TRANS-TEXAS WATER PROGRAM

West Central Study Area
Phase I
Interim Report

Volume 5

San Antonio River Authority

San Antonio Water System

Edwards Underground Water District

Guadalupe-Blanco River Authority

Lower Colorado River Authority

Bexar Metropolitan Water District

Nueces River Authority

Texas Water Development Board

1996

TRANS-TEXAS WATER PROGRAM

WEST CENTRAL STUDY AREA

PHASE I

INTERIM REPORT

VOLUME 5

Comments Received from the
Advisory Committee for Public and Technical Input

Prepared for

San Antonio River Authority
San Antonio Water System
Edwards Aquifer Authority
Guadalupe-Blanco River Authority
Lower Colorado River Authority
Bexar Metropolitan Water District
Nueces River Authority
Texas Water Development Board

By

San Antonio River Authority

August, 1996

SAN ANTONIO RIVER AUTHORITY

EXECUTIVE COMMITTEE
Chairman — Winston W. Lorenz
Vice Chairman — Martha Clifton McNeel
Secretary — H. B. Ruckman, III
Treasurer — Otis L. Walker
Member-at-Large — Jesse Oviedo
GENERAL MANAGER
Fred N. Pfeiffer

1.11-3.6

August 2, 1993

Steven J. Raabe
San Antonio River Authority
100 East Guenther Street
San Antonio, Texas 78283-0027

RE: TRANS-TEXAS WATER PROGRAM
NORTHERN PORTION SOUTH-CENTRAL STUDY AREA

Dear Mr. Raabe:

The San Antonio River Authority (SARA) is cooperating with the Texas Water Development Board, San Antonio Water System, Edwards Underground Water District, Bexar Metropolitan Water District, Nueces River Authority, Guadalupe-Blanco River Authority and the Lower Colorado River Authority to administer a portion of the Trans-Texas Water Program. The primary objective of this program is to manage the State's water resources to meet the needs of anticipated economic development in southeast and south-central Texas in an environmentally sound manner for both the short-term and long-term (50 years). The plan will be coordinated with local governments, water providers and users, and environmental interests.

The study is divided into the Southeast Study Area (Sabine to Brazos) and the South-Central Study Area (Brazos to the Nueces), along with associated coastal basins for each study area. The study will examine available water supplies, both ground and surface, and system operating agreements between water suppliers and users. Currently, the Southeast Study Area is being regionally sponsored and administered by the Sabine River Authority, with the City of Houston and San Jacinto River Authority as interlocal participants. The Southern Portion of the South-Central Study Area is being regionally sponsored and administered by the Lavaca-Navidad River Authority, with the Cities of Austin and Corpus Christi as an interlocal participants.

The Northern Portion of the South-Central Study Area is being regionally coordinated by the San Antonio River Authority with several interlocal participants. Funding for the study is being made available from a Texas Water Development Board loan along with financial contributions from interlocal participants. A Policy Management Committee has been formed for the Northern Portion South-Central Study Area which consists of representatives from the San Antonio Water System, Edwards Underground Water District, Bexar Metropolitan Water District, Nueces River Authority, Guadalupe-Blanco River Authority, the Lower Colorado River Authority, Texas Water Development Board, Texas Parks and Wildlife Department, Texas Water Commission, and San Antonio River Authority. This Committee will be the governing body for determining the nature and scope of the study. They will also review input from the Technical Advisory Committee for guidance and direction.

The San Antonio River Authority invites you to participate as a member of the Technical Advisory Committee for the Northern Portion South-Central Study Area of the Trans-Texas Water Program. The purpose of the first meeting will be to inform and involve the Technical Advisory Committee in this study and to define the Committee's role. The first meeting of the Technical Advisory Committee is as follows:

Wednesday, August 25, 1993, 2:00 to 4:00 p.m.

San Antonio Water System
Training Room
1001 E. Market Street
San Antonio, Texas

The agenda for the meeting is attached.

The Texas Water Development Board is required under the Texas Water Code to prepare and maintain a comprehensive State Water Plan as a flexible guide for the orderly development and management of the State's water resources in order that sufficient water will be available at a reasonable cost to further economic development of the entire State. In addition, the Board is directed to amend and modify the Plan in response to experience and changed conditions. The Trans-Texas Water Program is anticipated to become an important element in the State Water Plan.

Your participation in providing technical and environmental input to the Trans-Texas Water Program is essential for a successful project. The Policy Management Committee looks forward to working with you at the meeting.

Sincerely,

FRED N. PFEIFFER
General Manager

Enclosures:
1. Agenda
2. Technical Advisory Committee Members
3. Trans-Texas Brochure

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1.11-3.6 TAC

TRANS-TEXAS PROGRAM

NORTHERN SOUTH-CENTRAL TECHNICAL ADVISORY COMMITTEE

NAME: _____

ORGANIZATION: _____

ADDRESS: _____

TELEPHONE NO: _____

_____ YES - I PLAN TO PARTICIPATE ON THE TAC

_____ NO - I DO NOT WISH TO PARTICIPATE ON THE TAC

_____ MY ORGANIZATION WISHES TO PARTICIPATE BUT CHANGE THE CONTACT PERSON TO:

NAME: _____

PLEASE RETURN THIS FORM TO:

STEVEN J. RAABE
SAN ANTONIO RIVER AUTHORITY
P.O. BOX 830027
SAN ANTONIO, TEXAS 78283-0027

OR TURN IT IN AT THE TAC MEETING ON WEDNESDAY, AUGUST 25, 1993

ROLE OF THE NORTHERN SOUTH-CENTRAL TECHNICAL ADVISORY COMMITTEE TRANS-TEXAS WATER PROGRAM

- The purposes of the Trans-Texas Water Program (TTWP) Northern South-Central Technical Advisory Committee (TAC) are to (1) review and comment on the information produced in the Northern Portion South-Central Study Area; (2) provide socio/economic, engineering and environmental input to the Policy Management Committee (PMC); and (3) serve as a vehicle for public information and input.

- The TAC will identify and discuss socio/economic, engineering and environmental issues related to the TTWP. The goal of this discussion process will be to identify areas of agreement and disagreement regarding the adequacy and reliability of the data used in the Northern Portion South-Central Study Area.

- In order that each TAC Member's review concerning the Northern Portion South-Central Study Area is properly considered, written comments should be provided to the Policy Management Committee.

- There will be no voting in the sense of defining a single set of recommendations or conclusions of the TAC. Instead, the full extent of agreement and disagreement (as reflected in written comments from the TAC) will be recorded for input into the TTWP for the Northern Portion South-Central Study Area.

- Meetings of the TAC will be open to the public.

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TRANS-TEXAS WATER PROGRAM

NORTHERN SOUTH-CENTRAL TECHNICAL ADVISORY COMMITTEE MEETING

PROGRAM AGENDA

AUGUST 25, 1993
2:00 - 4:00 P.M.

1. INTRODUCTION OF MEMBERSHIP

Speaker: Fred N. Pfeiffer
San Antonio River Authority

- Introduce the San Antonio River Authority Staff
- Introduce the project sponsors:
  - San Antonio River Authority
  - Guadalupe-Blanco River Authority
  - Nueces River Authority
  - Lower Colorado River Authority
  - Bexar Metropolitan Water District
  - San Antonio Water System
  - Edwards Underground Water District
- Role and members of the Northern South-Central Policy Management Committee:
  - Project Sponsors
  - Texas Water Development Board
  - Texas Water Commission
  - Texas Parks & Wildlife Department
- Introduce Consultant:
  - HDR Engineering, Inc.
- Technical Advisory Committee (TAC) Members:
  - (Let everyone introduce themselves)

2. ORGANIZATION AND BACKGROUND OF THE TRANS-TEXAS WATER PROGRAM

Speaker: Tommy Knowles
Texas Water Development Board

- Project Overview:
  - Background
  - Concepts of the Program
  - Delineation of southeast and south-central study areas
  - Excess/Deficit river basins graphics
  - Environmental Issues
- Project and Study Area Committees
  - Structure of Committee
- Role/Responsibility of Committees
  - Program (or overall) Policy Management Committee
  - Regional Policy Management Committees
  - Technical Advisory Committee

3. ROLE OF THE NORTHERN SOUTH-CENTRAL STUDY AREA TECHNICAL ADVISORY COMMITTEE

Speaker: Steve Raabe
San Antonio River Authority

- Specific role/responsibilities of the Northern South-Central Study Area Technical Advisory Committee
  - Means of providing comments
  - TAC will not vote on issues
  - TAC meetings open to the public

4. DISCUSSION OF ENVIRONMENTAL CRITERIA

Speaker: Bruce Moulton
Texas Water Commission

- Background Information
- Discussion of Criteria

5. SCOPE OF STUDIES FOR THE NORTHERN PORTION SOUTH-CENTRAL STUDY AREA OF THE TRANS-TEXAS WATER PROGRAM

Speaker: Herb Grubb
HDR Engineering, Inc.

- Phase I Overview
  - Scope of Work
  - Phase I - Project Initiation/Conceptual Planning
- Discussion of Tasks
  - Ten major elements

6. SCHEDULE OF MILESTONE EVENTS FOR THE TRANS-TEXAS WATER PROGRAM

Speakers: Herb Grubb
HDR Engineering, Inc.

- Project Schedule
  - Project Schedule
  - Anticipated dates for deliverable products

Fred N. Pfeiffer
San Antonio River Authority

- Future Technical Advisory Committee Meetings
  - Objectives
  - Time and Place

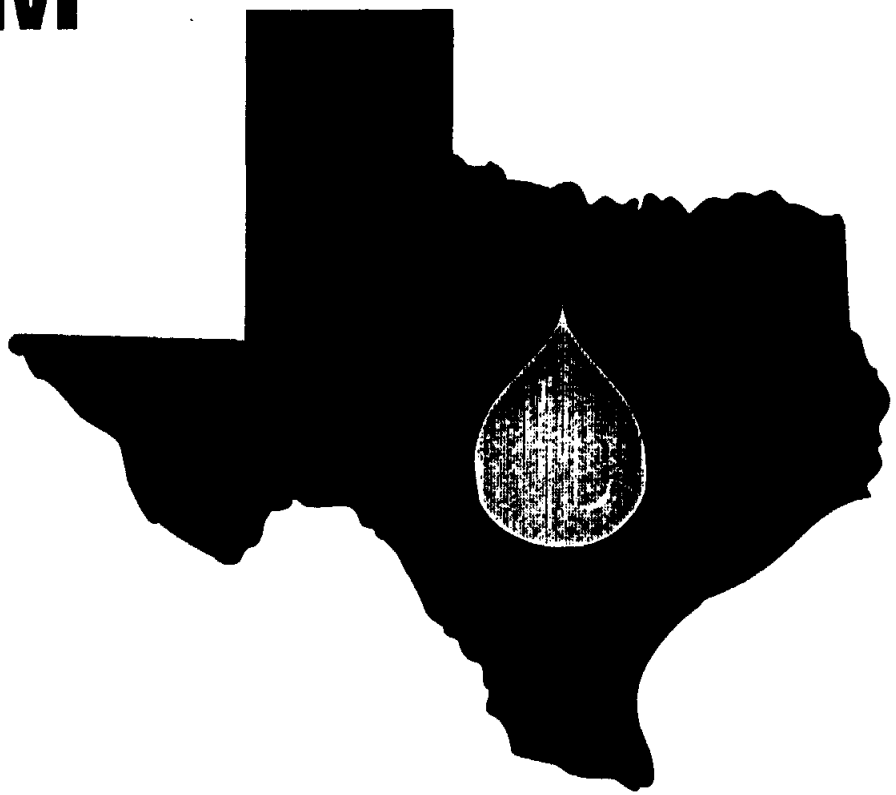
7. OTHER BUSINESS

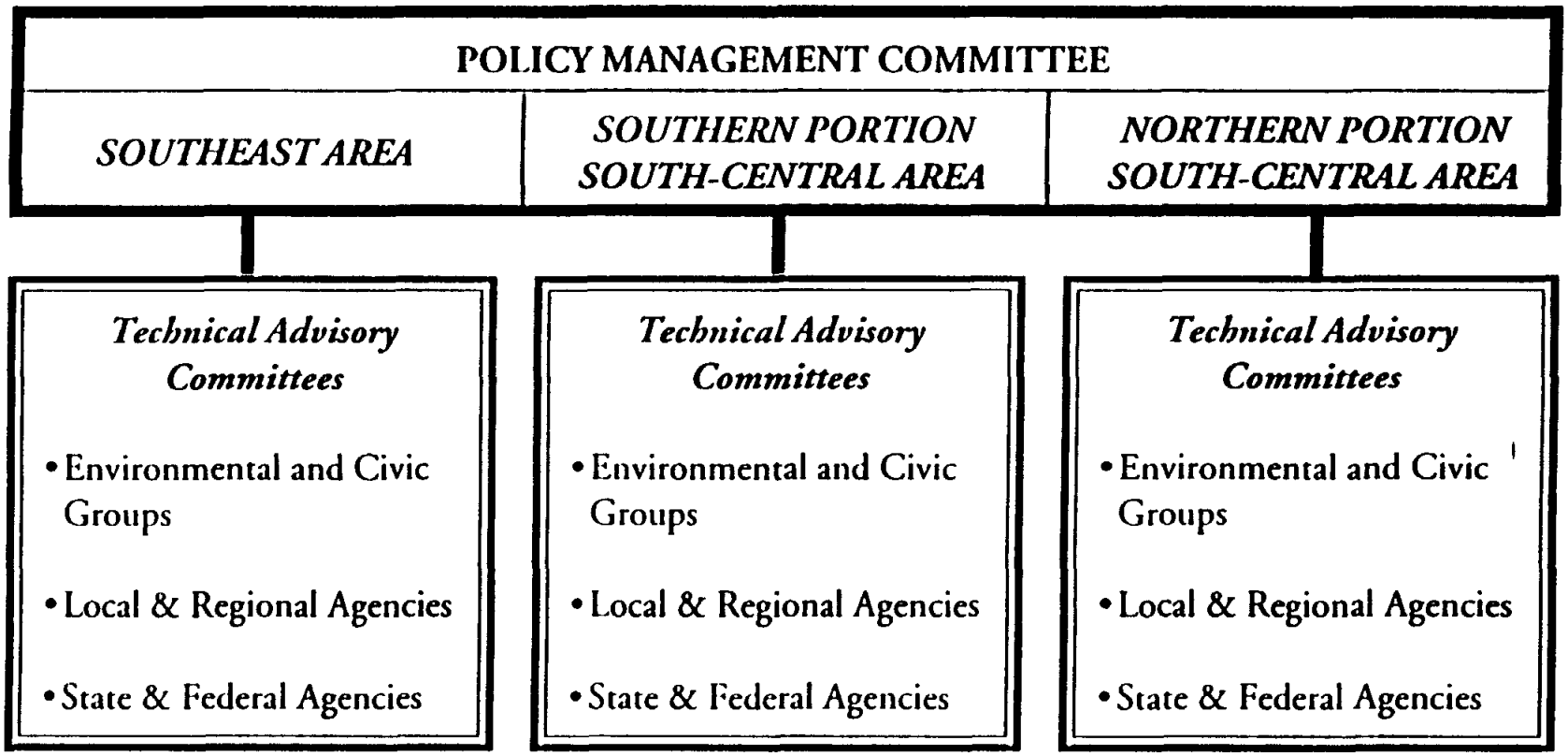
Speaker: Fred N. Pfeiffer
San Antonio River Authority

- Open the meeting to questions or discussion from committee members
  - Means of Providing Comments

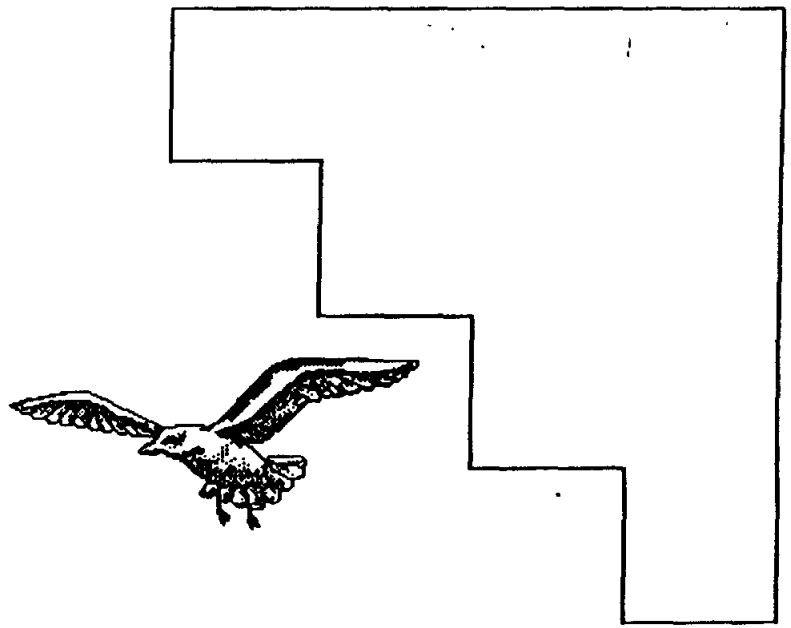
8. ADJOURNMENT

TRANS-TEXAS WATER PROGRAM



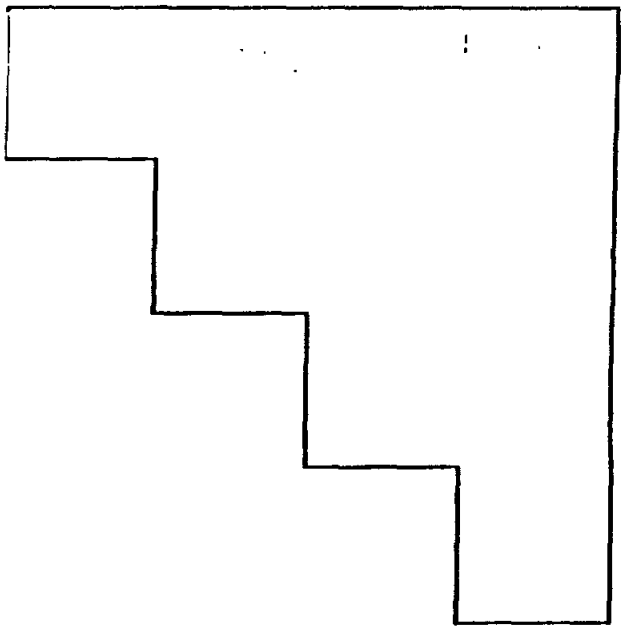

POLICY MANAGEMENT COMMITTEE
SOUTHEAST AREA
SOUTHERN PORTION SOUTH-CENTRAL AREA
NORTHERN PORTION SOUTH-CENTRAL AREA
Technical Advisory Committees
• Environmental and Civic Groups
• Local & Regional Agencies
• State & Federal Agencies
Technical Advisory Committees
• Environmental and Civic Groups
• Local & Regional Agencies
• State & Federal Agencies
Technical Advisory Committees
• Environmental and Civic Groups
• Local & Regional Agencies
• State & Federal Agencies

ENVIRONMENTAL ASSESSMENT GUIDELINES



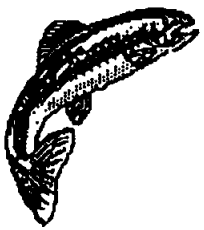
- Water Quality Standards Attainment
- Instream Flows for Fish & Wildlife
- Freshwater Inflows to Bays & Estuaries
- New Reservoirs

WATER QUALITY ASSESSMENT



- Water Quality Standards Attainment
- Chemical/Biological Compatibility of Waters
- Coastal Salt Water Intrusion
- Nutrients
- Compliance with Drinking Water Standards

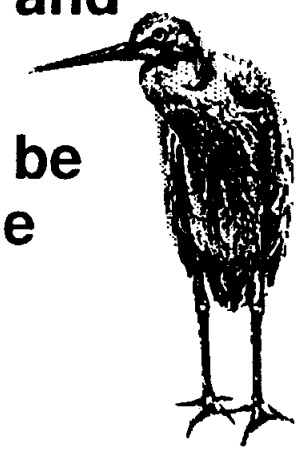
INSTREAM FLOWS FOR FISH & WILDLIFE



- TPWD-modified Tennant's Method (1979)
- Pass downstream up to 60% of median (50th percentile) monthly streamflows from March through September
- Pass downstream up to 40% of median (50th percentile) monthly streamflows from October through February
- Water stored in existing reservoirs will not be used to make up for natural flows below the specified limits
- Streamflows above these limits are considered available for other beneficial uses identified in Texas Water Code

FRESHWATER INFLOWS TO BAYS & ESTUARIES

- Pass normal flows up to mean (arithmetic average) monthly inflows in May-June and September-October, the bi-modal peaks of rainfall runoff to the bays
- Pass normal flows up to median (50th percentile) monthly inflows in July-August and November-April
- Water stored in existing reservoirs will not be used to make up for natural flows below the specified limits



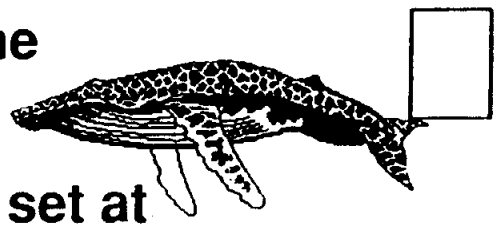
NEW RESERVOIRS

- Above 60% Capacity Storage—pass through streamflows up to mean (arithmetic average) monthly flows in April-June and August-October

