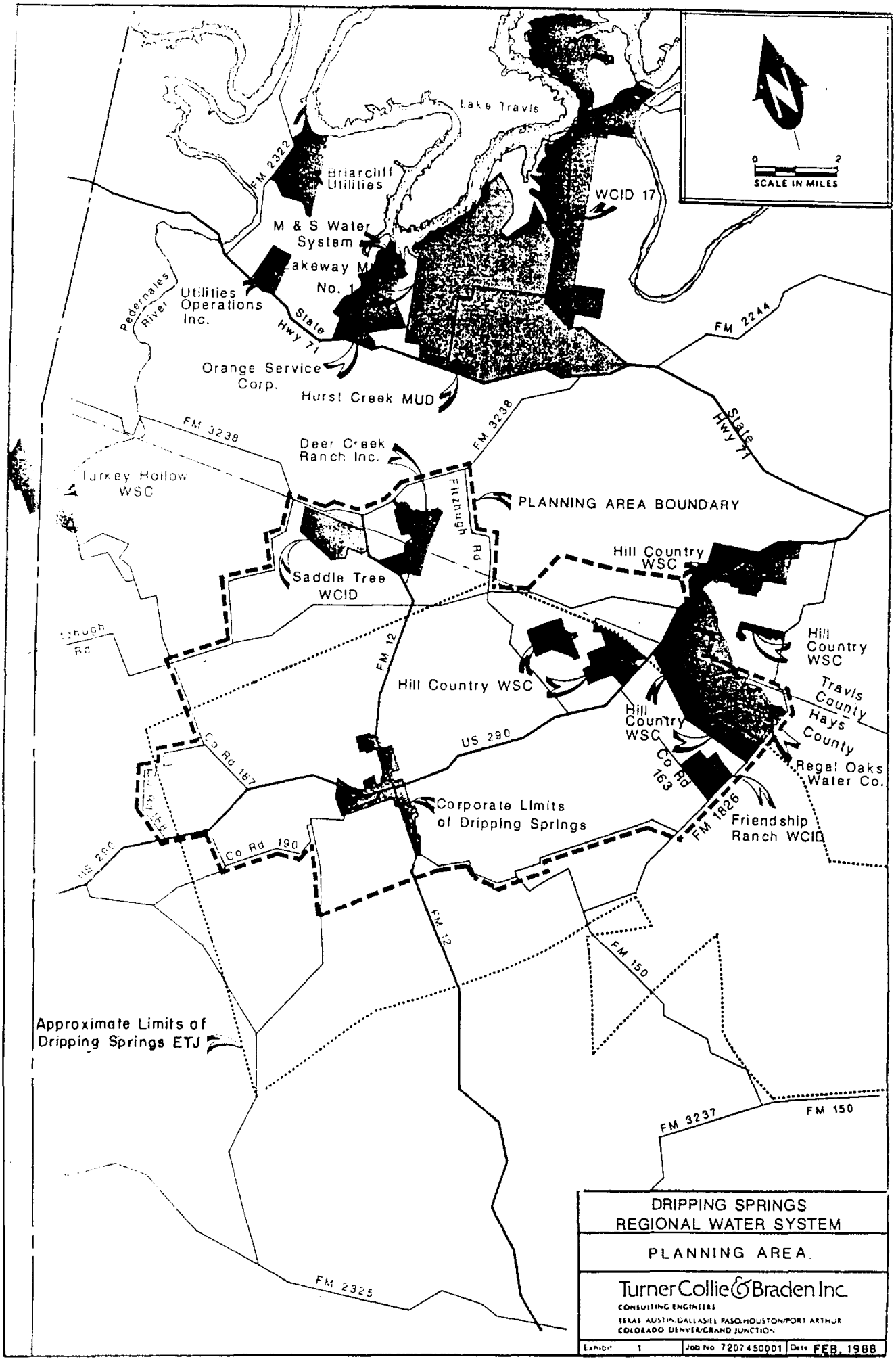
*From Table 19

**From Table 20

***Formula for Calculating Tax Rate for Combination Pledge Bonds:

$$\text{(Tax Rate for 1996 from Table 19 or 20, respectively)} \times \frac{\text{(1996 Debt Service Requirement from Table 19 or 20, respectively)} - \text{(350 Taps X Tap Fee from Table 21)}}{\text{1996 Debt Service Requirements from Table 19 or 20, respectively}}$$

