TRANS–TEXAS WATER PROGRAM

SOUTHEAST AREA

Planning Memorandum

Phase II Program Update

September 30, 1996

Sabine River Authority of Texas
Lower Neches Valley Authority
San Jacinto River Authority
City of Houston
Brazos River Authority
Texas Water Development Board

This document is a product of the Trans–Texas Water Program: Southeast Area. The program's mission is to propose the best economically and environmentally beneficial methods to meet water needs in Texas for the long term. The program's three planning areas are the Southeast Area, which includes the Houston-Galveston metropolitan area, the South-Central Area (including Corpus Christi), North-Central Area (including Austin) and the West-Central Area (including San Antonio).

The Southeast Area of the Trans–Texas Water Program draws perspectives from many organizations and citizens. The Policy Management Committee and its Southeast Area subcommittee guide the program; the Southeast Area Technical Advisory Committee serves as program advisor. Local sponsors are the Sabine River Authority of Texas, the Lower Neches Valley Authority, the San Jacinto River Authority, the City of Houston and the Brazos River Authority.

The Texas Water Development Board is the lead Texas agency for the Trans–Texas Water Program. The Board, along with the Texas Natural Resource Conservation Commission, the Texas Parks & Wildlife Department and the Texas General Land Office, set goals and policies for the program pertaining to water resources management and are members of the Policy Management Committee.

This is the final version of this document.

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Executive Summary

An investigation of water availability within the Southeast Area of the Trans–Texas Water Program (TTWP) was completed and discussed within the document entitled, *Southeast Area Phase I Report* (March 1994). Since completion of that document, additional planning information concerning future water demand projections and water supply yield has been developed. This new information has subsequently been evaluated and discussed within the recently completed, *Southeast Area Planning Information Update* (September, 1996). This report, *Phase II Program Update* assesses the impact of the new planning information on the conclusions set forth in the original *Southeast Area, Phase I Report.*

Original Conditions

The *TTWP Southeast Area Phase I Report* concludes that sufficient existing water supplies are present to meet the future needs of the Southeast area, but that these available supplies are not in close proximity to the areas of highest water need. It further concludes that, while existing Southeast Area water supplies could meet future Southeast Area demands, these supplies are insufficient to meet projected needs of the combined study areas of the TTWP. The *Phase I Report* recommends a combination of water resource management strategies including maximum use of existing supplies to meet all of the future TTWP demands. These conclusions led to two basic program objectives for future Southeast Area TTWP efforts:

1. Formulate water resource management strategies to meet the short, mid, and long term needs of the entire TTWP study region.

2. Utilize interbasin transfer of existing supplies as the foundation of long-term water supply for the Southeast Area, conveying surplus water supplies to areas of need. The largest existing sources of available surplus supply are within the Sabine and Neches River basins.

Revised Planning Data

During Phase I of the program, the State of Texas began development of the 1996 Texas Water Plan. This process includes initiation of the "Consensus Planning" effort which develops future planning information through a cooperative process involving the public and multiple government agencies.

The technical memorandum, *Planning Information Update*, updates the Phase I projections based upon the most current population and water demand projections created through the state-wide interagency *Consensus Based Update to the Texas Water Plan.*[1] As a result of these revised planning data the Southeast Area water demand projections are significantly lower (approximately 18 percent) than the previous Phase I projections. This means that existing water supplies in the Southeast will be able to meet water demands over a longer period of time.

Impact on Phase I Conclusions

Phase I program objectives require re-evaluation in the light of new planning data. A reduction of projected water demand and changes in estimated water supply have shifted the timing for needed new supply and altered program objectives. The following are the impacts of the revised planning data on Phase I program objectives.

- The first of the Phase I objectives, formulation of a water resource management plan to meet the entire TTWP region's short and long term needs, remains

a valid program effort. The crafting of a plan provides the mechanism to evaluate a full range of water management strategies.