- Above 60% Capacity Storage—pass through streamflows up to median (50th percentile) monthly flows in July and November-March

- Below 60% Capacity Storage—recognize drought contingency by passing through streamflows only up to the median (50th percentile) daily flow observed during the historical drought of record

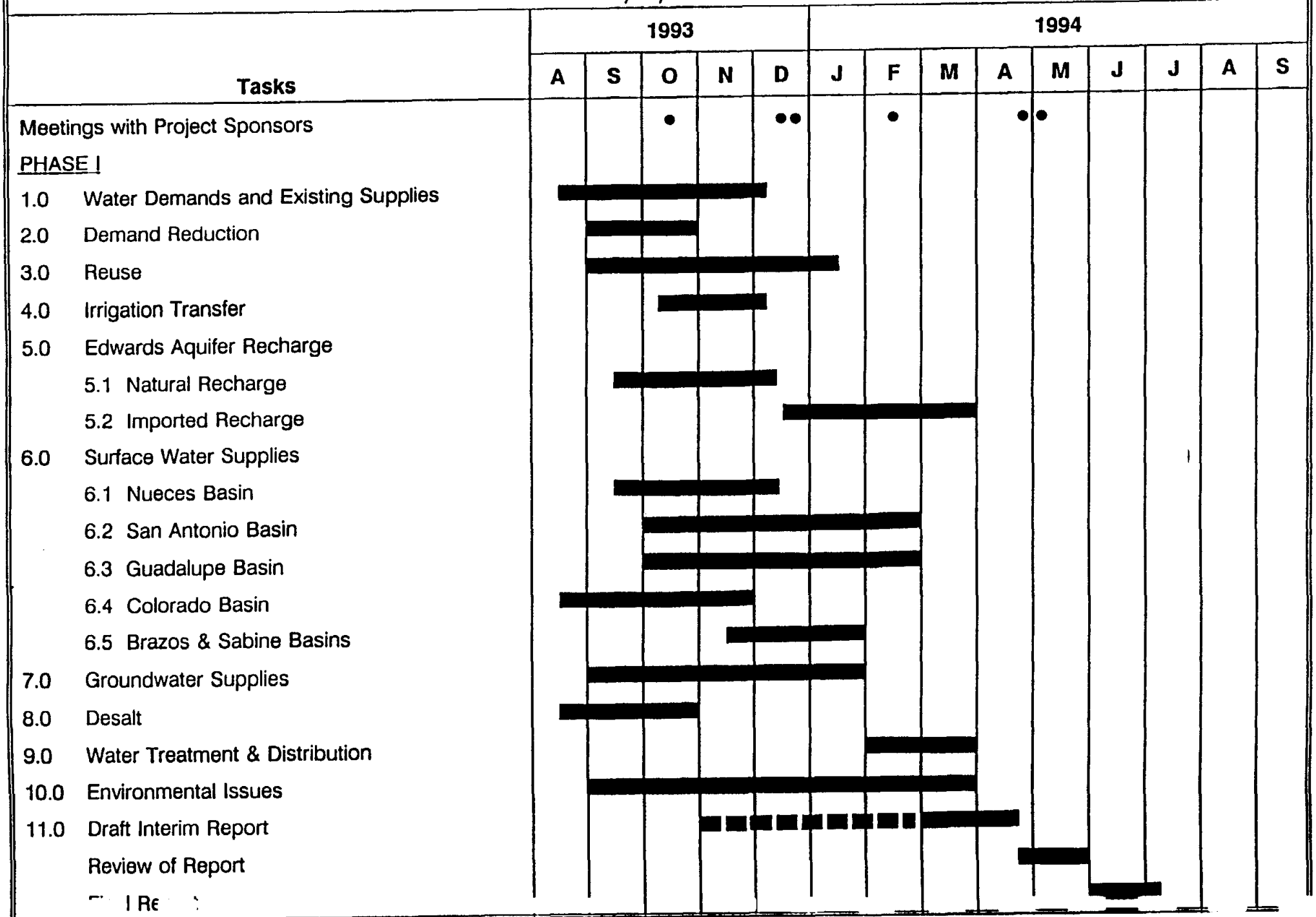
- Repeat analysis with capacity threshold set at 40% and 80% to demonstrate range of feasible solutions



TRANS-TEXAS WATER PROGRAM
SOUTH-CENTRAL TEXAS, NORTHERN PORTION

TASK NO.	DESCRIPTION	TASK NO.	DESCRIPTION
1.0	POPULATION/DEMAND/SUPPLY PROJECTIONS	5.2	Imported Recharge
1.1	TWDB High Case Demand Projections	5.3	Spring Flow Augmentation
1.2	Existing and Projected Water Supplies	6.0	SURFACE WATER SUPPLIES
1.3	Compare Projected Demand to Projected Supply	6.1	Nueces River Basin
2.0	DEMAND REDUCTION	6.2	San Antonio River Basin
3.0	REUSE	6.3	Guadalupe River Basin
3.1	Determine Suitable Amounts	6.4	Colorado River Basin
3.2	Specific Reuse Options	6.5	Brazos & Sabine Basins
	a. Exchange for Edwards Irrigation Water	7.0	GROUNDWATER SUPPLIES
	b. Exchange for Medina Water	7.1	Regional Aquifers
	c. Reuse by Industrial/Municipalities	7.2	Minor Aquifers
	d. Transfer to Choke Canyon	8.0	DESALT
4.0	EDWARDS IRRIGATION TRANSFER	9.0	WATER TREATMENT AND DISTRIBUTION
5.0	EDWARDS AQUIFER RECHARGE	10.0	ENVIRONMENTAL
5.1	Natural Recharge	11.0	PHASE I REPORT, COORDINATION & MEETINGS

Project Schedule - Trans Texas
North Portion South Central Study Area
7/14/93



TRANSTEXAS WATER PROGRAM
ENVIRONMENTAL ASSESSMENT

Water Quality

Preliminary water quality impact assessment of affected State waters must include evaluation of water quality standards attainment, chemical and biological compatibility of mixed waters, coastal salt water intrusion, and nutrients for compliance with drinking water standards. The recommended methodology, if any, for each analysis is given as follows:

1. Water Quality Standards Attainment

   A. Chloride, Sulfate, Total Dissolved Solids--Mass balance these constituents under a 7-day, 2-year, low flow (7Q2) condition to insure that the Standards are not violated.

   B. Dissolved Oxygen--If any interbasin transfer scenarios result in a reduction of a river's 7Q2, or if the baseflow is significantly reduced during spring spawning months [defined as the first half of the year when water temperatures are 63°-73°F in TWC Rule 307.7.(b)3. Aquatic Life], then simplified mathematical modeling must be performed to evaluate compliance with the Standard. Basic modeling assumptions are listed below:

      - Summer Analysis
        Headwater--7Q2 flow conditions
        Temperature--average of the three hottest months, plus one standard deviation, from the closest USGS station with water temperature data
        Discharges--full permitted effluent flow and quality
        BOD--compute $BOD_u = BOD_{5\ day} \times 2.3$
        K_n--nitrification rate = 0.30/day
        K_d--BOD oxidation rate = 0.10/day
        Reaeration--use Texas equation

      - Spring Spawning Analysis
        Same as above, except
        Headwaters--10th percentile monthly low flow conditions
        Temperature--90th percentile monthly high temperature conditions

   C. pH--No recommended method.

   D. Temperature--Mass balance temperature to insure compliance with the maximum temperature criteria, as well as the "rise over ambient" Standard.

   E. Fecal Coliform--No recommended method.

2. Chemical and Biological Compatibility of Waters

A. Formation of precipitates, etc.--No recommended method.

B. Introduction of exotic plants and animals--No recommended method.

3. Salt Water Intrusion

A. Migration of coastal salt wedge and effect of intrusion up tidal rivers--No recommended method.

B. Effect on water supply operations--No recommended method.

C. Effect on freshwater marshes/wetlands--No recommended method.

4. Nutrients

A. Potable water limits--Determine compliance with Drinking Water Standards.

B. Potential for nuisance aquatic vegetation--No recommended method.

Instream Flows

A relatively rapid assessment of instream flow needs to maintain downstream fish and wildlife habitats affected by the TransTexas Water Program can be performed by using the TPWD-modified Tennant's Method (Lyons 1979), which is based on a fixed percentage of median (50th percentile) monthly flows. At any point in a river basin intercepted by the TransTexas Water Program, streamflows must be passed downstream in an amount up to 60% of the median monthly flows from March through September, and 40 % of the median monthly flows from October through February. Streamflows above these monthly flow limits are to be considered available for other beneficial uses and interbasin transfer. Water stored in existing reservoirs will not be allocated to instream uses and released downstream to make up for normal flows below the specified limits.

Freshwater Inflows to Bays and Estuaries

For preliminary planning purposes, the freshwater inflow needs of the bays and estuaries can be conservatively estimated as a function of selected central tendency values. The typical bi-modal distribution of monthly rainfall runoff during the historical period is enhanced by requiring the pass through of normal inflows up to the mean (arithmetic average) monthly flow in May-June and September-October, while the minimum maintenance needs are satisfied with inflows up to the median (50th percentile) monthly flow in the remaining months of the year. Water stored in existing reservoirs will not be allocated to bay and estuary uses and released downstream to make up for normal flows below the specified limits.

New Reservoirs

Existing reservoirs that could potentially contribute to the TransTexas Water Program will be evaluated as to the effects on downstream flows and freshwater inflows to bays and estuaries under their existing state and federal permits which authorize their current operations, while any new reservoirs involved in the Program's future water storage and distribution system will be considered to operate such that they pass through impounded

streamflows up to the mean (arithmetic average) monthly flow in April-June and August-October, and median (50th percentile) streamflows in the remaining months of the year, as long as reservoir capacity is above 60%. When reservoir capacity is below 60%, the water management operations will recognize drought contingency by passing through up to the median daily flow of the stream observed during the historical drought of record. The analysis will be repeated at 40% and 80% capacity thresholds to demonstrate a range of feasible solutions for operating any new reservoirs.

July 1, 1993

SCOPE OF WORK AND SCHEDULE
TRANS-TEXAS WATER PROGRAM
NORTH PORTION SOUTH CENTRAL STUDY AREA

Prepared for

San Antonio River Authority
San Antonio Water System
Edwards Underground Water District
Guadalupe-Blanco River Authority
Lower Colorado River Authority
Bexar Metropolitan Water District
Nueces River Authority
Texas Water Development Board

HDR Engineering, Inc.

Austin, Texas

SCOPE OF WORK AND SCHEDULE
TRANS-TEXAS WATER PROGRAM
NORTH PORTION SOUTH CENTRAL STUDY AREA

BACKGROUND

The Trans-Texas Water Program includes two major areas of study: (1) the Southeast Texas Area, and (2) the South Central Texas Area. The Southeast Texas study is focusing upon facilities to serve the metropolitan area of Houston. The South Central Area studies are focused upon facilities to provide additional water supplies for areas west of Houston, including the Metropolitan areas of San Antonio, Austin, and Corpus Christi. The work for this portion of the Trans Texas Water Program will concentrate on water supply for the northern section of the South Central Area, including the City of San Antonio and all other cities of the area that rely upon the Edwards Aquifer for their water supply.[1]

The study will be carried out in two phases. Phase I will identify potential projects and available options, and provide a general assessment of the water supply potential, costs of each option, and environmental advantages and disadvantages of each option, so that decisions can be made as to which options should be evaluated in more detail in Phase II. Consideration will be given to currently available ground and surface water supplies, reuse, potential new supply facilities, and direct inter-basin transfer. Application of the Environmental Guidelines as adopted by the Trans-Texas Policy Management committee (PMC), will be applied during Phase I of the study and will be used as a preliminary screening mechanism to identify alternatives for further evaluation. These alternatives will be presented to the PMC for action. The major deliverable from Phase I will be an interim report containing information which identifies available actions and options for supplying water to the planning area. This report will summarize the pros and cons of each option. The policy management committee will provide direction as to which options should be studied in more detail in Phase II. The work tasks of Phase I are presented herein. **NOTE:** Potential water supply alternatives to meet the water demands of the study area, as derived in Task 1.0 will be identified and evaluated in Tasks 2.0 through 10.0 using information from previous planning and engineering studies. Cost information in Phase I studies will be at the reconnaissance level for raw water for all alternatives and additionally for treated water for selected options. For alternatives which include treatment, very preliminary

[1]The scope of this project follows the scope and guidelines issued by the Texas Water Development Board on June 8, 1992, and the conditions of legislation enacted by the Texas Legislature in 1993, Regular Session, including S.B. 1477 (Edwards Aquifer Authority) and S.B. 1030 (Texas Water Bank). These and other elements of legislative, administrative, and legal decisions, as well as public opinion and attitudes must be incorporated into the scope, data, and methods of this project. Therefore, it is assumed that the PMC will modify the scope and methods as necessary and appropriate in order to comply with applicable legislation and administrative decisions.

reconnaissance level costs for water treatment and distribution costs will be included. The water supply alternatives listed in Tasks 2.0 through 9.0 will be considered on an individual basis in Phase I and the report will include, in tabular and written form, a brief description, location map of each alternative, and pertinent data relative to water supply quantities, costs of water, and significant environmental issues.

Task	Description	Budget
1.0	**Population, Water Demand, and Water Supply Projections**	**$49,000**
1.1	HDR will tabulate and prepare graphs of TWDB High Case population and water demand projections, with conservation, for (1) study area counties:	$14,000

Bexar	Guadalupe	Caldwell	San Saba
Medina	Bandera	Gonzales	Blanco
Uvalde	Wilson	Victoria	Burnet
Comal	Karnes	Refugio	Travis
Hays	DeWitt	Calhoun	Bastrop
Frio	Goliad	Lee	Fayette
Zavala	Kerr	Williamson	Colorado
Atascosa	Kendall	Gillespie	Wharton
			Matagorda;

(2) cities of Bexar, Medina, Uvalde, Comal, and Hays counties; (3) San Antonio, Guadalupe, and Lower Colorado River Basins; and (4) the Edwards Balcones Fault Zone Regional Demand Center. Projections will be shown in ten-year intervals starting in 1990 and ending in 2050. Population will be in numbers of people, and water demand projections will be in acre-feet per year for water use categories: (1) Municipal and commercial, (2) Industrial, (3) Steam-electric power generation, (4) Irrigation, (5) Mining, (6) Livestock, (7) All other, and (8) Total water demand. Projections will be obtained from TWDB, South Central Texas Technical Data Review Panel Report and recent water planning reports of the study area. A brief guide to tables and graphs will be included.

1.2	HDR will tabulate and prepare graphs of TWDB projections of existing groundwater and surface water supplies for: (1) study area counties listed in Task 1.1, (2) cities of Bexar, Medina, Uvalde, Comal, and Hays Counties for which water supply data are available, (3) San Antonio, Guadalupe, and Lower Colorado River Basins, and (4) the Edwards Balcones Fault Zone Regional Demand Center. Projections will be shown in 10-year intervals starting in 1990 and ending in 2050. The water supply projections will be presented in acre-feet for the demand areas and demand centers to the extent that water supply data are available for counties, cities of the five-county Edwards Aquifer demand area, River Basins and Edwards Aquifer Demand Centers. TWDB water supply projections data, TWC water use permits information, South Central Texas Data Review Panel Report, and recent water supply studies (North Bexar County Report, Bastrop Groundwater Report, and Victoria County Water Plan) will be used in the preparation of the water supply projections for the water demand areas and center.	$19,000

1.3 Using results of Tasks 1.1 and 1.2, HDR will summarize water demand and water supply projections, in tabular and graphic form, by decade from 1990 through 2050 for the Counties, Cities, River Basins, and Edwards Aquifer Demand Centers listed in Tasks 1.1 and 1.2 above. The summaries will show supply surpluses and shortages for the water demand and water supply areas and centers. A brief guide and explanation of the water demand and supply analyses will be included. $16,000

2.0 Demand Reduction

2.1 A literature review of the following Accelerated/Increased Conservation measures will be performed to estimate potential water savings potential as well as the likely costs of such measures: $15,000

a. Public information
b. Incentive programs
c. Conservation pricing
d. Leak detection and repair
e. Conservation landscaping
f. Retrofit plumbing fixtures
g. Gray water use for lawns and landscaping
h. Low energy precision application for agriculture
i. Furrow diking for agriculture
j. Surge valves for agriculture

Objectives & Assumptions:

1. Conservation effects of existing water use reduction laws are included in TWDB water demand projections to be fully realized at a steady rate by 2020. Assumes no increase in per capita use rates due to life style changes.
2. Some options will accelerate the conservation effects of existing water use reduction laws so they will have a demand reduction earlier than 2020, but will not further reduce demand.
3. Options that require change in lifestyle/business practices will have a long-term demand reduction (assumes no rise in per capita use in response to rising incomes and life style changes).

4. Use available TWDB projections of advanced conservation demand reduction (Municipal and Industrial), and results of water conservation programs in cities such as Tuscon, Arizona, Trinity University study of price elasticity of water demand in San Antonio, Texas, and TWDB/Harris-Galveston Coastal Subsidence District 1992 study of "Effectiveness of Retrofit in Single Family Residences and Multi-Family Projects". Estimate costs and quantities of potential savings.
5. Develop unit cost to achieve conservation in agriculture, and make estimates of potential quantities of water saved per acre of irrigation. Use Texas Agricultural Extension Service (TAES Pena) and other available information.

3.0 Reuse $40,500

3.1 Determine Amount of Total Demand Suited/Available for Reuse $3,000

Objectives & Assumptions:

1. Suitable Uses - irrigation, industrial, and river augmentation (e.g.,treated effluent for tunnel project).
2. Unsuitable Uses - direct potable use, irrigation of food crops.
3. Evaluate timing of competing uses to determine actual amount of reuse water available without storage facilities for 1990 and 2010 conditions.
4. Consider only existing major discharges > 5,000 ac-ft/yr.

3.2 Specific Options for Reuse

a. Transfer to farmers for irrigation in exchange for farmers' Edwards water. $12,000
b. Transfer to farmers for irrigation in exchange for farmers' Medina lake water. $3,500
c. Existing recycling/reuse plans by SAWS. $15,000
d. Sale/transfer to Corpus Christi for storage in/use from Choke Canyon Reservoir. $7,000

Objectives & Assumptions:

1. Storage will only be included if necessary for project feasibility. If storage is required, costs will be based on reconnaissance level unit cost from similar type projects. Previous work regarding the potential use of Calaveras and Braunig Lakes for storage of wastewater will be taken into account.
2. Use SAWS generated information on specific reuse projects. Use TWDB's Industrial Reuse Study.
3. Develop additional options only for significant (i.e., >5,000 ac-ft/year) potential users like industry, golf courses, etc.
4. Reconnaissance level of effort in subtasks a, b, and d (i.e., one supply/demand condition, use Year 2010 flows from SAWS report, with effect of water conservation upon quantities of return flows included in the Year 2010 flows).
5. Assume no significant return flows occur from irrigation areas.
6. Assume no significant socio-economic or environmental impacts in irrigated area.
7. In most cases, diversion is directly from WWT plant. For d., diversion will be from San Antonio River.
8. Select one level of exchange for Medina Lake option. Cost and use of Medina Lake water which is made available to be considered in Task 6.01.

4.0 Irrigation Transfer $11,000

4.1 Purchase and/or leasing of Edwards irrigation water in Uvalde, Medina and Bexar Counties for retirement of irrigation use or for conversion to municipal and industrial use -- estimate probable range of quantities of water for average and dry years.

Objectives & Assumptions:

1. Estimates will be based upon provisions of S.B. 1477, Texas Legislature, 1993 Regular Session.
2. Economic impacts on Uvalde, Medina, and Bexar counties will be evaluated on the basis of TAES and other available studies (see Task 2.1).

3. Use experiences from other areas where irrigation has been bought out and estimate probable range of success and quantities of water for average and dry years.
4. Water pricing costs will be delayed until Phase II.

5.0 Edwards Aquifer Recharge $89,500

5.1 Natural Recharge (from waters originating from the Edwards catchment or recharge zone.) $23,000

Objectives & Assumptions:

1. Use information in HDR reports prepared for the Edwards. Costs for projects in Guadalupe and San Antonio River Basins have not been determined. Costs for these projects will be based on unit costs of storage for projects in Nueces.
2. Previous work by HDR and EHA on Medina Lake including potential purchase of BMA water rights will be used.
3. Assume one program of maximum capacity Type 1 projects.
4. Assume one program of optimum capacity Type 2 projects.
5. Assume water quality is acceptable for recharge purposes without filtration or treatment.
6. Unit cost of water from recharge projects will be based on drought conditions.