****350 taps assumed to be purchased during each year (7000 Taps ÷ 20 Years = 350 Taps/Year)

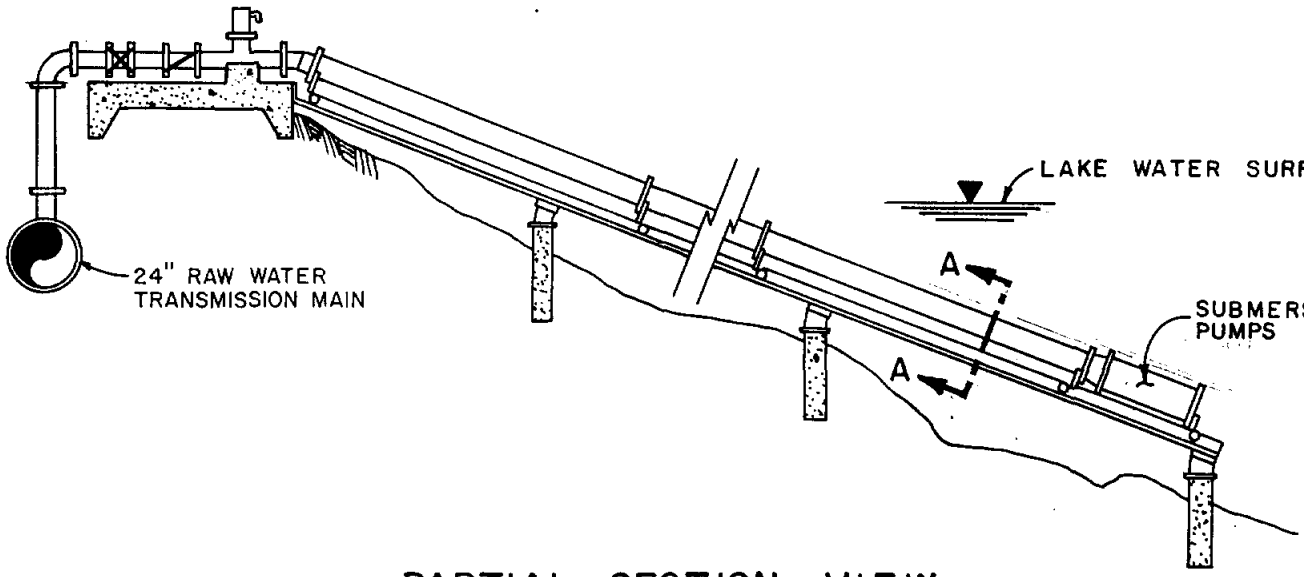

Lake Travis
FM 2322
Briarcliff Utilities
WCID 17
M & S Water System
Lakeway M
No. 1
Pedernales River
Utilities Operations Inc.
State Hwy 71
FM 2244
Orange Service Corp.
Hurst Creek MUD
FM 3238
Deer Creek Ranch Inc.
Turkey Hollow WSC
PLANNING AREA BOUNDARY
Fitzhugh Rd
Saddle Tree WCID
Hill Country WSC
FM 12
US 290
Co Rd 167
Co Rd 190
Corporate Limits of Dripping Springs
Co Rd 163
Travis County
Hays County
Regal Oaks Water Co.
FM 1826
Friendship Ranch WCID
FM 150
FM 3237
FM 2325
Approximate Limits of Dripping Springs ETJ
0
2
SCALE IN MILES
DRIPPING SPRINGS
REGIONAL WATER SYSTEM
PLANNING AREA
Turner Collie & Braden Inc.
CONSULTING ENGINEERS
TEXAS AUSTIN/DALLAS/EL PASO/HOUSTON/PORT ARTHUR
COLORADO DENVER/GRAND JUNCTION
Exhibit 1
Job No 7207450001
Date FEB. 1988

Regional Water System Study
For City Of Dripping Springs
Contract No. 8-483-521

The following maps are not attached to this report. They are located in the official file and may be copied upon request.

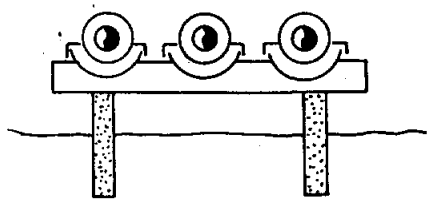
City Of Austin Water System-Exhibit 5
The Uplands Water System-Exhibit 6
Retail Service Areas Exhibit-7

Please contact Research and Planning Fund Grants Management Division at (512) 463-7926 for copies.



PARTIAL SECTION VIEW
SUBMERSIBLE PUMPS IN SLIDE & TROLLEY CONFIGURATION

N.T.S.



DETAIL A-A

N.T.S.