- The second Phase I objective, use of interbasin transfer from Sabine and Neches River basins as the foundation of the TTWP to meet Southeast Area water demands, is not currently valid. Interbasin transfers will continue to be needed both in the Southeast Area and elsewhere in the state but the large-scale transfer of Sabine and Neches River water proposed as key to the Phase I water management plan may be unnecessary in the Southeast Area until the end of the planning period. Complete evaluation of the suite of water management options will determine the role of "conceptual" interbasin transfers in meeting future water demands within the Trans–Texas Water Program.
- While the Southeast Area has adequate supplies, the Houston Metro region will require a reallocation of existing water supplies to meet future demand. Current excess supplies exist within the Trinity River basin. These supplies must be conveyed into the northern San Jacinto and San Jacinto - Brazos River basins to meet future projected demands.
- The *Planning Information Report* shows that sufficient surplus supplies exist within the Sabine and Neches basins to meet projected in-basin water demands past year 2050 and also serve all of the West-Central supply shortfalls. Reviewing the state's other TTWP areas, the Phase I reports for the West-Central Area report an approximate 600,000 acre-feet per year shortfall, but this does not occur until after year 2040. Large scale supply shortfalls within the West-Central region do not occur prior to year 2020. As in the Southeast Area, revised demand projections may further reduce this shortfall.
- The Phase I expectation that Sabine and Neches River supply is essential to meet the short term TTWP demands has changed. Initially considered the primary water source necessary in meeting short term water demands throughout the TTWP region, the transfer of these waters is no longer viewed as appropriate for the near term program. The importance of interbasin transfer of existing supplies has diminished in terms of priority. Its use in meeting long term program needs will be evaluated as a management technique in the program selection phase of the Southeast Area program.

Phase II Program Modifications

Several modifications have been made to the Phase II program as a result of this evaluation. These modifications are:

- Reduced effort associated with the definition of conceptual interbasin transfer routes from Sabine and Neches River basins.
- Increased effort in defining water quality issues associated with Sabine Lake.
- Increased analysis of the socio-economic impacts of interbasin transfer on exporting and importing basins.

1. The Trans–Texas Water Program

The Trans–Texas Water Program is a comprehensive water resources planning program created to evaluate a full range of water management strategies for an area of Texas encompassing about one-fourth of the state's current population. The overall goal of the TTWP is to identify the most cost-effective and environmentally sensitive strategies for meeting the current and future water needs of the Southeast, South-Central, North-Central and West-Central areas of Texas. The 1990 Texas Water Plan identified short- and mid-term water shortages within certain areas of the state. Additionally, it reported an imbalance of water supply surplus and supply deficit areas across the watersheds of the state. The TTWP analyzes current supplies and identifies appropriate strategies to solve the identified water shortage problems. A central premise of the TTWP is that maximum use of existing water supply sources will reduce the need to develop new supplies and will result in lower environmental impacts than are commonly associated with large water supply development projects.

1.1 Background

The TTWP is divided into four study areas: the Southeast, South-Central, North-Central and West-Central. The TTWP expects to be the foundation of an integrated regional water resource system and an important element in the 1996 Texas Water Plan.

The TTWP Southeast Area is located in the southeastern corner of the state, and comprises an area from the Sabine River on the Louisiana border west to the Brazos River basin. It includes 32 counties, all or part of eight river and coastal basins, and the Houston/Galveston and Golden Triangle metropolitan and industrial areas. The region encompasses about one-fourth of the state's population and one fifth of the state's total water demands.

1.2 TTWP Southeast Area: Phase I

Phase I of the Southeast Area program, Project Initiation and Conceptual Planning, undertook preliminary analysis of projected water demand and estimated water supply for a fifty year planning period from 2000 through 2050. It concluded with the outline of a conceptual water management plan for the Southeast Area. This initial work indicated the potential for significant water shortages in some areas of the region, principally in areas served by the City of Houston, as early as year 2020. Phase I proposed an integrated water management program for the region that included a range of water management techniques designed to provide long term water supply for the entire Southeast Area and possibly for the demands of other Trans–Texas Water Program areas.

The results of this initial analysis are presented in the *Trans–Texas Water Program, Southeast Area, Phase I Report* completed in March 1994. This document identifies existing Southeast Area water supplies, water demand projections, water ownership, and potential future water management options and opportunities. Based on this information, the *Phase I Report* lists five principal conclusions:

- "Sufficient water supplies currently exist within the Southeast Area to meet the projected demands within that area through approximately the year 2050 if ground water development occurs as pre-

dicted by the Texas Water Development Board (TWDB).