5.2 Imported Recharge $66,500

Objectives & Assumptions:

1. Utilizing the water availability information obtained from Tasks 6.0 (Surface Water Supplies) and 7.0 (Groundwater Supplies) evaluate and determine unit costs (with emphasis on drought conditions) for the following supply sources:
   a. Applewhite Reservoir
   b. Canyon Lake (delivery to Lake Dunlap)
   c. Lake Travis (water released to Lake Austin and diverted from Lake Austin)

d. Carrizo Aquifer (two pumping scenarios)
e. San Marcos River (unappropriated water)
f. Lake Dunlap (Guadalupe River - unappropriated water)
g. Cibolo Reservoir
h. Lindenau Reservoir
i. Cuero Reservoir
j. Goliad Reservoir
k. McFaddin Reservoir
l. Allen's Creek Reservoir (Brazos)
m. Toledo Bend Reservoir (Sabine)
n. Allen's Creek blended with Toledo Bend
o. Treated wastewater (with treatment costs)

2. Cost out pump stations, pipelines, and injection wells delivering water for recharge (note: well field production costs for Carrizo source obtained from Task 7.0).
3. Use one injection well area (with filtration facilities, if necessary) and two Type 2 recharge structures to deliver water to aquifer. Ability of aquifer to take water will not be addressed in Phase I. Verification of aquifer take rates will be necessary in subsequent phases.
4. For costings purposes three common delivery locations and pipeline routes to the recharge areas will be used.

5.3 Spring Flow Augmentation (results of the TWDB/TWC/TPWD 1993 study in progress on spring flow augmentation will be considered in Phase I of this study, in preparation for further analyses, as needed and appropriate in Phase II).

6.0 Surface Water Supplies $167,000

6.1 Nueces River Basin $2,500

Objectives & Assumptions:

1. Include map of significant water rights showing past uses and quantity permitted.
2. Existing and Proposed Reservoirs - none to be considered except for recharge projects covered in previous sections.
3. Evaluations of supplies potentially available through transfer of water rights will be based upon provisions of S.B. 1030, enacted by Texas Legislature in 1993 Regular Session.

6.2 San Antonio River Basin $45,500

Objectives & Assumptions:

1. Develop map of significant water rights showing past use and quantities permitted.
2. Calculate Unappropriated streamflows at three locations (present tables and graphs) (see Section 12.7)
   - with and without T-T environmental criteria
   - with and without significant return flows
3. Existing and Permitted Reservoirs
   For all existing and permitted reservoirs, water availability will be based on previous yield studies. Most likely these will be based on initial reservoir capacities. Costs will be determined for each reservoir project on a standalone basis with one diversion scenario evaluated for each reservoir. The diversion scenario will be based on the firm yield of the individual reservoir. Costs will be developed for the water to be pumped, treated and distributed within the San Antonio water system generally in accordance with previously published plans. Under Task 5.2, costs will be developed for selected sources for the water to be pumped and recharged directly to the Edwards Aquifer to locations west of San Antonio. The following reservoirs will be analyzed:
   - Medina Lake
     - consider purchase of existing rights with water released to Applewhite and then treated and distributed.
     - consider direct diversion and treatment
     - recharge use performed under Task 5.1
   - Applewhite Reservoir - update cost to complete based on available data.
     - consider direct diversion and treatment.
     - consider potential as part of a regional system of reservoirs.

4. Proposed Reservoirs
For proposed reservoirs water availability will be based on new yield studies based on initial reservoir capacity. Yield studies will be performed using the Trans-Texas environmental criteria as well as other selected criteria such as water rights, springflows, and return flows. Previously published costs will be updated to present conditions.
   - Cibolo - look at one storage size.
     - use previous cost data adjusted for inflation
     - consider potential as part of a system.
   - Goliad - use results of reservoir cost work from other T-T studies

5. Evaluations of supplies potentially available through transfer of water rights will be based upon provisions of S.B. 1030, enacted by Texas Legislature in 1993 Regular Session.

6.3 Guadalupe River Basin — $61,500

Objectives & Assumptions:

1. Develop map of significant water rights showing past use and permitted quantity.
2. Calculate Unappropriated Streamflows at up to three locations (present tables and graphs) (see Section 12.7)
   - with and without T-T environmental criteria.
   - consider springflows based on two available aquifer pumpage/recharge scenarios
   - consider two hydropower scenarios
3. Existing Reservoirs
(see discussions for San Antonio River Basin; Task 6.2 as applicable to existing reservoirs.)
   - Canyon Lake - use previous yield studies and maximum of two diversion rates
     - use previous work on flood pool conversion to conservation storage

4. Proposed Reservoirs (Significant)
(see discussion for San Antonio River Basin; Task 6.2); however, proposed reservoirs have not been permitted.)
   - Lindenau - update previous work on costs
   - Cuero - update previous work on costs
   - Cloptin Crossing - recharge project only - to be evaluated under Task 5.1
   - McFaddin - use results of firm yield and reservoir cost work from other T-T studies
     - run overdraft scenario

5. Proposed Reservoirs (Minor projects)
For these reservoirs only raw water costs at the source will be considered based on previous yield studies and previous cost estimates adjusted for inflation.
   - Dam 7
   - Gonzales
   - Lockhart
   - Dilworth

6. Evaluations of supplies potentially available through transfer of water rights will be based upon provisions of S.B. 1030, enacted by Texas Legislature in 1993 Regular Session.

6.4 Colorado River Basin (Imported Water) $36,500

Objectives & Assumptions:

1. Develop map of significant water rights showing past use and permitted quantity.
2. Calculate available water at up to four water rights locations (LCRA model) (see Section 12.7)
   - with and without releases from storage
   - with and without significant return flows
3. Existing Reservoirs
   - Lake Travis water diverted at Lake Austin - evaluate one diversion rate without reduction of second crop irrigation
     - consider alternate diversion rate with water available from reduction of second crop irrigation

4. Proposed Reservoirs
(see discussion from San Antonio River Basin; Task 6.2; however, proposed reservoirs have not been permitted.)
   - Shaws Bend - update previous work on costs
     - LCRA model to be used for yield analysis

5. Evaluations of supplies potentially available through transfer of water rights will be based upon provisions of S.B. 1030, enacted by Texas Legislature in 1993 Regular Session.

6.5 Brazos and Sabine River Basins (Imported Water) $36,500

Objectives & Assumptions:

1. Proposed Pipeline Projects:
   - Allens Creek - evaluate two diversion rates (standalone w/o Sabine water)
   - Sabine Water - evaluate two diversion rates (standalone w/o Allen's Creek)
     - assumes pipeline from the southeast will terminate at Brazos River
   - Brazos/Sabine Combined - consider Sabine water delivered to Allen's Creek and blended
     - evaluate two diversion rates
2. Evaluations of supplies potentially available through transfer of water rights will be based upon provisions of S.B. 1030, enacted by Texas Legislature in 1993 Regular Session.

7.0 Groundwater Supplies $29,000

7.1 Regional Aquifers

a. Edwards - The Edwards aquifer will not be evaluated in Phase 1.
b. Gulf Coast - Gulf Coast aquifer is being briefly studied in Corpus Christi study.
c. Carrizo Aquifer

The anticipated future water demands of San Antonio may have to be met with some source other than the Edwards aquifer, which is now the City's sole water source. One possible alternative is the development of a large well field in Atascosa, Wilson, Gonzales, Caldwell, and Bastrop Counties which would draw water from the Carrizo aquifer. Previous studies by the TWDB and others have shown that significant quantities of water (>100,000 Ac-Ft/Year) may be capable of being developed.

The Carrizo aquifer is composed of the Carrizo Sand of the Claiborne Group. However, the aquifer is hydraulically connected to the Wilcox and Queen City sands, causing the entire system to act as a leaky artesian aquifer. The aquifer is essentially full and currently may be losing water through interformational leakage to the overlying Queen City Sand, through flow to the major streams and rivers (San Antonio River, Cibolo Creek, San Marcos River, etc.) where it crosses the outcrop, and through rejected recharge in lower-lying portions of the outcrop area.

In Phase I, a regional reconnaissance level evaluation will be made of the Carrizo aquifer in South Texas. This evaluation will include: (a) collection and review of readily available basic data; (b) review of selected reports; (c) development of a reconnaissance level water budget for an assumed large withdrawal in Atascosa, Wilson, Gonzales, Caldwell, and Bastrop counties (> 100,000 acre-feet/yr); (d) development of a reconnaissance level well and well field costs; and (e) a written report which discusses water availability, aquifer storage and recovery, and includes tables and illustrations. This report will be included in the Phase 1 Report. The effects of large increases in pumpage in Bastrop County will be evaluated using the recent results of the LCRA/TWDB study (1989).

Care should be taken in the planning, location, and construction of new wells and/or well fields. In the past, some large capacity wells have been located too close to existing wells and well fields, resulting in interference among pumping wells. This has caused excessive local declines in the water table and losses of well pumping capacities. Therefore, the next phase of the study (after Phase I) with regard to a Carrizo well field may include the construction of a three-dimensional groundwater flow model, a detailed well field design and cost optimization study, and water quality analysis with regard to produced water.

7.2 Minor Aquifers

Minor aquifer yields are assumed to satisfy local needs except in identified areas of shortage, and will not be evaluated in Phase I.

8.0 Desalt **$4,000**

Objectives & Assumptions:

1. Modify de-salt writeup done for Corpus Christi.
2. A short narrative which discusses the advantages and disadvantages of using ground water from below the Edwards "bad water" line for desalt purposes.

9.0 Water Treatment and Distribution $20,000

Objectives & Assumptions:

1. Use SAWS plan—to treat and distribute Applewhite water as basis for general costing.
2. Use reconnaissance level of effort to estimate standard treatment and distribution costs and consider results of other studies.

10.0 Environmental $77,000

A. Phase I of the environmental program will include a reconnaissance level fatal flaw evaluation of the options being considered during the planning process. The various project components (e.g., location of pipelines, intakes and outfalls, use of ground versus surface water supplies, use of surface reservoirs for storage) will be subjected to an analysis of their potential environmental effects. A reconnaissance screening of environmental effects will be done.

The Conceptual layouts will be developed in Phase 1 for each alternative and the various alternatives will be characterized in sufficient detail for the environmental consultant to project the probable magnitudes of potential environmental effects for each of them. Existing information will be compiled and subjected to a matrix-type analysis to 1) identify environmental features that may indicate substantial constraints on the proposed options (e.g., impacts on endangered species such as the Attwater Prairie Chicken), and 2) develop preliminary impact assessments so that the various actions and projects can be compared and ranked with respect to potential environmental impacts, probable mitigation costs, and permitting difficulty.

Objectives & Assumptions:

1. Assemble descriptions of alternatives identified and characterized in Tasks 2.0 through 10.0 sufficient to define major construction and operational effects.
2. Compile database and environmental information for each alternative.
3. Maintain databases and document methods to provide input to subsequent Phases, particularly the alternatives that will be needed to satisfy National Environmental Policy Act guidelines.
4. Project probable impacts and mitigation liabilities using consistent methods and criteria to facilitate the comparison and ranking of alternatives in a matrix analysis.

11.0 Phase 1 Report, Coordination, and Meetings $98,000

During Phase 1, the North Portion South Central Area PMC (NPSCA PMC) will conduct 1) project management and review meetings, 2) Technical Advisory Committee meetings, and 3) Public information and participation meetings. The consultant will prepare information for use in coordination and public information and participation meetings.

The Phase 1 interim report will summarize the data collected and options and alternatives identified (25 copies of draft report and 25 copies of final report along with seven unbound camera ready originals). An overall conceptual summary of options will be prepared as a starting point for consideration in Phase 2 of the program. It is anticipated that during Phase I the consultant will participate in not more than two public information and participation meetings and not more than four coordination and review meetings to discuss the alternatives and make modifications as appropriate to incorporate the project sponsor input. It is anticipated that Phase 1 will be completed approximately 8 months after Notice to Proceed.

TOTAL $600,000

12.0 General Assumptions and Guidelines

1. All "management" tasks deferred until Phase 2. (Tasks 2.01, 2.07, 3.0, and 5.0 in HDR draft scope dated 4-13-93)

2. No model linkage will be developed in Phase 1. Linked models will be developed in Phase 2 to refine analysis done in Phase 1 and to evaluate "management" options.

3. Establish pipeline corridors to be used with various pipe sizes for costing transmission components of different options.

4. All assessment of water quality will be performed in Phase II.

5. Only fatal flaw type environmental analysis will be performed in Phase I.

6. Work related to enhance recharge of the Barton Springs portion of the Edwards aquifer will briefly be mentioned in Phase I but not addressed in detail until Phase II.

7. The study participants will confer with HDR Engineering in the specification of parameters, and assumptions, and in applications of environmental guidelines. The study participants will also confer with HDR in making determinations of points for evaluation of diversions from the San Antonio, Guadalupe, and Colorado Basins (Tasks 6.2, 6.3, and 6.4)

1.11-3.6 TAC

TRANS TEXAS WATER PROGRAM

NORTHERN SOUTH-CENTRAL
TECHNICAL ADVISORY COMMITTEE MEETING
AUGUST 25, 1993 2:00 P.M.

SUBMITTED BY: _____

COMMENTS: _____

PLEASE ATTACH ADDITIONAL SHEETS IF NECESSARY.

PLEASE RETURN TO:

STEVEN J. RAABE, P.E.
SAN ANTONIO RIVER AUTHORITY
P.O. BOX 830027
SAN ANTONIO, TEXAS 78283-0027
(210) 227-1373
FAX: (210) 227-4323

1.11-3.6 TAC

TRANS TEXAS WATER PROGRAM

NORTHERN SOUTH-CENTRAL
TECHNICAL ADVISORY COMMITTEE MEETING
AUGUST 25, 1993

NAME	ORGANIZATION	ADDRESS	PHONE NO.	FAX. NO.
Jay Sinkin		125 St. Denis	822-7544	
Robert Lidwin	USGS	435 Isom Rd	229-4390	
Joe Aceves	SAWS	—	224-7001	
Catherine Lemmon	LNV-TX	7616 Rogue Plaza	(214) 368-7489	
David Davenport	CRWA	Rt2 Box654W NB78130	210-608-0543	
Giles Babb	Private Citizen	5804 Deer Lake D. SATX 78244	661-6672	
DAVID Welsch	GBRA	933 E. Court	210/379-5802	
Judi Austen	HQ AETC/CEVE AIR FORCE	266 F. St west - Randolph AFB	652-2774 Voice 602-2540	
Glenn Longley	SWTSU, Edwards Aq. Res. Ctr, San Marcos, TX		512 245-2329	
~~WARREN KLEIN~~	~~GBCA~~	~~P.O. BOX 908 LOCKHART 78644~~	~~512-398-2182~~	
Karen Stahl	SAWS	—	225-7461	
Steve Schultz	G.SACC	602 E. Commerce	229-2118	
W.J. NOTTON III	AACOG	118 Broadway SA	225-5201	
Thomas Moreno	Bexar Met	2706 W. Southcross S.A. Tx.	922-1221	

1.11-3.6 TAC

TRANS TEXAS WATER PROGRAM
NORTHERN SOUTH-CENTRAL
TECHNICAL ADVISORY COMMITTEE MEETING
AUGUST 25, 1993

NAME	ORGANIZATION	ADDRESS	PHONE NO.	FAX. NO.
DENNIS CROWLEY	TWDB		SIV - 463-7976	SIV - 463-9893
KARL WURZ	ZELF	830 FLORIDA SA TEX 78210		
RALPH RAMSEY	RPL, Box 78 GOLIAD, Tex		(512)645-301	
ED JANECKA, FAYETTE	COURTHOUSE LA GRANGE, TX		968-6469	
ROBERT WAGNER	ZAV - D.S. WILDLIFE			
Douglas Steadman	San Antonio Manufacturers Assn W E Simpson Co., Inc		340-2216	340-575
Bruce T. Foster	P.O. Drawer E Hondo Texas		210-426-48	
NEIR LABATT	135 W. ELSMERE, SA, TX		(210) 732-249	
MARY B. AUTRY	RT 2, Box 6851, PIPE CREEK 78063		535-40	
LEW COLEMAN	4130 MONACO 78218		656-1056	225-2796
RAY BUCK	SWMD	Box 771 BANDERA 796 7260		796 8262
Luana Buckner	Medina Co UWCD	1100 16th St Hondo		426-316
KEVIN MAYES	TEXAS PARKS & WILDLIFE	PO Box 1684 San Marcos 78667		754-6844
Bob VANN	protect Lake Travis Assoc	10801 Rush Rd. Austin 78732	512-266-500	

1.11-3.6 TAC

TRANS TEXAS WATER PROGRAM

NORTHERN SOUTH-CENTRAL
TECHNICAL ADVISORY COMMITTEE MEETING
AUGUST 25, 1993

NAME	ORGANIZATION	ADDRESS	PHONE NO.	FAX. NO.
John J Byrum III	City of Victoria	P.O. Box 1758	512 572-2749	512 575-0997
F.F. Post Jr.	Goliad County	RT 7 Box 704 Vic T.		
Judge Charles Scott	Blanco County	P.O. Box 471 Johnson City 78636	210 868 4266	210 868 7288
JOE CADWELL	City of Austin	P.O. Box 1088 Austin T. 78736	512-322-2825	512 322-2[illegible]
Herb Garrabb	HDR Engr.	3000 So. 135 Austin 78704	512/442-8501	512/442-5061
TOM Culbertson	Reg CAE, Wty.	511 Westwood SA Tx 78212	557 733-7474	
Coy Mims	Nueces River Authority	PO Box 349 Uvalde, Tx 78802	210-278-6810	
Russell Mask	ELUD			
Rick Illgner	"	P.O. Box 15830 SA Tx 78212	9030	
Delay Dallmeier	Gonzales County	414 St Joseph Gonzales 78629	210.672-2327	
Calvin E Spencer	Sandi	414 St Joseph Gonzales 78629	210-672-2044	
Mike Meyer	SAWS	PO 2449 SA Tx	210 225-20[illegible]	
Danielle Milam	SAA LWV	213 Harriett SA TX	210 828 3960	
Gary L Becker	City of La Grange	155 E Colorado	409-968-3287	409-968-5471

1.11-3.6 TAC

TRANS TEXAS WATER PROGRAM

NORTHERN SOUTH-CENTRAL
TECHNICAL ADVISORY COMMITTEE MEETING
AUGUST 25, 1993

NAME	ORGANIZATION	ADDRESS	PHONE NO.	FAX. NO.
H.O. STRUNK	Colorado County Judge	P.O. Box 236	404-732-2604	732-5382
JACK C Nelson	LAVACA NAVIDAD River		512 782 5229	
KEN PEARCE	KARNES COUNTY JUDGE	COUNTY COURTHOUSE, KARNES CITY TX 78118		
DAGUE McKINNEY	UNIV. OF TEXAS	Center for Research in Water Resources	(512)471-8772	(512)471-05
Keith DeFalle	Evergreen UWCD	P.O. Box 155	Jourdanton, Tx 78026	404/245 1708
HASKELL SIMON	MATAGORDA Co. WATER CONSERV.	PO Bx 106	BAY CITY, TX 77404	
W. H. MULLINS	BMWD	5701 Broadway	210-828-5521	828-127
Dan Gerlich	W Central Co.	Box 608	Yoakum TX 77954	
Gene W. Barkemeyer	USDA-SCS	101 So. Main St.	Temple 76501	817-774-1217
Sharon Smith	Greater S.A. Bldr. Assoc.		349-3795	349-9419
Gene Richardson	LCRA	P.O. Box 220	Austin	512-473-4052
Margaret Kang	self	730 Town Crk.		
Mary Jordan	Texas Water Comm.	Austin, TX	(512)475-2201	
Ryan Wilson	self	202 Orchard	SA. TX 78213	342-6915

1.11-3.6 TAC

TRANS TEXAS WATER PROGRAM

NORTHERN SOUTH-CENTRAL
TECHNICAL ADVISORY COMMITTEE MEETING
AUGUST 25, 1993

NAME	ORGANIZATION	ADDRESS	PHONE NO.	FAX. NO.
Bob Tomasini	Bexar County	233 N. Pecos	270-6200	6713
Thomas D. Hill	GBRA	P.O. Box 271	379-5822	
Carol Patterson				
Tommy Knowles	TWDB	PO Box 13231	5124634043	
Walter R. Ford	SUNBEAM ENVT SVCS.	226 NORTHRIDGE S.A. TX 78209	(210) 828-2457	
Elizabeth B. Mounsund		505 W El Prado SA TX 78212		
Jerold Rolf		7407 BRIDGEWATER SA Tx 78209		

1.11-3.6 TAC

TRANS TEXAS WATER PROGRAM

NORTHERN SOUTH-CENTRAL
TECHNICAL ADVISORY COMMITTEE MEETING
AUGUST 25, 1993

NAME	ORGANIZATION	ADDRESS	PHONE NO.	FAX. NO.
GENE T. RICE, Jr.	U.S. ARMY CORPS OF ENGRS. FT. WORTH DISTRICT	P.O. BOX 17300 FT. WORTH, TX 76102	817-334-2185	817-885-7539
David R. Dennis	Cibolo Creek Municipal Auth.	Box 930 Schertz 78154	210 6586241	6585830
Greg Kolbe	GE Kolbe Co L.L.C.	P.O. Box 609 Nixon, Tx 78161	210-582-3011	
Bill West	L. CK H	P.O. BOX 220 Hallettsville, Tx	512-798-3308	
Wendell Hammond	UTSA	6500 N Loop 1604 W	691-4455	691-4469
Howard Johnston	Randolph Hills Assoc	6594 Kings Crown	655-9304	
Bruce A. Mullins	Tx Water Comm.	PO Box 13087, Austin TX 78711	512/463-8208	
Guy Fipps	Tx Agr Extension Service	College Station	409 845-7454 FAX 845-3 77843-2117	
Tom Brereton	SAWS	1414 Guenther St 78232	496-7419	496-7570
Carolyn Serold	HQ AETC/CEO	Randolph AFB, TX	652-4038	652-2542
Sam D. Hamilton	FWS	611 E 6th St. Austin	482-5436	
Dan Durden	PEPP	9901 Broadway St. 114 78217	826-5371	826-6020
[illegible]	SMA	[illegible]	662-2132	
Virginia Cooper	Ass Park-Northwood	P.O. Box 17893	S.A. Tx. 78217	

1.11-3.6 TAC

TRANS TEXAS WATER PROGRAM
NORTHERN SOUTH-CENTRAL
TECHNICAL ADVISORY COMMITTEE MEETING
AUGUST 25, 1993

NAME	ORGANIZATION	ADDRESS	PHONE NO.	FAX. NO.
PATSY LIGHT	Friends for Conservation of San Antonio River Basin	300 Argyle	210 8245914	210 828-6203
JANICE BEZDNSON TRONR		601 Westlake Dr Austin 78746	512 327-4111	512 328-3391
DON JOHN STONE	GREATER AUSTIN SAN ANTONIO CORRIDOR Council		512 2452535	

1.11-3.6 TAC

TRANS TEXAS WATER PROGRAM

NORTHERN SOUTH-CENTRAL
TECHNICAL ADVISORY COMMITTEE MEETING
AUGUST 25, 1993

NAME	ORGANIZATION	ADDRESS	PHONE NO.	FAX. NO.
PARKE CHRISTENBERRY	GARWOOD IRRIGATION CO	P.O BOX 428 GARWOOD 77442	409-758-3221	758-3814
STEVE RAMSEY	S.A.R.A.			
FRED R. ORE	Bureau of Reclamation	300 E. 8th Austin 78701	512 4825641	512 482 5654
J. Tom Ray	Brazos River Authority	POBox 7555 Waco TX 76714	817/776-1441	
Shelley Whitworth	AACOG	118 BROADWAY Suite 400 SA, Tx 78205	210-225-5201	
Rick Boodt		10319 Country Bluff	558-3444	
Dr & Mrs F.L. Doyle	Hydro Geology Associates	19926 Encino Moss SAT,	210 497-3590	same 210-608-21
David Whatley	City of New Braunfels	110 Golf Course Rd., New Braunfels, Tx 78130		Fax 210-609-21

08-31-93-1

1.11-3.6 TAC

TRANS TEXAS WATER PROGRAM

NORTHERN SOUTH-CENTRAL
TECHNICAL ADVISORY COMMITTEE MEETING
AUGUST 25, 1993 2:00 P.M.