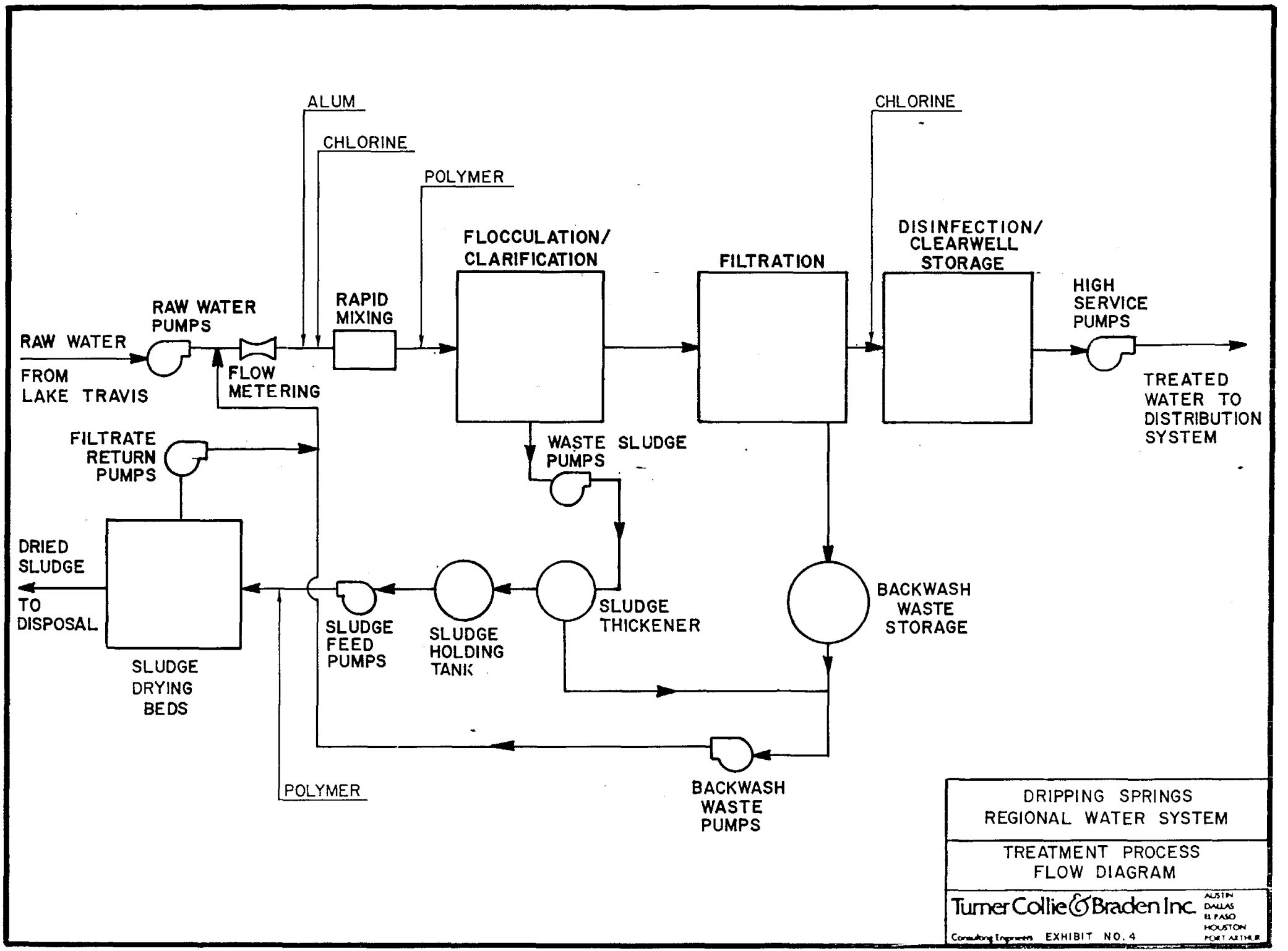
DRIPPING SPRINGS
REGIONAL WATER SYSTEM

RAW WATER INTAKE
STRUCTURE

Turner Collie & Braden Inc.
Consulting Engineers

AUSTIN
DALLAS
EL PASO
HOUSTON
FORT ARTHUR

EXHIBIT NO. 3



DRIPPING SPRINGS
REGIONAL WATER SYSTEM

TREATMENT PROCESS
FLOW DIAGRAM

Turner Collie & Braden Inc.
Consulting Engineers
AUSTIN
DALLAS
EL PASO
HOUSTON
FORT ARTHUR

EXHIBIT NO. 4

Regional Water System Study
For City Of Dripping Springs
Contract No. 8-483-521

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