- "Much of the available water supply is not located in the areas of demand and will require major water transfers to achieve the needed balance.
- "Sufficient supplies do not currently exist within the Southeast Area to enable the Trans–Texas Water Program as a whole to meet all of the potential transfer requirements of the three study areas through 2050.
- "Feasible water management methods are available to hold the Southeast Area demands within reasonable levels, extend the use of water sources that already exist, and create new supply.
- "Effective application of the full scope of such methods in the Southeast Area should allow the Trans–Texas Water Program to satisfy the projected demands and interbasin transfer requirements of the entire region through 2050."[2]

The *Phase I Southeast Area Report* observes that within the Southeast Area's eight watershed basins, three basins (Sabine, Neches, Trinity) have supply surpluses in year 2050 while the other five basins show supply deficits. The total Southeast Area had a supply deficit of approximately 90,000 acre-feet per year in year 2050. All four TTWP program areas collectively are shown to need over 900,000 acre-feet per year of water by year 2050.

Potentially viable water management methods addressing these problems are identified and included in the Phase I conceptual water management plan. These management techniques include:

- Water conservation;
- Wastewater reclamation;
- Existing reservoir surplus supply use;
- Coordinated reservoir system operation;
- Interbasin transfers;
- Contractual transfers.

The initial water management analyses conclude that, while the application of many resource management techniques could satisfy this level of shortfall, no single management method could address these demands alone. Further, some of the management techniques must be used in combination. For example, several of these techniques rely on interbasin conveyance to function.

The *Southeast Area Phase I Report* concludes that an imbalance of supply and demand exists within the Southeast study area and that a suite of water resource management techniques should be employed to address projected water supply shortfalls. It also identifies interbasin transfer as key to addressing this imbalance because interbasin transfer can convey existing supply surpluses to areas of demand without the environmental and economic costs associated with the construction of new reservoirs and other additional supply sources. The *Phase I Report* also concludes that Sabine and Neches river waters are needed to meet the demand shortfall because these basins contain the largest sources of uncommitted surplus supply.

1.3 TTWP Southeast Area Phase II: Planning Information Update

TTWP Southeast Area Phase II continues toward the goal of developing an implementable water management plan for the Southeast Area. Program efforts investigate in more detail the various water management methods recommended in the Phase I conceptual plan.

Revising the planning information used in the TTWP to reflect the latest data is an initial Phase II activity. The *Planning Information Update* reports water demand and supply values derived from the Consensus Planning information recently made available through the Texas Water Development Board. Information concerning water supply, ownership, and current, and potential future reservoir management options, has also been revised to reflect new data. As in Phase I, the comparison of water demand and supply availability establishes the parameters for the water management plan under development.

The *Planning Information Update* indicates that water demand within the Southeast Area will grow to almost 4 million acre-feet per year by year 2050. This represents a decrease of eighteen percent (18%) from Phase I projections of 4.7 million acre-feet/year. The primary causes for these demand reductions are; the projected decrease of per capita municipal use; reduced rate of growth in the manufacturing sector; and the impact of conservation on municipal, manufacturing and irrigation water use arising from market forces and improved technology. Combined, these savings reduce demand in municipal, manufacturing and irrigation use categories significantly and constitute the water demand reductions observed in the *Planning Information Update.*

Water supply and availability estimates changed from Phase I estimates incorporating revised ground water and surface water estimates. Adjustments to ground water supplies decrease the Southeast Area's year 2050 available supply which remains at approximately 5 million acre-feet per year. This area-wide demand and supply comparison is illustrated in Figure 1.

A comparison of the revised water demand and supply availability estimates indicates that the Sabine and Neches basins have sufficient water supplies to meet their projected 2050 water demands, maintain an additional future reserve supply of over 200,000 acre-feet per year within each basin, and still have significant excess water supplies; 791,000 acre-feet per year in the Sabine basin and 144,000 acre-feet per year in the Neches basin.