SUBMITTED BY: E. Gerald Rolf — So. Tex. Geol. Soc.

COMMENTS: It must have became apparent at the initial meeting that the TAC, although composed of an excellent group of folks, is too large and unwieldy to participate properly. I would recommend that a letter be sent to each TAC member asking them to pick out one but not more than ~~two~~ three of the 10 areas of study so that they could meet as a type of subcommittee with Dr. Grubbs staff at the time HDR has formulated the data for analysis & discussion. In this manner your TAC members will feel they contributed to the consensus. They will be able to tell the public the results were jointly arrived at and the final report will be an effective document not one surrounded by controversy and people calling foul. The task is difficult the success is based on agreement & consensus, let's do it so. PLEASE ATTACH ADDITIONAL SHEETS IF NECESSARY.

time is no sniping at the end.

E. Gerald Rolf

PLEASE RETURN TO:

STEVEN J. RAABE, P.E.
SAN ANTONIO RIVER AUTHORITY
P.O. BOX 830027
SAN ANTONIO, TEXAS 78283-0027
(210) 227-1373
FAX: (210) 227-4323

xc HDR
TWDB

08-27-93-2

1.11-3.6 TAC

TRANS TEXAS WATER PROGRAM

NORTHERN SOUTH-CENTRAL
TECHNICAL ADVISORY COMMITTEE MEETING
AUGUST 25, 1993 2:00 P.M.

SUBMITTED BY: RAY BUCK, SPRINGHILLS WATER MANAGEMENT DISTRICT

COMMENTS: STEVE,

I would encourage you to use the data from this District's regional water supply study. The 1991 study was performed by HDR Engineering, Inc. Herb Grubb did an excellent job in forcasting population growth. Please call me if you have any questions.

Ray

PLEASE ATTACH ADDITIONAL SHEETS IF NECESSARY.

PLEASE RETURN TO:

STEVEN J. RAABE, P.E.
SAN ANTONIO RIVER AUTHORITY
P.O. BOX 830027
SAN ANTONIO, TEXAS 78283-0027
(210) 227-1373
FAX: (210) 227-4323

09-23-93-1

1.11-3.6 TAC

TRANS TEXAS WATER PROGRAM

NORTHERN SOUTH-CENTRAL
TECHNICAL ADVISORY COMMITTEE MEETING
AUGUST 25, 1993 2:00 P.M.

SUBMITTED BY: Jay Lenkin

COMMENTS: There can be no justification for an expenditure of millions (billions?) of dollars for interbasin transfers and the building of dams (7?) to supplement our water supply when you aren't even considering the effects of massive development on the 80,000 acres of the recharge zone in Bexar Ct.

1604 effectively cements up the recharge capacity of at least 4,000 gpm for an unknown quantity of acres. Texas obliterated at least 40 (E.A.W.D.) acres recharge features and only USAA knows what Karen Hixe did to the Leon Creek recharge area. And now we're faced with 72 cantera and a parking lot accommodating 20,000 - 40,000 automobiles all leaking gasoline & oils. (Run-off for the aquifer?)

(Continued)

PLEASE ATTACH ADDITIONAL SHEETS IF NECESSARY.

PLEASE RETURN TO:

STEVEN J. RAABE, P.E.
SAN ANTONIO RIVER AUTHORITY
P.O. BOX 830027
SAN ANTONIO, TEXAS 78283-0027
(210) 227-1373
FAX: (210) 227-4323

In addition to pumping [illegible]
happenings of development: i.e. gasoline stations
laundries and their chemicals, lawn pesticides
toxic waste leeching, cracked sewer lines etc
all helping to pollute the aquifer. Have you
factored in the cost of treatment plants to clean
up the results of polluting spills?

If we write regs sufficiently potent
would they not have an effect upon the
amount of acre feet of surface water nec-
essary to supplement deep aquifer water?
Would it not have an effect on the number
& cost of treatment plants to clean up the
transported water?

Nowhere in your lengthy & complicated
"done deal" Trans Texas plan is there any
focus on how to protect & preserve what we
already have; Do you intend to address
the subject? If you do count me in -

L. Sutton

1735 Royal Crescent Dr/
San Antonio, Tx. 78231-2421
September 22, 1993

HDR Engineerings, Inc.
Suite 400
3000 South IH 35
Austin, Tx. 78704-6536

Dear Sir:

I understand you are undertaking a study of water in Texas. As a concerned citizen I would be interested in having some input when the time is appropriate and would be interested in receiving notice of the next public meeting.

It is my understanding that you are a national engineering firm involved in many kinds of studies and it is just recently that you became involved in the study of water. Could you send me a list of the projects you have been involved in and what cities were involved. Perhaps some were regional or state-wide studies, if so please indicate. At this point do you have any ideas as to what is expected of the study?

Sincerely,

Bernice H. Gross

BERNICE H. GROSS

1.11-3.6 TAC

TRANS TEXAS WATER PROGRAM

NORTHERN SOUTH-CENTRAL
TECHNICAL ADVISORY COMMITTEE MEETING
AUGUST 25, 1993 2:00 P.M.

SUBMITTED BY: Patsy Light, Friends for Conservation of the San Antonio River Basin. (Vice-Chairman)

COMMENTS: Please see attached

PLEASE ATTACH ADDITIONAL SHEETS IF NECESSARY.

PLEASE RETURN TO:

STEVEN J. RAABE, P.E.
SAN ANTONIO RIVER AUTHORITY
P.O. BOX 830027
SAN ANTONIO, TEXAS 78283-0027
(210) 227-1373
FAX: (210) 227-4323

10-13-93-2

Patsy Light
300 Argyle
San Antonio, Texas 78209

October 12, 1993

Mr. Steven J. Raabe, P. E.
San Antonio River Authority
P. O. Box 830027
San Antonio, Texas 78283-20027

Dear Mr. Raabe:

I am enclosing copies of letters to Mr. Ken Choffel at HDR Engineering, and Mr. Paul Price of Paul Price Associates, Inc. addressing the concerns of the Bexar County Historical Commission and Mr. Jim Steely of the National Register of Historic Sites about the eligible sites in the proposed Goliad dam location (also enclosed are their letters).

The Technical Advisory Committee should be aware that the proposed Goliad reservoir site is rich not only in historical sites; but also is an important natural site. I am also enclosing a copy of my "Citizens to be Heard" remarks which I presented to the SARA Board this summer, which covers many of our concerns.

The Friends for Conservation of the San Antonio River Basin are opposed to a reservoir at Goliad.

Thank you for your interest and your concern. Please keep us informed about Trans Texas Water Program meetings. Any other pertinent information you may have will be appreciated as well.

Sincerely,

Patsy Light

Patsy Light
Vice Chairman, Friends for
Conservation of the San Antonio
River Basin

Enclosures

THE STATE OF TEXAS

CURTIS TUNNELL
EXECUTIVE DIRECTOR

TEXAS HISTORICAL COMMISSION

P.O. BOX 12276 AUSTIN, TEXAS 78711-2276 (TELEPHONE) 512-463-6100 (FAX) 512-463-6095 (RELAY TX) 1-800-735-2989

3 September 1993

Ms. Patsy Light
Friends for Conservation of the San Antonio River Basin
300 Argyle
San Antonio, Texas 78209

Patsy,

Thanks for your letter and information of 30 August, and of course for your part in our recent visit to Goliad County.

Attached is a copy of "A Five-Minute Look at Section 106 Review." It highlights those parts of federal law that deal with historic preservation, and the required compliance with those laws by a federal agency.

The participants in the Trans-Texas Water Program study obviously anticipate some federal agency participation at some time, at some level in their water program. They have therefore instructed their consultant, HDR Engineering, to take federal regulations into account in this study.

As you can see in the marked sections of "A Five-Minute Look," the requirement to search for National Register properties includes ELIGIBLE sites, not just properties listed in the NR.

Well, as we determined during our visit, you have MANY eligible sites. When asked officially, we will immediately inform HDR Engineering and any other participant in this study that the sites we visited are indeed eligible. Your "Friends" charge at this point is to survey and LIST those properties in the National Register, so the determinations move beyond just our opinion.

We have sent Ann Bode several things discussed during our meeting, so please share this information with her and the group as well. Thanks again for a wonderful tour and reception.

Sincerely,

Jim Steely, Director
National Register Programs

cc: Amy Dase; Jamie Wise

BEXAR COUNTY HISTORICAL COMMISSION
BEXAR COUNTY COURTHOUSE
SAN ANTONIO, TEXAS 78205-3036
(512) 220-2657

RICHARD SANTOS
CHAIRMAN

HENRY GUERRA
VICE-CHAIRMAN

September 1, 1993

Chairman and the Board
Edwards Aquifer Authority
1615 North St. Mary's
San Antonio, Texas 78215

Ladies and Gentlemen of the Board:

The members of the Bexar County Historical Commission have discussed the ramifications of building a dam on the San Antonio River in Goliad County. Because of the large number of historical sites in that area, the vote was to oppose a reservoir at that location.

We are interested in preserving historic sites in Goliad County as well as in Bexar County.

Very truly yours,

Richard Santos

cc: Mr. Fred Pfeiffer
San Antonio River Authority

Mr. Cliff Morton
San Antonio Water System

Mr. Charles Jenness
Texas Water Development Board

Mr. Jim Steely
Texas Historical Commission

Mr. Andrew Sansom
Texas Parks and Wildlife

I am Patsy Light, Vice Chairman of the Friends for the Preservation of the San Antonio River Basin. I am a resident of San Antonio and own a ranch situated on the banks of the San Antonio River in Goliad County which has been in my family for 5 generations. My ranch will be totally submerged if a Goliad reservoir is built where the planning maps show it to be. Many of our organization's members also own ranches that have been operated by their families for over a hundred years.

The passage of the new legislative bill 1477 which virtually puts the Edwards Aquifer off limits to San Antonio mandates a renewed search for alternative water sources that will provide the additional amount needed.

The 1992 Texas Water Development Report, on page 98, states that it is unlikely that the Cuero I Reservoir will be built (because of environmental concerns), and that studies are underway to see which new water source would be best to construct first - the Goliad project or the Lindenau project.

The Friends for the Preservation of the San Antonio River Basin cannot see that a reservoir could provide any benefits to Goliad County for the following reasons:

1. The water quality of the river is poor, therefore, a reservoir would not be a beautiful pristine recreational lake.
2. A substantial number of fertile bottom land used for crops and rangeland will be gone forever.
3. Highway 239 between Kenedy and Goliad is in the proposed site, and would have to be rerouted.
4. Several thousand acres of virgin bottom land hardwood forests along the banks of Cabeza Creek and the San Antonio River for over 15 miles would be lost.
5. Acres and acres of ecologically important wet lands would be lost.
6. Significant loss of wildlife. The Texas Parks and Wildlife have expressed concern over at least 11 different species.
7. Approximately 33,000 acres of land would be removed from the tax rolls (a large percent of this land is in Goliad County). Significant dollar amounts of tax income is derived from the mineral interests within the proposed reservoir site.

8. All members of the agri-business community of the entire area will suffer (Kenedy, Victoria, Beeville, as well as Goliad) feed stores, grain elevators, contract farmers, equipment sales companies, etc.

9. The historical significance of which much has been written and documented will be negated:

   a) The old Goliad-San Antonio roads and the original paths between the missions.

   b) Indian campsites.

   c) Homes of significant architectural and historical importance.

   d) Family cemetaries.

   e) Centenarian oak trees registered with the Live Oak Society (measurements documented by the State of Texas Forest Service).

For the citizens of San Antonio and Bexar County, a Goliad reservoir would not be cost effective for the following reasons:

a) The initial land acquisition and construction costs of the dam.

b) Right-of-way acquisition and construction costs for a return pipeline from Goliad to San Antonio.

c) Cost of energy to pump water uphill.

d) Treatment costs.

e) Excessive evaporation because of a large surface area and a shallow depth.

It doesn't make any sense for San Antonio to let its waste water go 209 miles downstream and then spend huge amounts of money (which would be reflected in enormous water costs to the citizens) to retrieve it, only to have to treat it after it makes a round trip.

The Friends for the Preservation of the San Antonio River Basin asks for the help and support of this board to find other sources of water for Bexar County. There must be a better solution that is less environmentally damaging and more cost effective. The Friends for Preservation of the San Antonio River Basin are opposed to a surface reservoir in Goliad County.

Patsy Light
300 Argyle
San Antonio, Texas 78209

October 12, 1993

Mr. Ken Choffel
HDR Engineering
3000 South IH 35
Suite 400
Austin, Texas 78704

Dear Mr. Choffel:

As I understand from the schedule for the Trans Texas Study for the San Antonio Area, now is the time that your group will be considering the Goliad reservoir.

I am enclosing copies of letters from Jim Steely, Director of National Register Properties in Texas, and the Bexar County Historical Society. I have already sent this to Paul Price, since his group will be working on the historical and cultural aspects of the study, but thought you should have copies also.

Also enclosed are my "Citizens to be Heard" remarks which I presented to the San Antonio River Authority Board this summer which covers our major concerns.

Thank you very much for your interest and cooperation. We would appreciate hearing from you.

Sincerely,

Patsy Light

Patsy Light
Vice Chairman, Friends for
Conservation of the San Antonio
River Basin

Enclosures

Patsy Light
300 Argyle
San Antonio, Texas 78209

October 12, 1993

Mr. Paul Price
Paul Price Associates, Inc.
3006 Bees Cave Road
Suite B-180
Austin, Texas 78746-5540

Dear Mr. Price:

We met at the Trans Texas Water meeting in Corpus Christi, and then have talked on the phone since then. I am Vice Chairman of the Friends for Conservation of the San Antonio River Basin.

I have been concerned that the Corpus Christi report did not mention that there are sites eligible for the National Historic Register in the proposed Goliad reservoir sites. According to the schedule, it seems that your group will be studying Goliad for the San Antonio area report in the next few months. I think that I should send you this copy of the letter from Jim Steely, Director of National Register Programs in Texas, and also the one from the Bexar County Historical Commission.

The Goliad reservoir site does have many eligible sites for the National Register, and he said he would be willing to discuss this with you.

I am also enclosing a copy of my "Citizens to be Heard" remarks which I presented at a San Antonio River Authority board meeting this summer which covers most of our concerns.

Thank you very much for your attention to this matter. I would appreciate hearing from you.

Sincerely,

Patsy Light

Patsy Light
Vice Chairman, Friends for
Conservation of the San Antonio
River Basin

Enclosures

Trans-Texas Water Program
West-Central Study Area

San Antonio River Authority
San Antonio Water System
Edwards Aquifer Authority
Guadalupe-Blanco River Authority
Nueces River Authority
Lower-Colorado River Authority
Bexar Metropolitan Water District
Texas Water Development Board
Texas Water Commission
Texas Parks and Wildlife Department

1.11-3.6 TAC

November 3, 1993

TO: MEMBERS OF THE ADVISORY COMMITTEE FOR PUBLIC AND TECHNICAL INPUT

FROM: STEVEN J. RAABE, P.E., PROJECT MANAGER
(210) 227-1373

SUBJECT: TRANS-TEXAS WATER PROGRAM
WEST CENTRAL STUDY AREA
STATUS REPORT

In your role as an advisor to the Policy Management Committee (PMC), we are sending this status report to you for your information and comment.

In an effort to better identify this study area of the Trans-Texas Water Program, the PMC voted to change the name to the West Central Study Area.

The PMC agreed that future PMC meetings will be announced to the press and open to members of the Advisory Committee and the public. An agenda item for public comment will be included at each meeting.

Comments received from the Advisory Committee will be distributed to the PMC for their review and consideration. The comments will be discussed at the next scheduled PMC meeting and will be included in their original form in the Phase 1 final report.

HDR Engineering, Inc. started work on the study on September 1, 1993. Work efforts to date have concentrated on Task 1.0, "Population, Water Demand and Water Supply Predictions", Task 2.0, "Demand Reduction", Task 3.0, "Reuse" and assembling technical reports and other information on the alternatives to be considered. Attached is a listing of the alternatives which will be evaluated in the study. Please review and return the attached form if you have any comments.

Technical memoranda on several tasks will be prepared by the consultant in December, 1993. These technical memoranda will be mailed to the Advisory Committee in early January for review and comment. The next meeting of the Advisory Committee will be scheduled for the last week in January, 1994.

Please contact us if you have any questions.

TEXAS
PARKS AND WILDLIFE DEPARTMENT
4200 Smith School Road • Austin, Texas 78744 • 512-389-4800

ANDREW SANSOM
Executive Director

November 2, 1993

Mr. Steve Raabe, P.E.
San Antonio River Authority
P.O. Box 830027
100 East Guenther Street
San Antonio, Texas 78283-0027

and

Dr. Herb Grubb
HDR Engineering, Inc.
3000 South I.H. 35
Austin, Texas 78704-6536

RE: West Central Study Area - Trans Texas Water Program Water Source Alternatives and Summary of Alternatives

Dear Mr. Raabe:

After a review of the Summary of Alternatives Table (dated 10/26/93), Department staff are in general agreement with the contents as prepared by the study consultant, HDR Engineering, Inc. The Texas Parks and Wildlife Department (TPWD) staff perspective is largely the consensus-based, state agency view shared in part with the Texas Natural Resource Conservation Commission (TNRCC) and Texas Water Development Board (TWDB). The consensus reached by the state agencies was that no project or alternative would become viable in Phase I without environmental criteria in place. TPWD staff do not believe that the state agency consensus on this issue has changed. Therefore, it is important that when additional hydrologic sensitivity analyses are performed that they do not become viewed by the technical advisers and general public as equivalent alternatives. It is difficult to imagine that any alternative will not have substantive environmental criteria as part of the TNRCC permitting process.

As part of the contract deliberations before the Springflow Augmentation studies by the University of Texas, U.S. Geological Survey, and Bureau of Reclamation staffs, the state agency staffs agreed that to be conservative and cautious, surface reservoir waters (such

as Canyon Reservoir) would need some level of treatment regardless of their locality in relation to the Edwards Aquifer recharge zone before supplying water for recharge to the Aquifer. The rationale was that Edwards Aquifer water is so consistently of such high quality and clarity, that surface water may need filtration or other treatment in order to avoid any contamination of the Edwards Aquifer. Therefore, at S-13 A, G-13 A, G-14 A, G-15 A, C-13 A and C-13 D, our staff would recommend removing the question mark after "Includes Treatment (?)", to indicate that reservoir water regardless of source may have to be treated to achieve Edwards Aquifer recharge standards.

Thank you for your consideration of our comments.