Future reserves are water supplies that are removed from the total available supply to accommodate potential growth of in-basin demands beyond the 50 year planning hori-

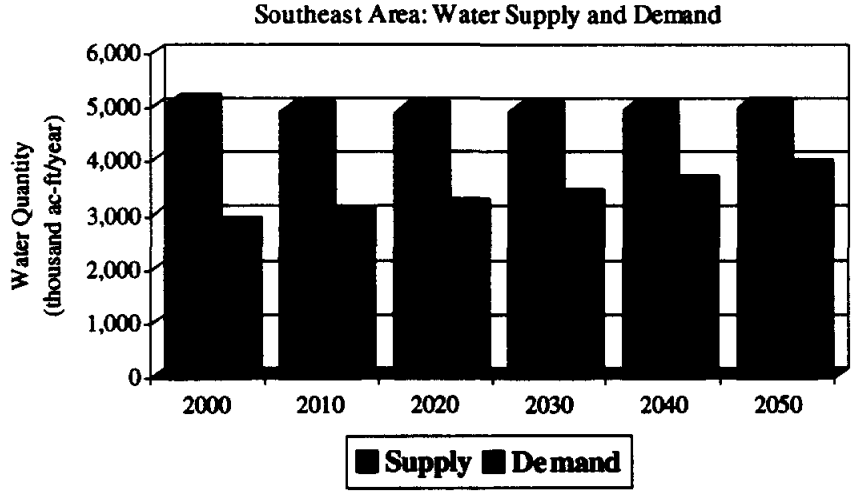


Figure 1: Southeast Area Water Supply and Demand

zon. The Sabine basin reserve provides over two times the projected year 2050 demands for future contingent water demands within the Sabine basin. Neches basin reserves set aside for future in-basin use the currently undefined dependable yield of the Sam Rayburn/B.A. Steinhagen reservoir system. The Neches basin reserve is equivalent to 25% of the Neches basin surface water yield, approximately the total current 1990 water demand for that basin.

An excess supply of approximately 1.1 million acre-feet per year in year 2050 will exist in the Southeast Area after all of the region's projected water demands are satisfied. After removing the additional 490,000 acre-feet per year held in reserve for Sabine and Neches in-basin use, there will still remain approximately 670,000 acre-feet per year of excess supply.

While the overall volume of predicted supply deficits are reduced, shortages are still expected in the Southeast Area counties with the largest population growth, Harris, Montgomery and Fort Bend, all of which lie in the San Jacinto and San Jacinto-Brazos basins. These basins meet their current and future demands with local (in-basin) and imported (through interbasin transfer) water supplies under existing permits. These permitted water supplies will be adequate to meet the City of Houston's service area demands until approximately year 2025.

Figure 2 provides a comparison between water supply versus demand within the localized Houston Metro region. As shown, the high growth Houston demand center will face inadequate water supply within the TTWP planning horizon.

In addition to the Southeast Area demands, water supply shortfalls have been established for the West-Central Area of the TTWP. These shortfalls range from 150,000 acre-feet per year in year 2020 up to 600,000 acre-feet per year by the year 2050. These demands, while significant, could be satisfied by the available Southeast Area surplus supplies. Documents prepared for the West-Central Area have indicated that while interbasin transfers from the Southeast Area are a viable option, other localized West-Central water management methods are potentially more cost effective and less environmentally damaging. It can be anticipated that interbasin transfer from the Southeast to the West-Central region will be viewed as a mid term

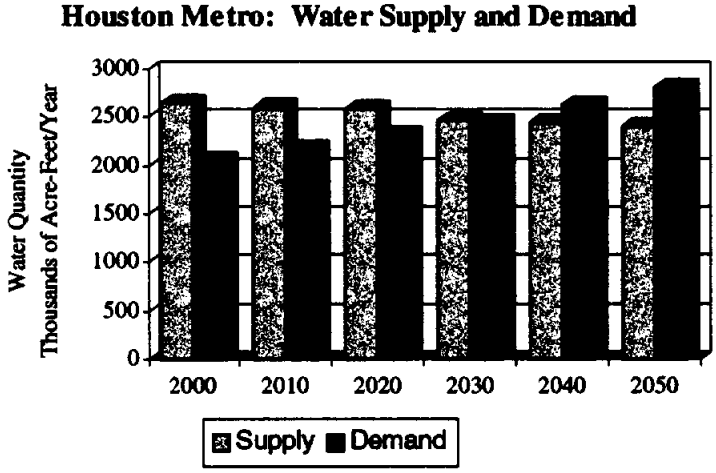


Figure 2: Houston Metro Demand vs. Supply

to long term management option.

It should be noted that the supply versus demand analysis only addresses consumptive water uses. Noncosumptive water uses, most notably environmental (instream and estuary inflow) water uses, have not currently been defined. There is an expectation that environmental water uses will be defined within the Sabine Lake and Galveston Bay areas. State of Louisiana officials have suggested that potentially significant Sabine River flows are necessary to assist in the reduction of wetlands losses within their state. If defined, these environmental water needs may decrease the quantity of available surplus Southeast Area supplies defined within the Planning Information Update document.

1.4 Conclusions

The *Planning Information Update* indicates the need to reevaluate the Phase I recommendations. Specifically, since it is clear that the level of supply shortfall within the Southeast Area is significantly lower than previously anticipated, a shift in the Phase I conceptual water management plan is needed.

Based upon the newest demand projections as presented in the projected *Planning Information Update* memorandum, there are sufficient surplus Southeast Area water supplies to serve all of the projected future TTWP demands (West-Central and Southeast) through the planning period. Additionally, current research indicates that other management techniques (advanced conservation, etc.) may be able to satisfy future demands both for the Southeast Area and the other TTWP areas.

As a result of these new data, the relative importance of the Phase I water resource management techniques recommended in the conceptual plan has changed. The following section will discuss the changes effected in the integrated water management plan envisioned in Phase I.

2. Integrated Water Management Program

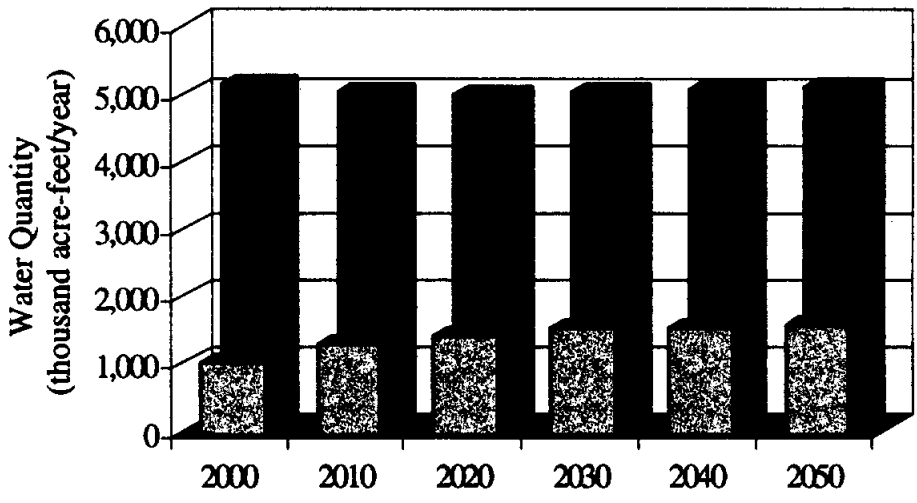
The *Phase I Report* concludes with a recommended conceptual water management plan. This conceptual plan proposes an integrated water management program for the Southeast area comprised of a range of water management techniques designed to provide for the long term water needs of the entire Southeast Area and possibly for areas elsewhere in the state. The recommended management techniques include:

- Methods which manage water demand through water conservation beyond that assumed in state projections.
- Water resource management through wastewater reclamation and reuse, coordinated reservoir system operations, the interbasin transfer of water, and the contractual transfers of water rights supply; and
- Methods to increase water supply through development of new surface water projects.

2.1 Phase I Conceptual Plan

Among all of the management options investigated in the *Phase I Report*, interbasin transfer was identified as the foundation of the TTWP management strategy. Further, Sabine River water was identified as the primary source of available surplus water supply. The interbasin transfer of surplus Sabine River supply is a major element in the Phase I conceptual program, essential for meeting Southeast Area shortages predicted to occur by year 2020. Phase I analysis predicted that this source of supply would prove the most cost effective and least environmentally harmful source to develop and that

Southeast Area: Interbasin Transfer



it could meet the predicted regional shortages within the necessary time frame. Figure 3 shows area water supply currently provided through existing interbasin transfers.

2.2 Phase II Program Selection

Phase II of the Southeast Area TTWP study involves the analysis of water management techniques included in the Phase I conceptual plan. These analyses assess the need for and the benefits of each technique, and develop the associated costs, environmental impacts, financing and pricing alternatives and legal and institutional arrangements associated with the implementation of each. The goal of these studies is the development of a program of management strategies which address the water demands of the Southeast Area and, if possible, the TTWP program areas further west.

Identified water supply shortages in the Southeast Area occurring during the planning period are localized in the Houston metro region. Implementing a water management plan, a suite of water demand and resource management alternatives, will satisfy these local supply shortages.