Sincerely,

Randy Moss

Randall E. Moss, Ph.D.
Coordinator, Freshwater Studies Program
Resource Protection Division

REM

11-12-93-1

TEXAS NATURAL RESOURCE CONSERVATION COMMISSION

Protecting Texas by Reducing and Preventing Pollution

November 8, 1993

Mr. Steven J. Raabe, P.E.
San Antonio River Authority
P.O. Box 830027
San Antonio, Texas 78283-0027

Re: Summary of Alternatives Table, West Central Study Area, TransTexas Water Program.

Dear Mr. Raabe:

Thank you for providing me a copy of the summary of alternatives table and minutes of the October 12, 1993, PMC meeting for review and comment.

The summary and minutes indicate that certain alternatives will have hydrologic analyses performed without the environmental criteria being applied. I understand that a condition in the scope of work for all TransTexas studies is the application of the agreed-upon environmental criteria to identified water development alternatives. Would you please provide me with a clarification as to why hydrologic analyses are being proposed to be performed without this criteria, what is the usefulness of the analyses without the criteria (given that the criteria is a necessary screening device), and remarks made at the meeting by David Welsch (GBRA) apparently stating that the local sponsors have not agreed to the use of the environmental criteria (p.2, Meeting Minutes-October 20, 1993).

Please note that state law requires the assessment and avoidance or mitigation of adverse environmental impacts for any proposed water development project brought before the Texas Natural Resource Conservation Commission for review and approval. This includes the protection of instream uses, water quality, aquatic and wildlife habitat, and bays and estuaries. Therefore, any hydrological analysis performed without the environmental criteria being applied would not be useful to the local sponsors or the TransTexas Water Program in determining which alternatives warrant further examination.

I appreciate your time and attention to this matter. If you have any questions, please contact me at (512) 475-2201.

Sincerely,

Mark Jordan, Director
Water Policy Division
Texas Natural Resource
Conservation Commission

MJ:ag

cc: West Central Policy Management Committee
Bruce Moulton
Laura Koesters

h:\policy\mark\transtx\raabe.ltr

TEXAS WATER DEVELOPMENT BOARD

November 2, 1993

Mr. Steve Raabe, P.E.
San Antonio River Authority
P.O. Box 830027
San Antonio, Texas 78283-0027

Dear Mr. Raabe: Steve

Re: Summary of Alternatives Tables
Trans-Texas Water Program, West-Central Texas

This is in response to your recent request for our review of the subject tables. We offer the following comments on the tables.

We want to be clear that the references in the tables to "Hydrologic Sensitivity Analysis" in no way imply that alternatives that do not meet the Environmental Guidelines will be presented in a Phase I report. I believe that it is important to use the guidelines as a screening mechanism.

On several of the alternatives that use surface water to recharge the Edwards, the comments are made that it "includes treatment(?)". It seems to us that the treatment questions will be very key in these alternatives and that the question of the level of treatment necessary should be addressed at the beginning of Phase I. I expect that the decision on this, and probably other points, will need to be made during the course of the work. The frequent meetings of the West-Central PMC that are anticipated should allow ample opportunity to address such issues as they arise so that the report is as complete as possible.

If you have any questions, please let me know.

Sincerely,

Tommy

Tommy Knowles
Deputy Executive Administrator for Planning

cc: Laura Koesters, TNRCC
Larry McKinney, TPWD

1 TRANSTEX
11-12-93-2

1.11-3.6 MAC

TRANS TEXAS WATER PROGRAM
WEST CENTRAL STUDY AREA
ADVISORY COMMITTEE FOR PUBLIC AND TECHNICAL INPUT
NOVEMBER 1993 STATUS REPORT

SUBMITTED BY: ROBERT L. WRIGHT DATE: 11/10/93

COMMENTS: I WAS NOT AT THE LAST MEETING WHEN THE MATERIAL INCLUDED IN YOUR MAILING OF 11/3/93 WAS DISCUSSED. IF THE COMMENTS I AM SUBMITTING NOW HAVE ALREADY BEEN DISCUSSED AND DISCARDED, PLEASE LET ME KNOW.

IT IS MY UNDERSTANDING THAT WHERE RECHARGE IS INTRODUCED INTO THE AQUIFER CAN INFLUENCE THE "QUALITY" OF RECHARGE DEPENDING UPON THE DIRECTION OF UNDERGROUND FLOW AND THE ABILITY TO RETAIN THE RECHARGE. TO SAY IT A DIFFERENT WAY, IF YOU PUMP RECHARGE IN TO THE SAN ANTONIO POOL YOU DIRECTLY IMPACT ON INCREASING THE APPARENT LEVEL OF THAT POOL. BY DOING SO THE FLOW FROM THE COMAL AND SAN MARCOS SPRINGS INCREASE IMMEDIATELY TO DISCHARGE A NEAR ONE TO ONE TO THE RATE AT WHICH THE RECHARGE IS INTRODUCED. IF THE RECHARGE IS INTRODUCED FURTHER TO THE WEST, IDEALLY TO THE WEST OF THE KNIPPA GAP OR A SIMILAR RESTRICTION, YOU WOULD THEN BE TAKING ADVANTAGE OF THAT RESTRICTION AND THUS RETAIN THE WATER MUCH LONGER.

IT IS MY OPINION THAT THE RECHARGE SIGHT THAT HAS BEEN IDENTIFIED IN YOUR DRAWING TITLED "WATER DELIVERY LOCATIONS"MAY NOT HAVE TAKEN THIS INTO ACCOUNT. UNLESS THE FLOW PATTERN AT THIS POINT WILL RETURN WATER TO THE WEST SUFFICIENTLY TO TAKE ADVANTAGE OF A NATURAL RESTRICTION THEN A RELOCATION IS APPROPRIATE.

I WOULD BE HAPPY TO DISCUSS THIS ISSUE IN MORE DETAIL BY PHONE OR IN A MEETING WITH YOU AND OTHERS IF YOU WOULD LIKE.

R. L. Wright
11/10/93
PHONE 512/573-3464
FAX 512/572-0565

TRANSTEX
11-15-93-2

TO: Steven j. RAABE,P.E.

1.11-3.6 TAC

TRANS TEXAS WATER PROGRAM

WEST CENTRAL STUDY AREA
ADVISORY COMMITTEE FOR PUBLIC AND TECHNICAL INPUT
NOVEMBER 1993 STATUS REPORT

SUBMITTED BY: TOM CULBERTSON, REGIONAL CLEAN AIR & WTR **DATE** Nov. 11,1993

COMMENTS: A good date to write about improving our government.

The institutions addressed was different from that which copies were sent to. The Edwards Aquifer Authority was left off of those addresses, the Texas Water Commission is now called the Texas Natural Resource Conservation Commission. The Edwards Aquifer Authority was left off of the Carbon copies., perhaps rightfully so as they are appointed and not elected as the E.U.W.D. Directors.

Although the Basin and Source Abbreviations sound reasonable, I question the necessity of these terms. On page 2 injection wells should be designated as ~~asgted~~ assisted or artificial recharge, not natural recharge.

In your delivery locations please remember that the Glen Rose most likely recharges the Edwards formation. I think we are trying to formulate realistic projects, not necessarily tangible ones.

On page 3 Other recharge sites are likely beside the~~s~~ the BMA canal. I would like to point out that Cibolo creek is a likely site.

Why bring up the Applewhite Reservoir, when the citizens of San Antonio voted to abandon the project ? This is particularly true since the Bureau of Economic Geology of the Univ. of Texas has reported a tremendous increase in the accurately assessed size of the Edwards fresh water zone. Four times larger.

SUMMARY OF ALTERNATIVES: This could be simplified into categories, for example, Agriculture(list the LEPA ,furrow diking ,surve valves, etc. under this category. Other such categories would make good sense.

At the bottom of each page is a repetition of Alternatives as classified. Why repeat this on every page?

Again, under the Summary of Alternatives, why Applewhite? Cibolo also has been rejected by San Antonio Water Plans. A map showing the location of the many alternatives would be most advisable.

PLEASE ATTACH ADDITIONAL SHEETS IF NECESSARY.

PLEASE RETURN TO:

STEVEN J. RAABE, P.E.
SAN ANTONIO RIVER AUTHORITY
P.O. BOX 830027
SAN ANTONIO, TEXAS 78283-0027
(210) 227-1373
FAX: (210) 227-4323

Tom Culbertson, Hydrologist

11-22-93-1

TEXAS WATER DEVELOPMENT BOARD

November 18, 1993

Mr. Steve Raabe, P.E.
San Antonio River Authority
P. O. Box 830027
San Antonio, Texas 78283-0027

Dear Steve:

As you and I previously discussed, there was a recent meeting on the Trans-Texas Water Program that among other things included a discussion on Goliad Reservoir and the effects that return flows may have on future yields. This questioning was primarily lead by Ms. Patsy Light, Friends for Conservation of the San Antonio River Basin.

As a result of these discussions, it is recommended that the Phase 1 Scope of Work for the West Central Study Area include an analysis of yield using return flows by decade for the proposed Goliad Reservoir. Based on our past experience, the most effective way to determine these values is to calculate yield without considering return flows. Return flows for decades can then be calculated for various scenarios and superimposed on the yield to determine total estimated yield. Drought of record hydrology should be used.

If you have any questions, please call Steve Densmore at (512) 445-1472 or me at (512) 463-7976.

Sincerely,

Dennis J. Crowley, P.E.
Regional Projects

P.O. Box 13231 • 1700 N. Congress Avenue • Austin, Texas 78711-3231
Telephone (512) 463-7847 • Telefax (512) 475-2053 • 1-800- RELAY TX (for the hearing impaired)

1.11-3.6 TAC

TRANS TEXAS WATER PROGRAM

WEST CENTRAL STUDY AREA
ADVISORY COMMITTEE FOR PUBLIC AND TECHNICAL INPUT
NOVEMBER 1993 STATUS REPORT

SUBMITTED BY: Bruce A. Mauldin - TNRCC **DATE** 22 Nov 93

COMMENTS: I appreciate very much the opportunity to provide comment on the proposed water source alternatives. The list appears to be comprehensive.

Alternative L-19 will evaluate springflow augmentation. As you are probably aware the BEG has received a research grant from the TWDB to investigate the feasibility of augmentation for the San Marcos and Comal Springs. It will not include the Barton Springs which your proposal includes. I question the value and effort to address Barton Springs recharge.

Alternative S-10 will evaluate an option of "no return flow". Studies conducted by the City of San Antonio in 1988, looked at wastewater reuse and the associated hydrology for the San Antonio River. Historically, the base flow of the river were provided by spring flows, which have been significantly modified by human development over the past 50-100 years. Unless some

PLEASE ATTACH ADDITIONAL SHEETS IF NECESSARY.

PLEASE RETURN TO:

STEVEN J. RAABE, P.E.
SAN ANTONIO RIVER AUTHORITY
P.O. BOX 830027
SAN ANTONIO, TEXAS 78283-0027
(210) 227-1373
FAX: (210) 227-4323

TRANSTEX
11-30-93 I

TRANS TEXAS WATER PROGRAM
West Central Study Area
Advisory Committee for Public and Technical Input

SUBMITTED BY: Jerry L. Morrisey, Sierra Club DATE: 11/27/93

COMMENTS: Planning for future water demand using historical data for high use with projected conservation is problematic. Recent data from the San Antonio Water Systems indicates that per capita usage has declined in the last few years compared to longer term averages. Since high use figures are driven by landscape and agricultural irrigation in dry years, they are likely to be subject to restrictions imposed by the enforcement of the Endangered Species Act in dry years. A rational approach to the sustainable use of Edwards Aquifer groundwater requires aggressive water conservation measures be employed by all users at all times. Long range demand planning should take into account an active effort to reduce usage and not simply be a passive effort to project historical usage into the future.

1.11-3.6 TAC

TRANS TEXAS WATER PROGRAM

WEST CENTRAL STUDY AREA
ADVISORY COMMITTEE FOR PUBLIC AND TECHNICAL INPUT
NOVEMBER 1993 STATUS REPORT

SUBMITTED BY: BAM DATE

COMMENTS: during the last PMC meeting concerning this topic. To assess various alternatives without including environmental criteria, could lead the average reader of the Phase I report to assume a higher amount of surplus water available. I believe the PMC should give more thought to eliminating those options which do not contain the environmental criteria adopted for the Phase I Trans Texas study.

PLEASE ATTACH ADDITIONAL SHEETS IF NECESSARY.

PLEASE RETURN TO:

STEVEN J. RAABE, P.E.
SAN ANTONIO RIVER AUTHORITY
P.O. BOX 830027
SAN ANTONIO, TEXAS 78283-0027
(210) 227-1373
FAX: (210) 227-4323

1.11-3.6 TAC

TRANS TEXAS WATER PROGRAM

WEST CENTRAL STUDY AREA
ADVISORY COMMITTEE FOR PUBLIC AND TECHNICAL INPUT
NOVEMBER 1993 STATUS REPORT

SUBMITTED BY: BAM DATE

COMMENTS: Flows are left in the system, we could see significant adverse environmental impacts below the City of San Antonio. I would strongly urge consultants for the study program review the studies done in 1988 and reconsider running the "no return flows" option for any of the alternatives.

Alternative C-16 provides no "delivery location" for the option. Will this option along with others outside the San Antonio Basin require terminal storage?

Alternative C-10 includes 4 options addressing w/ and w/o releases from storage and w/ and w/o return flows. These options need further explanations, especially those concerning the no return flows.

Several of the alternatives include what is being called "Hydrologic Sensitivity Analysis". As you may remember, considerable discussion took place

PLEASE ATTACH ADDITIONAL SHEETS IF NECESSARY.

PLEASE RETURN TO:

STEVEN J. RAABE, P.E.
SAN ANTONIO RIVER AUTHORITY
P.O. BOX 830027
SAN ANTONIO, TEXAS 78283-0027
(210) 227-1373
FAX: (210) 227-4323

TRANS-TEXAS WATER PROGRAM

SAN ANTONIO RIVER AUTHORITY 100 EAST GUENTHER STREET P.O. BOX 830027 SAN ANTONIO TEXAS 78283-0027

1.11-3.6 TAC

Local/Regional Participants

Austin
Bexar Metropolitan Water District
Brazos River Authority
Corpus Christi
Edwards Underground Water District
Guadalupe-Blanco River Authority
Houston
Lavaca-Navidad River Authority
Lower Colorado River Authority
Nueces River Authority
Sabine River Authority
San Antonio River Authority
San Antonio Water System
San Jacinto River Authority

State Agencies

Texas Water Development Board
Texas Natural Resource Conservation Commission
Texas Parks and Wildlife Department

Printed on Recycled Paper

January 6, 1994

TO: Member of the Advisory Committee
for Public and Technical Input

FROM: Steven J. Raabe, P.E., Project Manager
San Antonio River Authority
Office: (210) 227-1373
Fax: (210) 227-4323

SUBJECT: Trans Texas Water Program
West Central Study Area

In your role as an Advisor to the Policy Management Committee (PMC), we are sending you this memo and attached material for your information and comment.

HDR Engineering, Inc. has prepared technical memoranda on Population and Water Demand Projections, Cost Estimating Procedures and Phase 1 - Evaluation of the Carrizo-Wilcox Aquifer. These are enclosed for your review and comment.

There will be a meeting of the Advisory Committee for Public and Technical Input on January 20, 1994 from 2:00 p.m. to 4:00 p.m. in the San Antonio Water System training room, located at 1001 East Market Street in San Antonio. HDR Engineering, Inc. will make a presentation on the attached memoranda followed by questions and comments from the Advisory Committee. Please submit all your comments in writing at the meeting on January 20, 1994 or mail to the San Antonio River Authority by January 28, 1994.

There will be a meeting of the Policy Management Committee for the West Central Study Area on February 10, 1994 at 9:00 a.m. at the San Antonio River Authority boardroom, located at 100 East Guenther Street, San Antonio, Texas 78204. You are invited to attend to observe the meeting. There will be an item on the agenda for public comment.

Also attached is a schedule of anticipated completion dates for the different sections of the final report. The Advisory Committee will be given the opportunity to review and comment on each section prior to completion of the final report.

If you have any questions, please contact me.

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WEST-CENTRAL STUDY AREA
TRANS TEXAS WATER PROGRAM
ANTICIPATED SCHEDULE - as of December 23, 1993

TASK NO.	DESCRIPTION	PRELIMINARY DRAFT DUE DATE
1.0	POPULATION/DEMAND/SUPPLY PROJECTIONS	Jan 5
2.0	DEMAND REDUCTION (L-10)	Feb 10
3.0	REUSE (L-11,-12,-13,-14)	Feb 10
4.0	EDWARDS IRRIGATION TRANSFER (L-15)	May
5.0	EDWARDS AQUIFER RECHARGE	- - -
5.1	Natural Recharge Type 1 (L-17) Type 2 (L-18)	 Feb 10 May
5.2	Imported Recharge	- - -
	from San Antonio Basin	May
	from Guadalupe Basin	May
	from Colorado Basin	May
	from Brazos/Sabine Basin	May
	from Carrizo Aquifer	May
5.3	Springflow Augmentation (L-19)	May
6.0	SURFACE WATER SUPPLIES	- - -
6.1	Nueces River Basin	Feb 10
6.1	San Antonio River Basin	- - -
	run of river hydrology (S-10,-11,-12)	Feb 10
	reservoir projects (S-13,-14,-15)	May
6.3	Guadalupe River Basin	- - -
	run of river hydrology (G-10,-11,-12,-13,-14)	Feb 10
	reservoir projects (G-15,-16,-17,-18)	May
	Minor Reservoirs (G-19,-20,-21,-22)	Feb 10
6.4	Colorado River Basin	- - -
	run of river hydrology (C-10,-11,-12,-14,-15,-16)	Feb 10
	cost of alternatives (C-13, C-17)	May
	Shaws Bend Reservoir (C-18)	Feb 10
6.5	Brazos and Sabine River Basins	May
7.0	GROUNDWATER SUPPLIES (Availability/Costs)	Jan 5 / May
8.0	DESALT	May
9.0	WATER TREATMENT AND DISTRIBUTION	Jan 5
10.0	ENVIRONMENTAL	May
11.0	PHASE 1 REPORT	May

TRANSTEX
01-10-94/1-2

WRIGHT CONSULTING

3904 JOHN STOCKBAUER MEADOW CREEK EXECUTIVE OFFICES
VICTORIA. TEXAS 77904
PH 512/ 573-3464 FAX 512/ 572-0565

MR. STEVEN RAABA
SAN ANTONIO RIVER AUTHORITY
100 EAST GUENTHER
P.O.BOX 830027
SAN ANTONIO.TEXAS 78283-0027

RE: TRANS-TEXAS WATER PROGRAM
WEST CENTRAL STUDY AREA

ENCLOSED PLEASE FIND MY COMMENTS ON THE DRAFT REPORT SECTIONS MAILED ME ON JANUARY 6.1994. THE COMMENTS ARE NOT DETAILED IN NATURE. BUT THEY DO COVER MY PERSPECTIVE IN THESE AREAS.

DUE TO A PREVIOUS COMMITMENT IN HOUSTON I WILL NOT BE ABLE TO ATTEND THE MEETING YOU CALLED FOR JANUARY 20.1994. LET ME REEMPHASIZE THAT MY INTEREST IN PARTICIPATING IN THIS COMMITTEE REMAINS HIGH AND THAT I WILL DO WHAT I CAN TO MEET YOUR SCHEDULING REQUIREMENTS IN ATTENDING FUTURE MEETINGS. PLEASE CONTINUE TO PROVIDE ME WITH REPORTS AND MATERIALS ON THE TTWP AND OUR COMMITTEE ASSIGNMENTS.

SINCERELY,

Robert L. Wright

ROBERT L. WRIGHT

1.11-3.6 TAC

TRANS TEXAS WATER PROGRAM

WEST CENTRAL STUDY AREA
ADVISORY COMMITTEE FOR PUBLIC AND TECHNICAL INPUT
JANUARY 20, 1994 MEETING

SUBMITTED BY: Robert L. Wright **DATE** January 12, 1994

COMMENTS: on Trans - Texas Water Program Information:

West Central Study Area TTWP Cost Estimate Procedures.

* Estimating Procedures appear to be inclusive and based on acceptable practices.

* Ouestion: Has the impact of recyling desolved solids on concentration of TDS limits and treatments costs been fully evaluated? Some mention of such an evaluation and the results needs to be reported.

Phase I Evaluation Carrizo - Wilcox Aquifer West Central Study Area TTWP - Comments

* What value is the Metric Conversation table on page 3? I found no use of metric units in the paper.

* A double reference of recharge rate should be made on page 5. (Ac Ft/Yr. as well as % of rain fall.) Same for page 15.

* An early reference should be made to uncertainties of recharge options as mentioned on page 21. This should be acknowledged in Recharge, Discharge and Movement section starting on page 4.

PLEASE ATTACH ADDITIONAL SHEETS IF NECESSARY.

PLEASE RETURN TO:

STEVEN J. RAABE, P.E.
SAN ANTONIO RIVER AUTHORITY
P.O. BOX 830027
SAN ANTONIO, TEXAS 78283-0027
(210) 227-1373
FAX: (210) 227-4323

1.11-3.6 TAC

TRANS TEXAS WATER PROGRAM

WEST CENTRAL STUDY AREA
ADVISORY COMMITTEE FOR PUBLIC AND TECHNICAL INPUT
JANUARY 20, 1994 MEETING

SUBMITTED BY: Robert L. Wright **DATE** January 12, 1994

COMMENTS: on Trans - Texas Water Program Information:

TTWP (Section 2) - Comments

* General - Population and water demand growth must be estimated but the tendency to over project historically has generated unreasonable long term demand projections.

* Industrial - Demand elastisity does not appear to have been adequately factored in at least for this segment. As water availability decreases and development costs for new sources increases, the demand will be reduced. This reduction in demand could be as much as 25% of projection in Table 2-5 without significantly effecting the growth of industry.

PLEASE ATTACH ADDITIONAL SHEETS IF NECESSARY.

PLEASE RETURN TO:

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AGENDA

TRANS TEXAS WATER PROGRAM
WEST-CENTRAL STUDY AREA
ADVISORY COMMITTEE FOR PUBLIC AND TECHNICAL INPUT

SAN ANTONIO WATER SYSTEM
JANUARY 20, 1994 2:00 P.M. - 4:00 P.M.

I.	Welcome	Fred N. Pfeiffer San Antonio River Authority
II.	Role of Advisory Committee	Steven J. Raabe, P.E. San Antonio River Authority
III.	Upcoming Events ▪ Policy Management Committee meeting - February 10, 1994 at 9:00 a.m. San Antonio River Authority boardroom ▪ Technical Memoranda Review - will be mailed to the Advisory Committee late February, 1994 ▪ Draft Report - Mid May, 1994	Steven J. Raabe, P.E. San Antonio River Authority
IV.	Population / Demand Projections	Dr. Herb Grubb HDR Engineering, Inc.
V.	Carrizo - Wilcox Aquifer Evaluation	Charles Kreitler LBG-Guyton Associates
VII.	Open Discussion	
VIII.	Closing Remarks	Steven J. Raabe, P.E. San Antonio River Authority

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Bill Aleshire
COUNTY JUDGE, TRAVIS COUNTY

Travis County Administration Building
P.O. Box 1748 Room 520
Austin, Texas 78767
512 473-9555

TO: Steven J. Raabe, P.E., Project Manager
San Antonio River Authority

FROM: Judge Bill Aleshire
Advisory Committee for Public
and Technical Input

DATE: January 19, 1994

RE: Trans Texas Water Program

==========

With respect to the materials covered by your memoranda of November 3, 1993 and January 6, 1994, these are my comments and questions.

Is the analysis by HDR coordinated with similar work being done by the Basin Planning Initiative of the Texas Natural Resource and Conservation Commission? If so, what are areas of agreement, and where do the technical data and assumptions conflict? (I am attaching a copy of the Management Unit Criteria from the TNRCC for your reference.)

How can the preliminary data compiled by HDR be applied to the basic National Environmental Policy Act approach, including the evaluation of direct, indirect, and cumulative impacts of the Trans-Texas project, including long-term impacts? Alternatives should be more clearly defined.

Wouldn't it be useful to collect data that could be used to develop plans <u>within basins</u>? Much of the information presented so far seems to be devised to support transferring water from one basin to another.

Does the method used by HDR to predict population assume that the rate of growth for an area drives its demand for water? One interpretation of the materials under review makes it look as if we are forecasting growth (based on trends) assuming unlimited water supplies were available; the temptation will be to use these forecasts to justify whatever water policy will help them come true. Wouldn't it make more sense to allow water availability to shape our population forecast, rather than the other way around?

§ 2.3.2, <u>Surface Water Supply Projections</u>, and § 2.4, <u>Water Demand and Supply Comparisons</u>, of the "Trans Texas Water Program,

Population and Water Demand Projection, West Central Study Area" (Dec. 30, 1993 draft) say that information on supply is "to be completed." I believe that an adjustment to supply figures provided by the Texas Water Development Board will help complete these sections. The Lower Colorado River Authority has long held that the supply figures for the Colorado River basin contained in the 1990 Texas Water Plan overestimate the supply by 90,000-100,000 acre-feet, that is, by some 10 to 15 percent. I've heard that this figure is being adjusted at the staff level in the TWDB, but that a formal correction of the numbers is still pending. I suggest that the supply figures developed by LCRA, not those from the TWDB, would be the most useful in these as yet unfinished sections of HDR's report.

Generally, I believe that the Trans-Texas Project would be best served by technical memoranda from HDR that are easy for lay people to understand. The purpose of HDR's study should be the production of an unbiased technical foundation upon which we can build a reasonable, legitimate plan. Such a plan must include policy direction from a variety of elected officials and others who are not thoroughly familiar with all of the technical information, including underlying assumptions. Some way must be found to render the complex science understandable to non-scientists who must work with it. I suggest that there's room for improvement in this area.

Thanks for your attention to my comments.

Sincerely,

Bill Aleshire

cc: Mayor Bruce Todd, City of Austin
Dr. Quentin Martin, LCRA
David Pimentel, Travis County Environmental Officer
Cole Rowland
Mike Booth

Document: C:\LETTERS\TRANSTEX

RECD: 01-20-94-3

LCRA
THE POWER TO MAKE A DIFFERENCE.

January 20, 1994

Mr. Steven Raabe, P.E.
San Antonio River Authority
P.O. Box 830027
San Antonio, TX 78283-0027

Dear Steve:

The purpose of this letter is to communicate LCRA's comments on the West-Central Study Area Trans-Texas Program Draft Reports transmitted in your memorandum of January 6, 1994.

LCRA staff have evaluated the information and findings in these reports concerning the Trans-Texas Program South-Central Study. We find this information reasonable and have no objection to its use in the study, with the notable exception of the projected water demands for irrigated agriculture in the lower Colorado River Basin.

In the case of the projected irrigation water demands, HDR projections are radically different from those of LCRA. On page 2-76, the total irrigation demands projected by HDR are 567,000 and 500,000 acre-feet annually for years 2000 and 2030, respectively.

LCRA has prepared independent projections of future water demands in the LCRA ten-county statutory water district. These projections are reported in the LCRA publication LCRA Long-Term Water Use Forecast Report prepared in Dec. 1988. In contrast to those given by HDR, LCRA's projected irrigation demands for three alternative levels of demand are:

TABLE 1. LCRA Water Demand Projections of Irrigation (in acre-feet)

Case	Year	
	2000	2030
Low	604,000	587,000
Base	758,000	736,000
High	943,000	915,000

As evident from Table 1, the HDR projections are significantly less than the low range of water demands projected by LCRA. The cause of the difference between the LCRA and HDR projections is a major disagreement in the expected water demands for rice irrigation in Colorado, Wharton and Matagorda Counties.

The current (1990) irrigation water use in the LCRA district is

760,000 acre-feet. The HDR report did not justify the large projected decline of about 200,000 acre-feet in water use by irrigation as early as year 2000. The HDR projection for year 2000 irrigation water demands represents a decline of 25% from the 1990 actual use. Such a drastic drop needs a great deal more justification than is given in this report.

I understand that water demand projections are subject to differences of opinion. However, LCRA strongly objects to these water demand projections being the sole basis for the analysis of alternatives in the Trans-Texas Study. An alternative set of projections should also be used, and this alternative set should include more realistic irrigation water demand projections.

Thank you for the opportunity to provide review comments to these draft reports. Please let me know if you need additional information or have any questions.

Yours truly,

Gene Richardson
Manager, Water Resources

01-31-94-3

Trans Texas Water Program
West Central Study Area
Advisory Committee for Public and Technical Input
January 20, 1994 Meeting

Comments submitted by Jerry L. Morrisey, Ph.D.
January 26, 1994

In response to the municipal water demand projections for cities and counties in the Edwards Aquifer Area, I believe they are overstated, especially with regard to the City of San Antonio. The daily per capita consumption for San Antonio extracted from the Tables presented by HDR Engineering is 201 gallons per person in 2000 and declines to 181 gallons per person in 2040. In the relative dry years of 1984 and 1989 the per capita consumption for San Antonio was 195 and 177 gallons respectively. In the November 1993 Water Conservation and Reuse Plan for the San Antonio Water Systems the per capita goal for the year 2008 is 140 gallons. Such a goal or even tougher goals are certainly achieveable with a steeper block rate structure for water prices and ordinances to control watering in dry periods. The Endangered Species Act enforcement actions for dry years in the near future are likely to change water usage habits toward better conservation practices.

Thus it would be more realistic to adjust water demand projections to lower levels. If this is not done, then the first water source which should be examined is water demand reduction. Appropriate water conservation for the whole region could cut the projected demand for the year 2040 by 25 to 30 percent and correspondingly reduce the need for new supplies.

EVERGREEN UNDERGROUND WATER CONSERVATION DISTRICT

210-769-3740 Fax: 210-769-2492 1-800-259-3740

P.O. Box 155 1306 Brown

JOURDANTON, TEXAS 78026

January 26, 1994

TRANSTEX
01-27-94-I

JAN 19[illegible]
SARA

Steven Raabe, P.E.
San Antonio River Authority
P.O. Box 830027
San Antonio, Texas 78283-0027

Dear Mr. Raabe:

Please find enclosed a set of the Evergreen Underground Water Conservation District's rules and review in particular the rules governing drilling of wells, recharge, and transportation of ground water from the District.

Our District which consists of Atascosa, Wilson and Frio counties, currently uses approximately 170,000 acre feet of water per year from the Carrizo Sands Aquifer. With estimated recharge to the District being approximately 49,000 acre feet (TWDB Report #210), we do not feel your study to supply Carrizo Sands Aquifer water to the entities in the West Central Study Area, outside of our District or for artifical recharge to the Edwards Aquifer at a rate of 200,000 acre feet per year as stated in your Trans Texas Water Program reports submitted to us dated January 6, 1994 is a viable solution and would be detrimental to the residents of this District. Therefore, we cannot support this option and would oppose such action.

Sincerely,

Board of Directors
Evergreen Underground Water
Conservation District

Clifton L. Stacy
President

Carl E. Ray
Vice President

Kenneth Stephens
Secretary/Treasurer

Richard A. Hoover
Director

William O. Lamb
Director

Robert Hausser, Jr.
Director

1.11-3.6 TAC

TRANS TEXAS WATER PROGRAM

WEST CENTRAL STUDY AREA
ADVISORY COMMITTEE FOR PUBLIC AND TECHNICAL INPUT
JANUARY 20, 1994 MEETING

SUBMITTED BY: Carl E Ray DATE 1/26/94

COMMENTS: I think the Trans-Texas Water Program report released Jan. 6, 1994, is outrageous! The report is based on what I consider to be faulty studies from long ago. Anybody should know that current usage of water has changed over the years.

This study also overlooks the long held belief that the rights of property owners are primary.

Also the letter head on the report has excluded Evergreen Underground Water Conservation Dist. - the one authority that has jurisdiction & legislative responsibility in this area. in the future.

I would hope that any study would be more accurate and factual and I would include everyone.

Carl E. Ray, Vice President
Evergreen U.W.C.D. Board of Directors

PLEASE ATTACH ADDITIONAL SHEETS IF NECESSARY.

PLEASE RETURN TO:

STEVEN J. RAABE, P.E.
SAN ANTONIO RIVER AUTHORITY
P.O. BOX 830027
SAN ANTONIO, TEXAS 78283-0027
(210) 227-1373
FAX: (210) 227-4323

1.11-3.6 TAC

TRANS TEXAS WATER PROGRAM

WEST CENTRAL STUDY AREA
ADVISORY COMMITTEE FOR PUBLIC AND TECHNICAL INPUT
JANUARY 20, 1994 MEETING

SUBMITTED BY: Jim I. Hester, Advisory Committee Member **DATE** 1-27-94

COMMENTS: Phase I Evaluation Carrizo-Wilcox Study. This plan was conceived and executed without regard as to the water rights of the citizens and property owners in Atascosa and Wilson Counties. Furthermore, the Evergreen Underground Water Conservation District should have been contacted prior to any project funding and engineering studies made for HDR Engineering, Inc. by LBG Guyton Associates. To "assume a large withdrawal of water" study from an area which is in part under the jurisdiction of a state agency established by the legislature is a most ludicrous and insulting act.

Prior to beginning work on the Phase II Evaluation for the West Central Study area, serious consideration should be given to contacting all agencies that have jurisdiction over any or all water in the planning area.

Jim I. Hester
Gen Mgr
Evergreen U.W.C.D.

PLEASE ATTACH ADDITIONAL SHEETS IF NECESSARY.

PLEASE RETURN TO:

STEVEN J. RAABE, P.E.
SAN ANTONIO RIVER AUTHORITY
P.O. BOX 830027
SAN ANTONIO, TEXAS 78283-0027
(210) 227-1373
FAX: (210) 227-4323

01-31-94-1

United States Department of the Interior
BUREAU OF RECLAMATION
Great Plains Region
Austin Reclamation Office
300 East 8th Street, Room 801
Austin, Texas 78701-3225

TAKE PRIDE IN AMERICA

IN REPLY
REFER TO:
TX-700G
PRJ-3.00

JAN 28 1994

Mr. Steven J. Raabe, P.E.
San Antonio River Authority
P.O.Box 830027
San Antonio, Texas 78283-0027

Subject: Trans Texas Water Program, West Central Study Area

Dear Mr. Raabe:

Enclosed are our comments as requested by your letter dated January 6, 1994. Thank you for the opportunity to review and comment. Please contact me or Mr. Brooks Gallman of this office at (512) 482-5641 if you have any questions.

Sincerely,

Fred R. Ore

Fred R. Ore
Austin Reclamation Representative

Enclosure

TRANS TEXAS WATER PROGRAM
WEST CENTRAL STUDY AREA
ADVISORY COMMITTEE FOR PUBLIC AND TECHNICAL INPUT

Comments submitted by: Bureau of Reclamation. Austin.Texas Date: 1/27/94

The technical memoranda provided for review and comment in general does a good job of pulling together existing information and presenting it in a concise manner. We had hoped to provide an in-depth review by our technical support specialists. however, we are unable to do so because of insufficient supporting data and the time allowed. The following general comments are provided for your consideration.

POPULATION AND WATER DEMAND PROJECTIONS

1. Page 2-1: To help set the stage it would be helpful to provide the reader a brief explanation of why the TWDB specified using only high case projections with conservation included. A range of projections would allow more flexibility for alternative plan formulation.

2. Pages 2-90 and 2-91: Footnote 3 at bottom of tables is in regard to entire table?

COST ESTIMATING PROCEDURES

Our engineering and construction technical support personnel have been asked to review this document and we will provide those comments as soon as received.

PHASE I EVALUATION CARRIZO-WILCOX AQUIFER

Based upon the information presented it would appear that the Carrizo-Wilcox Aquifer should be pursued as a potential water supply source. We concur that considerable site-specific study is needed to verify preliminary findings to date, however, this aquifer as a single source or in conjunction with existing or new surface supplies could eventually prove to be an acceptable partial solution towards helping to solve the long-range water needs of the study area.

02-03-94-1

1.11-3.6 TAC

TRANS TEXAS WATER PROGRAM

WEST CENTRAL STUDY AREA
ADVISORY COMMITTEE FOR PUBLIC AND TECHNICAL INPUT
JANUARY 20, 1994 MEETING

SUBMITTED BY: Bob VANN DATE 2-1-94

COMMENTS: 1) On "Population & Water Demand Projections & Groundwater Supply Projections" I take exception to doing population and water demand projections with just "high case projections" for the purpose of the Trans TX Water Plan. Some comparison projection based on current water supply with limited expansion of supply should be included in order to show range.

2) On "Evaluation of Carrizo-Wilcox Aquifer" I take exception to the study not projecting a total (estimated) cost for the pipeline system, the effect on the aquifer during a drought of record of the pumping of 200,000+ acre-feet of water, and the rate of recharge. To evaluate this aquifer for use these factors must be considered.

PLEASE ATTACH ADDITIONAL SHEETS IF NECESSARY.

PLEASE RETURN TO:

STEVEN J. RAABE, P.E.
SAN ANTONIO RIVER AUTHORITY
P.O. BOX 830027
SAN ANTONIO, TEXAS 78283-0027
(210) 227-1373
FAX: (210) 227-4323

TRANS-TEXAS WATER PROGRAM

SAN ANTONIO RIVER AUTHORITY 100 EAST GUENTHER STREET P.O. BOX 830027 SAN ANTONIO TEXAS 78283-0027

1.11-3.6 TAC

February 16, 1994

TO: Members of the Advisory Committee
for Public and Technical Input

FROM: Steven J. Raabe, P.E., Project Manager
San Antonio River Authority
Office: (210) 227-1373
Fax: (210) 227-4323

SUBJECT: Draft Memoranda For Review
Alternatives Nos. L-10 through L-17, N-10,
S-10 through S-12, G-10 through G-14,
G-19 through G-31, C-10 through C-18

In your role of providing public and technical input to the Policy Management Committee, we are providing the above listed draft memoranda for your review. If you have comments, please send them to us by March 11, 1994.

Attached is an updated list of the Policy Management Committee member agencies and their respective representatives for your information.

We would also like to remind you that the Statewide Policy Management Committee is tentatively scheduled to meet on March 29, 1994 in Austin. If you are interested in attending this meeting, please contact me prior to the meeting to confirm the meeting place and time.

Thank you for your continued participation and cooperation.

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Trans-Tex
02-14-94-1

Feb.11,1994

STEVEN J. RAABE,P.E.
Trans-Texas Water Program
San Antonio River Authority
100 E. Guenther St.
P.O. Box 830027
San Antonio, Texas 78283-0027

Dear Mr Raabe,

The presentation by the HDR representative, ? Asst. to Dr. Grubb, was very lucid but talked to fast when referring to the charts. As a former Professor I can say this with some degree of experience. Furthermore, the decline in the audience should have been a clue to the speaker. Of course-he turned his back on the public and talked only to the table for his discussion on his last chart. And Dr.Grubb stated he had no handouts for the citizens, as he didn't have enough copies. That is when I left, as did some others.

Mr. Fred N. Pfeiffer, Mgr.of the S.A.R.A. gave you an excellent suggestion in his recommendation regarding -having the speakers face the audience.

In the final outcome of the Trans-Texas Water Program and our West-Central Study Area you will be needing public support. Do you believe that you will receive the public's support ?

There were a number of things which attending citizens would have like to asked,but apparently were not invited to put before your Policy Management Committee.

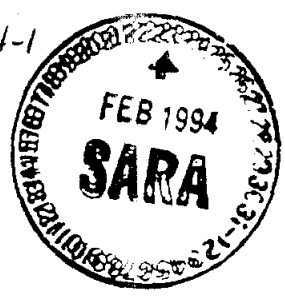
I hope these comments will help you manage the next meeting so that we can all work together for solving the water issue in the West-Central Area.

Sincerely,

Tom Culbertson

Tom Culbertson
Hydrologist
511 Westwood,SA.TX.78212

02-23-94-1



1.11-3.6 TAC

TRANS TEXAS WATER PROGRAM
WEST CENTRAL STUDY AREA
ADVISORY COMMITTEE FOR PUBLIC AND TECHNICAL INPUT
FEBRUARY 1994 STATUS REPORT

SUBMITTED BY: Tom KANE (POLLEY-KANE & ASSOC.) DATE 2-20-94

COMMENTS:

THANK YOU FOR THIS EXCELLENT PIECE OF WORK.

I CAN'T PUT INTO WORDS THE VALUE OF THIS PROJECT. I'M SO GLAD YOU ARE CARRYING IT FORWARD. IT IS GOOD FOR ALL OF US TO LOOK & PLAN AHEAD, REVIEWING ALL OPTIONS OBJECTIVELY.

DEMAND REDUCTION

RE: THE SECTION ON MUNICIPAL WATER CONSERVATION

(HOUSEHOLD NON-LAWN) → I WOULD LIKE SOME PERSPECTIVE BUILT INTO THE REPORT. SOMETHING RELATING THE NUMBER OF ACRE FEET SAVED VERSUS THE EXPENSE TO INSTALL ALL THESE FIXTURES* (NOT TO MENTION THE DISCOMFORT OF SHOWER HEADS THAT DON'T WORK WELL) I SUSPECT THE SAME AMOUNT OF MONEY APPLIED TO OTHER AREAS WOULD ACHIEVE GREATER WATER USE REDUCTIONS. AND IF GRAY WATER BECOMES USABLE THEN MOST OF THE SAVING WILL BE NEUTRALIZED (I SUSPECT SOME CARRYOVER FROM THE UNSCIENTIFIC AND EMOTIONAL "SAVE THE EARTH" MOVEMENT OF THE 80's. DISCUSSING THE COST EFFECTIVENESS OF MUNICIPAL DOMESTIC CONSERVATION SPECIFICALLY IN YOUR REPORT WOULD REASSURE ME THAT WE HAVE PUT OUR "HIPPIE" HERITAGE BEHIND US AND ARE READY TO BE SCIENTIFIC & OBJECTIVE.) Tom Kane

PLEASE ATTACH ADDITIONAL SHEETS IF NECESSARY.