The integrated management program recommended for further investigation in Phase II includes the review of many demand and supply management techniques. The Phase I preliminary analysis of these techniques indicates their potential for providing additional supply. These recommended alternatives and preliminary estimates of their potential demand reduction or supply yield are as follows:

- Additional water conservation measures may reduce municipal water demands by as much as an additional 300,000 acre-feet per year by year 2050.
- Wastewater reclamation and reuse to industrial water users within the Houston area could meet up to 100,000 acre-feet per year of industrial water demands.
- Coordinated surface water reservoir operation within several of the TTWP Southeast Area river basins could develop as much as 50,000 acre-feet per year of additional supply.
- Contractual rights transfers may allow reallocation of water supplies from irrigation users to municipal and industrial water users. This would require interbasin transfer of reallocated supplies.
- The Allens Creek Reservoir and Neches Salt Water Barrier projects, if developed, could create an additional supply of 335,000 acre-feet per year.
- Interbasin transfers can convey the available supplies throughout the Houston demand center and, if necessary, other TTWP program areas.

Preliminary estimates indicate that these management strategies can address the identified shortages expected within the Southeast Area, and potentially within the West-Central, without any new large-scale supply development. New interbasin transfers of surplus water supply, while still a valid and important long term supply option is not justified for use in the short and mid term periods for the TTWP Southeast Area. Similarly, the overall TTWP may not require interbasin transfer westward until the mid to long term. Based on current estimates, large scale interbasin transfers outside of the Southeast Area will not be required under any scenario until after the year 2020.

3. Phase II Program Modifications

The Trans–Texas Water Program's Southeast Area conceptual water management plan will focus on the three primary components of water management; demand, resource allocation, and supply. Crafting the appropriate water resource management plan for use in the Southeast and in other TTWP areas requires that each option be analyzed fully so the benefits it offers and its costs (financial, social, political and environmental) are properly assessed.

The interbasin transfer of surplus Sabine and Neches River waters, once considered essential for program success, will be evaluated as a management technique along with all of the other management methods. As a water management technique, interbasin transfer is a valuable tool, potentially making large quantities of surplus water supply available to areas with shortages. This supply may be quicker to develop with fewer environmental consequences and lower costs than other alternatives such as large scale reservoir development. The full impact of interbasin transfer can only be tested through proper analysis of its development costs and its impacts on both exporting and importing basins.

With regard to the TTWP Southeast Area, the *Planning Information Update* data indicate that large scale supply shortages will not exist within the area until 2030. However, long range demands within the statewide TTWP area may require the development of new interbasin transfers. The conceptual impacts (social, etc.) associated with any interbasin transfer will be assessed in future TTWP tasks. Additionally, the environmental water needs of the Southeast Area rivers and estuaries will be examined.

Based on the conclusions contained within previously completed TTWP documents, modifications in the direction of the Phase II activities are necessary. Three primary modifications are now included in the current revised scope of services:

- Reduced effort associated with definition of conceptual Sabine and Neches basin interbasin routes. A preferred schematic route will be identified for environmental/financial cost development allowing evaluation and comparison with the other resource management options being evaluated.
- Allocation of more effort for the definition of water quality issues associated with Sabine Lake. The investigation of public issues surrounding the Trans-Texas water program indicated public concern regarding the lack of commonly held information on the environmental conditions of the Sabine Lake system.[3] Environmental evaluation of the options involving Sabine River water supplies requires a better understanding of river and estuary conditions.
- Allocation of more effort for the analysis of socio/economic impacts associated with water allocation among communities. Research indicates that issues regarding the economic and social importance of water resources are not fully defined or understood. This information will be critical to properly evaluating several of the management alternatives being considered in TTWP.

References

[1]Water Demand/Drought Management Technical Advisory Committee of the Consensus-Based State Water Plan. 1995. *Water for Texas—Today and Tomorrow; A 1996 Consensus-Based Update to the Texas Water Plan*, Volume III, Water Use Planning Data Appendix. January 1995.

[2]Brown & Root and Freese & Nichols. 1994. *Trans–Texas Water Program Southeast Area Phase I Report*, March 1994, page ES6.

[3] Blackburn & Carter and Ekistics Corporation. 1995. *Enhanced Public Participation Technical Memorandum*, August 1995, pages 13-14.

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