PLEASE RETURN TO:
STEVEN J. RAABE, P.E.
SAN ANTONIO RIVER AUTHORITY
P.O. BOX 830027
SAN ANTONIO, TEXAS 78283-0027
(210) 227-1373
FAX: (210) 227-4323

P:\RMC\WPDATA\TRANSTEX\LTRS

* LIKE YOU DO ON PAGE 3-16

Trans Tex
03-11-94-3

1.11-3.6 TAC

TRANS TEXAS WATER PROGRAM

WEST CENTRAL STUDY AREA
ADVISORY COMMITTEE FOR PUBLIC AND TECHNICAL INPUT
Warren R. F FEBRUARY 1994 STATUS REPORT

SUBMITTED BY: Warren R. Ford - Sunbeam Envi. Svcs. **DATE** 03/09/94

COMMENTS: 3.26 Guadalupe River Diversion to Camp Bullis

3.26.1 Description of Proposed Alternative

The Guadalupe River immediately downstream from the proposed location of Guadalupe River Dam No.7 to within two or three miles of Canyon Lake could provide the diversion point for unappropriated floodwaters to be directed to the Camp Bullis property at suitable locations to be impounded and enter the recharge zone and provide some headwaters for the Leon, Salado and Upper Olmos Creeks providing further recharge. Considering the drainage area of the Upper Guadalupe River watershed and the drainage area of the Upper San Antonio River watershed on Camp Bullis there should be considerable potential for water management activities that are proximate to urban uses for these activities. There are existing water management structures on the Upper Salado Creek with two structures on Camp Bullis. The potential impoundment area above the recharge zone area located on Camp Bullis is quite large and may prove to be an ideal example of an inter-basin transfer of water to the most efficient and cost-effective storage medium possible all within a very short distance and with a myriad number of beneficial side-effects for the nearby urban users (ie. increased streamflows in area creeks would benefit recreational purposes, mitigate stormwater contaminant recharge and augement the process flows of any waste-water treatment plants in the future).

PLEASE ATTACH ADDITIONAL SHEETS IF NECESSARY.

PLEASE RETURN TO:

STEVEN J. RAABE, P.E.
SAN ANTONIO RIVER AUTHORITY
P.O. BOX 830127
SAN ANTONIO, TEXAS 78283-0027
(210) 227-1373
FAX: (210) 227-4323

P:\RMC\WPDATA\TRANSTEX\LTRS

03-14-94-2

United States Department of the Interior

FISH AND WILDLIFE SERVICE
611 E. Sixth Street
Grant Bldg., Suite 407
Austin, Texas 78701

MAR 0 1994

Steven J. Raabe
Trans Texas Water Program
San Antonio River Authority
P.O. Box 830027
San Antonio, Texas 78283-0027

Dear Mr. Raabe:

This is in response to your February 16, 1994, draft memoranda for review of alternatives L-10 through L-17, N-10, S-10 through S-12, G-10 through G-14, G-19 through G-22, and C-10 through C-18 for the Trans Texas Water Program, West Central study area.

Comments

While we realize that the Trans Texas Water Program is still in the early stages of development, we wish to emphasize the need to discuss and evaluate environmental issues as early in the planning process as possible. On page 16 of the April 13, 1993, Trans-Texas Water Program -Southeast Area Program Issues (TTWP-SAPI), a statement is made that environmental concerns will be addressed early in the planning process and given significant weight in project decisions. In your February 16, 1994, draft memoranda, only three of the projects addressed environmental considerations. The remainder said environmental information will be supplied in the final draft report.

Alternative L-16 (Demineralization of Edwards "Bad Water") did have an "Environmental Issues" section. However, the environmental section needs to provide more detail regarding potential problems associated with the construction of demineralization facilities, the disposal of the extracted brine, and the potential effect water withdrawal may have on underground fresh water and the surface springs. A conclusion is reached not to proceed with this alternative based on costs and the available increase of water supply. Environmental concerns should be considered early in the planning process to help in determining the feasibility of project alternatives.

Included with the February 16, 1994, draft memoranda was Appendix A, Trans Texas Environmental Criteria. The items contained in Appendix A were also contained in Attachment 3 of the TTWP-SAPI. While the Environmental Criteria seem to emphasize water quality related issues, they do suggest fish and wildlife habitat based criteria. The purpose for the Environmental Criteria

listed should be clarified. Furthermore, their relationship to Sections 3.0-3.5 of the TTWP-SAPI that discuss environmental issues should be made clear. We believe that the subjects listed in Section 3.0 of the TTWP-SAPI, especially impacts on wetlands; migratory birds including neotropical migrants; and, federally-listed, proposed, and candidate species under the Endangered Species Act, should be considered in the Environmental Criteria or any other criteria used to determine the potential environmental effects and ecologic feasibility of proposed projects.

Additionally, we are particularly concerned about any significant alteration in the timing and duration as well as the volume of existing stream flows; the definition of "surplus" flows and their appropriation; the adverse effects to aquatic resources that may result from inter-basin transfers whereby physical, chemical, and biological materials that are transferred may adversely alter the receiving streams; potential effects to aquifer recharge; and, cumulative or synergistic bio-physical effects produced by multiple proposed projects in watersheds. Because of the numerous potential projects and their interactions, there is likely to be some dramatic changes in particular watersheds.

Instream Flow Assessment

The Trans Texas Environmental Criteria specify that the Texas Parks and Wildlife Department modified Tennant's method for assessment of instream flow needs will be used. This method relies on a fixed percentage of the median monthly stream flows and attempts to provide minimum instream flows for aquatic life in general. We recommend that where practicable and appropriate, a habitat-based instream flow methodology be used, such as the U.S. Fish and Wildlife Service's Instream Flow Methodology. This methodology can provide specific information in regards to how and when alterations of instream flows may affect the aquatic species present in the watershed, and can provide recommended flows for specific aquatic life in a given river or stream throughout the year. While this methodology is more labor intensive, it is more likely to lead to scientifically based instream flow management to maintain the aquatic resources present an to reduce the likelihood of adverse impacts.

Corrections

p. 3.1-6, under (3), should read "arrangements remain unchange(d)."

pp. 3.1-14 and 1-15. There are several instances where "surge values" needs to be replaced with "surge valves".

We recommend that environmental criteria be applied and evaluated for all of the proposed Trans Texas Water Program alternatives individually and cumulatively in a draft document prior to the issuance of a "final" draft.

We appreciate the opportunity to comment at this time. If you have any questions regarding this response or if we can be of any further assistance, please contact Richard Szlemp at the above address or (512) 482-5436.

Sincerely,

Richard Szlemp

Acting Field Supervisor

cc: CCFO (Attn: T. Cooper)

1.11-3.6 TAC

TRANS TEXAS WATER PROGRAM

WEST CENTRAL STUDY AREA
ADVISORY COMMITTEE FOR PUBLIC AND TECHNICAL INPUT
FEBRUARY 1994 STATUS REPORT

SUBMITTED BY: Gene W. Barkemeyer, PE DATE 3-11-94

COMMENTS: I have comments on two sections - 3.1.2 Irrigation water Conversion and 3.2.1 Description of Alternative — which are hand written on the draft copies of the Phase I Report and attached hereto.

I recommend clarification between "methods of irrigation" and "methods of irrigation water conservation". If my notes are inadequate for the writer to rewrite, please feel free to contact Jerry Walker, Irrigation Water Management Engineer, on my staff 817-774-1217.

Gene W. Barkemeyer

PLEASE ATTACH ADDITIONAL SHEETS IF NECESSARY.

PLEASE RETURN TO:

STEVEN J. RAABE, P.E.
SAN ANTONIO RIVER AUTHORITY
P.O. BOX 830027
SAN ANTONIO, TEXAS 78283-0027
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FAX: (210) 227-4323

P:\RMC\WPDATA\TRANSTEX\LTRS

Trans Jet 03-11-94-1

SOIL CONSERVATION SERVICE

Facsimile Transmittal Sheet

Soil Conservation Service
101 South Main Street
Temple, Texas 76501-7682

Date: 3/11/94

Number of Pages: Transmittal Sheet + 7

To: Steven J. Raabe, P.E.
San Antonio, TX

Telephone Number _____

FACS Machine Telephone Number _____

From: Gene Barkemeyer
SCS, Temple, TX

Telephone No. _____

FACS No. _____

Comments:

Steve — I will be unable to attend the Mar. 29 Mtg. at Adv. Com., but Terry Walter will represent SCS for me.

Thanks,
Gene B.

Transmission completed by...

The costs of water saved through the use of "Best Management Practices" (education, water audits, and retrofit of plumbing and landscaping) in Southern California was estimated at $202 per acre foot[10].

3.1.2 Irrigation Water Conservation

Irrigation water, as described in Section 2.2, is freshwater that is pumped from aquifers and/or diverted from streams and lakes of the study area and applied directly to produce crops, orchards, and hay and pasture in the study area. In the case of groundwater, the irrigation wells are usually located within the fields to be irrigated such that the irrigation water is taken directly from the wells and applied to the land by: (1) flooding the fields, and by (2) sprinklers. In the case of surface water from study area streams and lakes, water is diverted from the source and conveyed by canals and pipelines to the fields where it is then applied by: (1) flooding, and (2) sprinklers. In both the use of groundwater and surface water, the conservation objective is to reduce the quantity of water that is lost to deep percolation, evaporation and evapotranspiration between the originating points (wells in the case of groundwater and diversion points in the case of surface water) and the irrigated crops in the fields. Thus, the focus is upon investments in irrigation application equipment, instruments, and conveyance facility improvements (canal lining and pipelines) to reduce seepage losses, deep percolation, and evaporation of water between the originating points of the water and the destination locations within the irrigated fields. The principal methods of irrigation water conservation are: (1) Low pressure sprinklers; (2) Low

where is irrigation scheduling, Management Applied Deficit Irrigation, etc

[10] "Assessment of Water Savings from Best Management Practices," Metropolitan Water District of Southern California, Brown and Caldwell Consultants, February, 1991.

energy precision application systems (LEPA); (3) Surge valves; and (4) Furrow diking. In comparison to the flood irrigation method of releasing the water into the furrows at the ends of the rows and allowing it to flow across the fields until each furrow has been saturated throughout its entire length, the use of sprinklers, LEPA, surge values, and furrow diking improves application efficiency within the irrigated fields and thereby reduces the total quantity of water needed to produce an irrigated crop.

Given that the TWDB irrigation water demand projections for the West Central study area (Edwards aquifer, Winter Garden, and Gulf Coast areas) have already incorporated significant decreases in irrigation usage through conservation, the potentials for additional conservation may be quite limited. For example, the TWDB irrigation demand projections for the Edwards Aquifer Authority area are 27 percent less in 2020 than in 1990; projections for the Winter Garden counties are 28 percent less by 2020; and projections for the Gulf Coast counties of the Colorado and Guadalupe Basins are 32 percent less in 2020 than was used in 1990. Given that the technological limits of irrigation conservation potential are in the range of reducing water use per acre by 20 percent to 40 percent, the effects of increased water conservation above that which is included in the TWDB projections would be to achieve the results at an earlier date, i.e., by 2005 instead of 2020. The following discussion pertains to such an objective for the Edwards Aquifer Authority and Winter Garden areas. No estimates are given for the Gulf Coast areas since the technology available to that area may not permit achievement of the goals of additional conservation beyond that of TWDB projections for that area.

For the Edwards Aquifer Authority area, the estimated additional water savings above the TWDB projections are 11,240 ac-ft at the year 2005. For the Winter Garden area, the

estimated potential additional conservation savings at year 2005 are 20,240 ac-ft/yr. Water conservation methods are described below.

Low pressure sprinklers spray water into the atmosphere above the crops as the sprinkler systems are moved across the fields. LEPA systems involve a sprinkler line that has been modified for low pressures. Water is discharged directly into furrows at low pressure, thus reducing evaporation losses. When used in conjunction with furrow dikes, which hold both precipitation and sprinkler applied water behind small mounds of earth within the furrows, LEPA and other sprinkler systems can accomplish the irrigation objective with less water than is required for the flood irrigation method. (Note: Furrow dikes are constructed by towing the furrow diking implement behind planters or cultivators when these operations are performed. The furrow dikes hold water in place within the furrows, allowing it to infiltrate the soil profile as opposed to allowing the water to flow down the furrows and exiting the fields. Furrow dikes have been demonstrated to be useful management tools on both irrigated and non-irrigated cropland.) Surge Irrigation is the method of irrigation. Surge VALVES are the equipment you use to practice surge irriga

Surge Valves not Values Surge values are an alternative method of irrigation in which water is released from pipes located at the head of the furrows as in flood irrigation methods. The difference between flood irrigation and surge values is that surge values allow the flow into the furrows for a period of time (usually 30 minutes to an hour) and then switch the water stream into the adjoining furrow for a period of time. This allows the water to soak into the furrow length which has just been wetted while the neighboring furrow is being watered. On the next cycle, the water stream is switched back to the original furrow where it is discharged into the previously wetted furrow section. On the second, third, and subsequent cycles, the water stream flows over the previously wetted sections much faster and with less deep

percolation than if the stream of water had been continuously discharged into the furrow until the entire length had been wetted. In short, the alteration between rows ~~saves water by reducing percolation and evaporation within the furrows~~ reduces intake rate and increases rate of advance, which can be managed to control deep percolation and runoff. Although surge values and furrow dikes cannot be used within the same row or furrow, furrow dikes and surge values are sometimes used in alternate furrows.

Low pressure sprinklers and surge values improve irrigation application efficiency in comparison to ~~flood~~ furrow irrigation by reducing water requirements per acre in the 10 to 15 percent range, while LEPA combined with furrow diking can reduce water requirements per acre by 30 to 40 percent. In the Edwards aquifer area, conversion from furrow irrigation to LEPA systems with furrow diking would save 0.8 ac-ft per acre converted[11]. Use of LEPA and furrow dikes would allow irrigation farmers to produce equivalent yields per acre at lower energy and labor costs of irrigation; i.e., it has been demonstrated that LEPA systems improve production and profitability of irrigation farming. The barriers to installation are high capital costs, with no assurance that the water saved in the Edwards aquifer from the investment would be available to the irrigation farmer who incurred the costs. However, under the Edwards Aquifer Authority's regulatory powers, the water conservation investor would be assured ownership of the conservation savings.

To accomplish the goals of achieving the additional conservation potential within the Edwards aquifer area by year 2005 instead of the TWDB projected year 2020, it would be necessary to apply conservation methods to an additional 14,050 acres of the area's 120,000

[11]"Irrigation Water Use Conservation Potential and the Economic Implications of Adopting More Efficient Irrigation Technology, the Case in Uvalde County," Water for South Texas, Pena, Jose G., and Robert Jenson, Texas Agricultural Experiment Station, Texas A & M University, College Station, Texas, CPR - 5043-5046, October, 1992.

irrigated areas. The capital cost per acre to install LEPA irrigation systems and furrow diking is approximately $325, for a total investment of $4.75 million to equip 14,050 acres. Such an investment is expected to have a life expectancy of 25 years and would save 11,240 ac-ft of water per year at a cost of $38 per ac-ft saved, (for bond financing at eight percent for 25 years). The water saved would represent a reduction in withdrawals from the Edwards aquifer.

little over 30% - in lot the cheaper than municipal savings.

For the Winter Garden area, the potential additional conservation is 20,040 ac-ft, which would require that an additional 25,050 acres be equipped with conservation systems by 2005. At a cost of $325 per acre, a water savings of 0.8 ac-ft per acre, eight percent interest and a 25-year recovery of the investment, the cost of water saved would also be $38 per ac-ft. The water saved would contribute to reducing the rate of decline of the Carrizo aquifer from which the Winter Garden area obtains its water supply, since the water would be left in the aquifer for withdrawal at a later date although transmissivity of the Carrizo aquifer is much less than that of the Edwards, there is still the concern that water saved and left in the aquifer via irrigation conservation investments could be lost to neighboring areas.

[Note: In next draft, a summary section will be included.]

3.2 Exchange Reclaimed Water for Edwards Irrigation Water (L-11)

3.2.1 Description of Alternative

Edwards aquifer water usage can be reduced by replacing water pumped for farm irrigation with reclaimed water obtained from municipal wastewater treatment plants. In Bexar and Medina counties, approximately 45,000 acres are irrigated with groundwater, of which approximately 39,000 acres is supplied by the Edwards aquifer. Reclaimed water, with no additional treatment, is suitable for irrigation of livestock feed, fiber, ~~and forage~~ crops, including cotton, hay, pasture, corn, and pecans. Without some additional treatment, the application of reclaimed water is unsuitable for use on vegetables and fruits for human consumption. Of the total acreage irrigated with Edwards water, approximately 80 percent is planted in crops suitable for reclaimed water irrigation, or 31,000 acres. Using an average annual irrigation application rate of 2 ac-ft/ac, the total irrigation demand on the aquifer in these two counties is 78,000 ac-ft/yr, of which 62,000 ac-ft/yr is for crops suitable for irrigation with reclaimed water.

The availability of reclaimed water to be transferred to irrigated farms and displace aquifer pumpage has been studied for reclaimed water sources exceeding 5,000 ac-ft/yr. Three sources of reclaimed water in Bexar and Medina counties have been identified that produce more than 5,000 ac-ft/yr: Dos Rios Wastewater Treatment Plant (WWTP), Salado Creek WWTP, and Leon Creek WWTP. Plant capacities and 1988 total discharge is listed in Table 3.2-1. Other sources of reclaimed water in the study area are estimated to exceed 5,000 ac-ft/yr by the year 2050, but currently produce less and those sources did not receive detailed reuse study. Those sources are: Saltrillo, Martinez 1, and Martinez 2 owned by the

who says? reference? This depends on current analysis of water quality. I would be very concerned about a potential salinity buildup over a long period. May want to plan rotation of wastewater + aquifer water applications to offset this potential problem

03-14-94-1

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE

Habitat Conservation Division
4700 Avenue U
Galveston, Texas 77551-5997

March 11, 1994

Mr. Steven J. Raabe, P.E.
Project Manager
San Antonio River Authority
100 East Guenther Street
San Antonio, Texas 78283-0027

Dear Mr. Raabe:

As you requested in your letter of February 16, 1994, we have reviewed the Trans-Texas Water Program (Section 3 (Partial) - Selected Hydrology Studies and Analyses of Alternatives) West Central Study Area Phase I Report (January 31, 1994 Submitted). We offer the following comments:

Report Section 3.8 Natural Recharge Enhancement Projects (L-17).

We are concerned about the statement that "Application of the Trans-Texas environmental criteria for pass-throughs for instream flows and estuarine flows was not included in the Phase I study scope of work for the Type I recharge projects." (Top of page 3.8-6). It indicates that the Phase I study lacks analysis of potential environmental impacts to living marine resources from reduced Nueces River Basin freshwater inflows into the Nueces Estuary. We, therefore, request that these studies be presented in the Phase II report.

Report Section 3.12 San Antonio River Unappropriated Streamflow (S-10, -11, -12)

This section does not discuss potential environmental impacts to the Guadalupe Estuary from the significant reductions of freshwater inflows from the three water diversion scenarios presented. Since the study states the Trans-Texas Environmental Criteria were used in all scenarios, we request this data be presented in the Phase II report.

Report Section 3.17 Guadalupe River Unappropriated Streamflow (G-10, -11, -12, -13, -14)

Please see the comments at Report Section 3.12 above.

APPENDIX A: TRANS-TEXAS ENVIRONMENTAL CRITERIA

Water Quality

3. Salt Water Intrusion

C. Effect on freshwater marshes/wetlands -- No recommended method.

We request a discussion of the method(s) to be utilized to determine Water Quality 3.C. above in the Phase II report. Given the preliminary data, which show significant reductions of freshwater inflows into coastal estuaries by almost all of the diversion or impoundment freshwater scenarios in the Phase I report, this environmental assessment is critical to predicting impacts of the various scenarios to the survival of living marine resources.

Freshwater Inflows to Bays and Estuaries

The last sentence states that: "Water stored in existing reservoirs will not be allocated to bay and estuary uses and released downstream to make up for normal flows below the specified limits." We request an explanation of this statement and the presentation of the data/analysis it is based upon in the Phase II report.

We appreciate the opportunity to provide these comments, and if there are any questions, please contact Mr. William Jackson at (409) 766-3699.

Sincerely,

Donald Moore, Chief
Galveston Field Branch

cc:
F/SEO2 - A. Mager
F/SEO22 - W. Jackson

Trans Tex
03-11-94-2

AMENDED

1.11-3.5 TAC

TRANS TEXAS WATER PROGRAM

WEST CENTRAL STUDY AREA
ADVISORY COMMITTEE FOR PUBLIC AND TECHNICAL INPUT
FEBRUARY 1994 STATUS REPORT

SUBMITTED BY: Robert L. Wright **DATE** 3-11-94

COMMENTS: Sec. 3.1

Please be sure that I have the opportunity to review the Demand Reduction for Industry Section for input to this report and to be sure of consistency for the data used in the State of Texas Consensus Water Plan also now being drafted.

Sec. 3.2, 3.3, 3.4, and 3.5

Reuse of reclaimed water definitely needs to be a part of the Trans Texas Water Program. How ever, current stream flows and water availability would be impacted with any diversion. These four section do not adequatly address this issue. It is noted that instream flows are taken into account in determining available reclaimed water for diversion but the explanation of this determination is insufficient to assure downstream permit holder that their needs will be met.

Also noted is that reclaimed water availability drops off during summer month which is the period of high irrigation water demand. Has the storage capacity to accumulate and store water been adequatly addressed in this analysis?

Sec. 3.12 and 3.17

Some additional comment should be made that describes the method used in determining the unappropriated stream flow. This would demonstrate to existing

PLEASE ATTACH ADDITIONAL SHEETS IF NECESSARY.

PLEASE RETURN TO:

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SAN ANTONIO RIVER AUTHORITY
P.O. BOX [illegible]0027
SAN ANTONIO, TEXAS 78283-0027
(210) 227-1373
FAX: (210) 227-4323

P:\RMC\WPDATA\TRANSTEX\LTRS

1.11-3.6 TAC

TRANS TEXAS WATER PROGRAM

WEST CENTRAL STUDY AREA
ADVISORY COMMITTEE FOR PUBLIC AND TECHNICAL INPUT
FEBRUARY 1994 STATUS REPORT

SUBMITTED BY: Robert L. Wright **DATE** 3-11-94

COMMENTS: Sec. 3.12 and 3.17

permit holders that their permits were properly considered in the determination.

Also, the use of annualized stream flow data shields the fact that the periods of greatest demand usually occurs coincidentally with the lowest stream flow. To be able to fully utilize the yearly average, storage must be a part of the plan.

Sec, 3.24.4 and 3.25.4

I question the Quality of recharge of the Edwards Aquifer in the Eastern reaches of this Aquifer. More details in you wish.

Comments on Appendix A

I have no background information concerning the setting of the Instream Flows at the standard specified in this appendix. If there is a readyly available report on why the TPWD picked this standard, inform me. In some cases without further diversion, the stated requirement could be overwhelming.

PLEASE ATTACH ADDITIONAL SHEETS IF NECESSARY.

PLEASE RETURN TO:

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FAX: (210) 227-4323

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03-16-94-1

League
of Women
Voters
of Texas

March 14, 1994

TO: Steven J. Raabe, Project Manager
Trans Texas Water Program, West Central Study Area

FROM: Catherine Perrine, Advisory Committee

In response to the draft report on alternatives for meeting future water needs mailed to the Advisory Committee on February 16, my comments are:

(1) Fixed annual pumping rates will not result in optimum use of water from the Edwards Aquifer. Section 3.17 of the draft report considers the availability of Guadalupe River streamflows under scenarios that assume fixed annual pumping rates from the aquifer of 400,000 acre-feet per year and 200,000 acre-feet per year.

Recharge to the Edwards Aquifer is dramatically variable, fluctuating from 43,700 acre-feet in 1956 to more than 2,000,000 acre-feet in 1987. The amount of water that can be pumped from the aquifer without reducing springflows below desirable levels also varies from year to year and from month to month.

Because the Edwards will continue to be the least expensive source of water for those who now rely upon it, the amount of water available from this source should be calculated on a monthly basis, using the most accurate models available. Alternative sources of supply can then be evaluated in accordance with their usefulness in supplementing supplies from the Edwards when needed.

(2) Alternatives for recharge of the Edwards Aquifer, discussed in Sections 3.4 and 3.8, should be analyzed by use of aquifer models to show their effect on monthly springflows and monthly water availability.

(3) Aquifer storage and recovery projects for the Edwards should be studied as an additional alternative.

(4) Section 3.5 indicates that withdrawals of reclaimed water from the San Antonio River for transfer to the Choke Canyon/Lake Corpus Christi System are not viable because of existing water rights. Would it be feasible to pump the reclaimed water from Braunig and Calveras lakes to the Atascosa River as an alternative means of transfer to Lake Corpus Christi?

1212 Guadalupe
Suite 107
Austin, TX 78701-1800
512-472-1100
FAX 512-472-4114

(5) Section 3.11 indicates that water rights in the Nueces River Basin are not available for use in the West Central study area. Would it be feasible to purchase a portion of the unutilized rights of the Nueces County Water Control and Improvement District No. 3 for use in the Choke Canyon/Lake Corpus Christi service area? This would appear to be a more logical means of compensating for losses caused by Edwards recharge dams in the Nueces basin than the purchase of San Antonio River water rights, as suggested in Section 3.5.2.

In regard to the draft reports mailed to the Committee in January and discussed at the January 20 meeting, I hope that studies on the Carrizo-Wilcox Aquifer are continuing and that additional information will be provided for the May Phase I report. As was pointed out at the meeting, the proposed wells are likely to have high conveyance costs. A more compact configuration--perhaps in Wilson and Gonzales Counties only--should be considered. Also, pumpage rates from the aquifer should be considered in conjunction with pumpage from the Edwards. Larger withdrawals could be made in dry years, and smaller withdrawals in wet years when more Edwards water is available. More detailed information should also be developed on the various kinds of recharge projects mentioned.

Section 2 of the draft report projects future demands on the basis of drought year conditions. A more accurate forecast of future water use could be provided by assuming a scenario of varying demands based on a repetition of past weather conditions.

TRANSTEX
4-12-94-1

[redacted]

EDWARDS UNDERGROUND
WATER DISTRICT

2.5-2.3-6.5-1

April 4, 1994

Mr. Steve Raabe, P.E.
San Antonio River Authority
P. O. Box 830027
San Antonio TX 78283-0027

Re: Trans-Texas Water Program

Mr. Raabe:

Enclosed you will find a memorandum prepared by Greg Rothe providing comment for the District on the February draft submittal by HDR Engineering, Inc.

Please accept these as the District's comments for your purposes in guiding HDR's work. We understand that these alternatives were discussed at the March 10 technical group meeting and that Mr. Rothe offered these comments there.

If you or HDR need further clarification or explanation, please call us.

Cordially,

rick illgner

Rick Illgner
General Manager

RI:ST-S
TT.0404.01

cc: Greg Rothe

1615 N. ST. MARYS · P.O. BOX 15830
SAN ANTONIO TEXAS 78212-9030
210-222-2204
FAX 222-9860

G.E. ROTHE COMPANY, INC.
P.O. Box 668 Hondo, Texas 78861 (210) 426-5696 FAX (210) 426-2213

MEMORANDUM

March 8, 1994

To: Rick Illgner
From: Greg Rothe

Subject: Trans-Texas Water Program

We have completed our review of the January 31, 1994, draft of the West Central Study Area alternatives. The remainder of the analyses have a May, 1994, deadline for submittal. The following are my questions, comments, concerns, and recommendations on the alternatives.

3.1 Demand Reduction (L-10)

The draft of this section promises a summary in the next draft. We will provide our final comments after a review of the summary. For purposes of this memorandum, the following are a list of questions for reference when we make a final review of this section.

1. Is the 17.8 gpcd estimated water savings in Table 3.1-1 the same savings as the 17.9 gpcd already programmed in the water demand projections by the TWDB, but only occurring at an earlier date?

2. In Table 3.1-1, why did we not take credit for water savings for conservation pricing and leak detection and conservation exams?

3. It appears that the estimated water savings for irrigation water conservation are an acceleration of the water conservation projected by TWDB to occur anyway. This may be the same question as 1. above. If so, the final presentation of the results should make it clear that these are not projection period savings at the estimated cost but rather accelerated savings but with a short term benefit.

Again, additional comments will follow with a review of the final draft of this section.

3.2 Exchange Reclaim Water For Edwards Irrigation Water (L-10)

This alternative proposes to exchange reclaimed water from the Dos Rios WWTP to farms in eastern Medina County and western Bexar County. Questions that we have are:

1. What is the basis for the instream flow requirement shown in Table 3.2-3? How does it relate to the Trans-Texas Environmental Criteria for instream flow requirements?

2. How much water does the Tunnel Reuse project (which is subtracted before computing availability for this alternative) require?

My concerns relative to this alternative are:

1. This is a general concern, that the alternatives are being examined with boundary conditions that presume some uses of water take precedence over the alternative being examined. In this instance, the instream flow requirements and the tunnel reuse project are examples. Those uses might not necessarily come ahead of the subject use or they could be satisfied from other sources, which in conjunction with water delivery to this alternative would result in a net reduction in water cost overall. This may be posing a problem that we cannot cope within the context of this study. However, the presentation of the results should carefully explain the boundary conditions or priorities of use that are precedent in the examination of each alternative.

2. This alternative is examined with a monthly demand distribution as shown in Table 3.2-6 taken from records of the Medina Lake diversions for irrigation. We believe that this monthly demand distribution is too flat for purposes of projecting the amount of water required on a monthly basis to offset an equal amount of pumpage from the Aquifer. We believe the monthly demand distribution (approximately 80% of the demand is corn and cotton) in the Edwards Aquifer area is concentrated in the late spring and early summer months. The effect of this problem is to underestimate the amount of acres that could be converted from the Edwards Aquifer to the reclaimed water source or to underestimate the cost of the facilities to convert the desired number of acres of irrigation demand from the Aquifer to the reclaimed water source. Whichever, the effect is an understatement of the cost per acre foot for this alternative.

3.3 Exchange Reclaim Water For BMA Medina Lake Water (L-12)

This proposal would substitute reclaimed wastewater from the Dos Rios WWTP for water from Medina Lake. My concerns about this alternative are:

1. This alternative proposes to furnish 66,000 acre feet per year to the BMA irrigation system on a firm annual basis. We do not believe that an equal amount of water will be available from Medina Lake in place of the firm supply delivered. Should the cost per

acre foot of water under this alternative be computed as presented in the draft on the basis of the 66,000 acre feet of reclaimed water delivered or should the cost to deliver that water be divided by the net amount returned to the region from the Medina Lake supply? This comment relative to the computation of the unit cost of water may apply to other alternatives proposing substitutions of one source of supply for another.

3.4 Reclaimed Water Use (L-13)

This alternative proposes to take treated wastewater from the Dos Rios WWTP and treat it to potable quality and inject it into the Edwards Aquifer. This alternative offers that "The Aquifer then becomes a long term storage facility and holds the water until needed." This supposition might be disputed and has a bearing on the utility of this alternative in relation to its cost.

3.5 Transfer of Reclaimed Water To Corpus Christi Through Choke Canyon Reservoir (L-14)

This alternative proposes to transfer reclaimed waste water to the City of Corpus Christi in exchange for reduction in yield in the Lake Corpus Christi/Choke Canyon Reservoir system caused by construction of recharge projects in the Nueces River Basin. My comments about this alternative are:

1. The term "reclaimed water" suggests that this water remains in the possession of the reclaimer and is not subject to the Trans-Texas Environmental Criteria. However, in this alternative, reclaimed waste water is returned to the stream, essentially becoming river water, and is subjected to the Trans-Texas Environmental Criteria for purposes of determination of its availability at the diversion point. The title of the alternative or the method of examination needs to change in this alternative. My recommendation is that examination method should change to not subject the reclaimed water to the Environmental Criteria. This assumes that TNRCC would allow, as they have in other situations, for the San Antonio River to be used as delivery conduit to the point of diversion.

2. Notwithstanding the resolution of the problem cited in the comment above, the suggestion in this alternative that some existing run-of-river right be purchased (such right not subject to Trans Texas Environmental Criteria) is a good one.

3.7 Demineralization of Edwards "Bad Water" (L-16)

The examination of this alternative concludes that "Pumping water from the saline zone would almost be the same as pumping from the freshwater zone." However, the analysis includes a complete description of the methods and cost for demineralization. The recommendation in the draft is that this alternative not be considered further. Do your geologists concur in this finding and recommendation? I will ask them and provide subsequent comment.

3.8 Natural Recharge Enhancement Project (L-17)

The draft presents the findings of previous studies by the District on recharge enhancement projects in the Nueces River Basin and Guadalupe - San Antonio River Basin. The information presented in the draft is for the Type 1 recharge projects. The District is not pursuing these projects favoring the Type 2 projects which will be reported in Alternative L-18, but are not found in the February submittal. The cost estimates from the District's studies of these recharge projects are more detailed that the standard evaluation in this Phase I of Trans-Texas so the consultant will report those results without new work.

3.11 Existing Water Rights in Nueces River Basin (N-10)

This alternative concludes that there are "no significant utilized or underutilized water rights in the Nueces River potentially available to the West Central Study area." We can't dispute this.

3.12 San Antonio River Unappropriated Stream Flow (S-10, 11, 12)
3.17 Guadalupe River Unappropriated Stream Flow (G-10, 11, 12, 13, 14)

These alternatives examine unappropriated stream flows available for diversion for any purpose at selected points under varying conditions of stream flows and water rights and subject to the Trans-Texas Environmental Criteria. This is a qualitative analysis of water available. According to the scope of work no destination or purpose of use is proposed. The results are a function of the operation of the surface water models developed for the District. The presentation of the results of average drought and minimum year conditions is acceptable. The results of these examinations will be used for cost estimating selected alternatives for bringing unappropriated water to the recharge zone of the Edwards Aquifer for injection or recharge at existing structures. The meeting of

the technical group on March 10 is for purposes of selecting the alternatives to be cost estimated.

3.24 Guadalupe River Dam No. 7 (G-19)
3.26 Lockheart Reservoir (G-21)
3.27 Dilworth Reservoir (G-22)

These three reservoir projects were given a cursory examination. Information from previous studies is reported here. Cost estimates are updated and it is noted for each that previous yield estimates do not take into account the new Trans-Texas Environmental Criteria. The narrative indicates that the yield would be reduced when the Trans-Texas Environmental Criteria is applied.
We concur.

3.28 Colorado River Lake Austin (C-10, 11, 12, 13)

The draft of this section is only partially complete. We would like to withhold comment pending a complete draft and some additional study of the Colorado River water rights.

3.29 Colorado River at Colombus (C-14, 15, 16, 17)

The draft of this section is only partially complete. We will comment on it later.

3.30 Shaws Bend Reservoir (C-18)

This is a major reservoir project on the Colorado River near La Grange with 132,000 acre feet of storage. The project is estimated to have 100,000 acre feet of firm yield after application of the Trans-Texas Environmental Criteria. This alternative proposes to divert the firm yield from the reservoir to a water treatment plant at San Antonio. My concern here is that the firm yield is overstated, especially after the application of the Environmental Criteria. Typically, in this area firm yield to total storage ratios are 1:5 to 1:10. My guess is that the firm yield quoted is a system (all Colorado River reservoirs) improvement in firm yield to be gained by construction of the reservoir. I will ask the consultant to confirm the yield.

05-25-94-2

TEXAS WATER DEVELOPMENT BOARD

May 23, 1994

Mr. Steve Raabe, P.E.
San Antonio River Authority
P. O. Box 830027
San Antonio, Texas 78283-0027

Dear Steve:

Re: General and Specific Comments, TT-WC Study Area-Draft Memoranda of Alternative Nos. L-10 through L-17, N-10, S-10 through S-12, G-10 through G-14, G-19 through G-31 and C-10 through C-18

Attached for your review are comments on the above-referenced memoranda. If you have any questions or comments, please call Dennis Crowley at (512) 463-7976.

Sincerely,

Tommy Knowles
Deputy Executive Administrator

ATTACHMENT 1
GENERAL AND SPECIFIC COMMENTS
TT-WC STUDY AREA - DRAFT MEMORANDA OF
ALTERNATIVE NOS. L-10 through L-17, N-10, S-10 through S-12,
G-10 through G-14, G-19 through G-31, and C-10 through C-18

GENERAL COMMENTS

Conservation:

1. The San Antonio area has already seen significant efforts by a number of local entities, including the City of San Antonio, the Edwards Underground Water District, Bexar Met, etc. to develop local water conservation plans. It is recommended that these considerations be discussed in this plan.

   The draft section makes no mention of current and planned water conservation programs in the Edwards region. It is recommended there be a summary of EUWD's and SAWS' current and planned programs and some evaluation of their impact and adequacy.

2. It is recommended that the plan include a discussion of supply side conservation techniques such as water audits and pressure maintenance along with addressing alternate water sources such as water reuse.

   The discussion of leak detection and repair is focused solely on the residential sector. Fixing internal plumbing leaks can save water and is often incorporated into other types of programs (e.g., direct installation retrofit programs, home water audits, etc.). However, there is no discussion about leak detection and repair programs for water utility distribution systems. Often these losses can be substantial, as are the economic returns to the utility for controlling unaccounted for water losses.

3. In a large metropolitan area such as San Antonio, commercial and institutional conservation programs are important and should be addressed.

4. Texas Water Development Board staff has developed a new per capita water-saving estimate for new plumbing fixture standards. These are to be used in the Board's 1994 municipal water demand projections. The new number is 21.7 gpcd.

5. Discussion of "conservation pricing" is focused solely on theoretical price and income elasticity effects, which are important. The discussion does not address the likelihood that there are very significant price responses once the price of the overall cost of water to the consumer crosses a certain threshold. If the overall price/cost of water is low, even relatively large percentage increases in price may have little

effect. However, if the price/cost is high, the response to price increases should be greater. For example, a rate structure that prices "seasonal" use (e.g., landscape irrigation) at the full marginal cost of new surface water supplies, plus treatment and distribution, would likely impose very substantial cost increases on users with large seasonal demands. It is recommended that the discussion address issues of cost allocation and the effect of different cost allocation policies on water pricing structure.

It is also recommended that conservation pricing coupled with aggressive and sustained public information campaigns be discussed. On-going public information is important to reinforce the connection between consumer behavior in real time and a water bill that arrives a month or more later. Also consumer education is important in shaping consumer preferences and providing the consumer with important useful information about conservation practices and technologies. Economists often look at these kinds of issues in a theoretical manner, ignoring the fact that there are many "market imperfections". Practitioners of water conservation know that the price/demand relationship in municipal water supply is very imperfect and requires active intervention by the utility (i.e., social engineering if you will) if pricing strategies are used to modify demand.

6. For additional information on agriculture water conservation programs in the Edwards region see Attachment 2.

Environmental:

1. It is recommended that the additional cost of treatment that is required to treat reclaimed water for application on crops destined for human consumption be shown if this use is contemplated.

2. The cost of "Environmental Studies and Mitigation" appears to be lumped into the same category with "Land Acquisition," even thought the land acquisition referred to is for the project's basic land needs and has nothing to do with compensatory land acquisition associated with mitigation of environmental impacts. These costs should be separated and better defined.

3. The costs allocated for environmental studies and mitigation appear to be low. For statewide water planning purposes, the Board has estimated mitigation costs to be 16% of the total cost of reservoir projects.

SPECIFIC COMMENTS:

1. Include Texas Parks and Wildlife Department and Texas Natural Resource Conservation Commission on the cover page and title

page under "Prepared for".

2. Conservation pricing should have an associated annual cost/person in Table 3.1-1 on page 3.1-10.

3. On Table 3.1-2, Page 3.1-11 the superscript on Adm./Labor/Info. should be "d" and not "c".

4. Page 3.1-3, The plumbing bill, as passed, does not include labeling requirements for dishwashers and clothes washers. The reference to the plumbing bill should be Chapter 337.

5. Page 3.2-1, Paragraph 1, The basis for using 2 ac-ft. for application rate should be shown. The corn produced is for human consumption and thus could not use reclaimed water. Using TWDB Report 294 the acreage would be near 50% and not 80%.

6. Page 3.2-3, Please define what the Central East Infrastructure project (i.e., "Tunnel Project") is.

7. Page 3.2-10, 3rd sentence - "Because the us <u>of</u> this existing storage...." The word <u>of</u> should be inserted.

8. Page 3.3-4, Paragraph 2, Dam safety concerns should be considered.

9. Page 3.3-6 and page 3.3-9, If the unit costs of per acre foot for these options assumes no cost in obtaining the wastewater flows from SAWS, please state.

10. Page 3.3-6, The unit cost assumes full benefit. While reducing demands on the Edwards, the diversion would not provide a one- to one increase in municipal supplies. For consistency it may be necessary to convert to cost per unit of municipal supply gained.

11. Page 3.3-9, Same as 3.3-6. Also BMA attempting to convert permit to multi-use permit that could change the use of this option.

12. Page 3.4-1, Discuss the status and conditions of any permits held by the city for the use of treated effluent.

13. Page 3.4-7, Use of reclaimed water to recharge the Edwards would have lots of implementation issues. These need to be addressed.

14. Page 3.5-1, Section 3.5.1 - Please define Type 1 and Type 2 recharge structures.

15. Page 3.5-5, Costs are not broken down to unit cost for

comparison to other options.

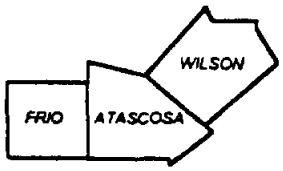
16. Page 3.7-8, Cost seems low. TDS range should be in 10,000 mg/l range not 2500 mg/l like BRA project. Also, costs do not include power cost which could make cost much higher.

17. Page 3.8-7, Unit cost is based on additional recharge not additional supply. There is not one for one recovery of recharged water

18. Page 3.11-4, Paragraph 2, "...(District No. 1) . Water rights....." A period is needed after the first sentence.

19. Page 3.12-1, Recent evaluations of pumping levels needed to maintain springflow above taking would require pumping level of less than 200,000 acre-feet per year during a drought. These needs to be considered in the analysis in this section.

TPWD TEX
5-31-94-1



EVERGREEN UNDERGROUND WATER CONSERVATION DISTRICT

210-769-3740 Fax: 210-769-2492 1-800-259-3740
P.O. Box 155 1306 Brown
JOURDANTON, TEXAS 78026

May 27, 1994

Mr. Steven J. Raabe, P.E. Project Manager
Trans Texas Water Program
West Central Study Area
San Antonio River Authority
P.O. Box 830027
San Antonio, Texas 78283-0027

Dear Steven:

On behalf of the Board of Directors of the Evergreen Underground Water Conservation District, a sincere "Thank You" for coming to our meeting on May 24th. We all certainly appreciate your inviting Dr. Tommy Knowles, TWDB, Bill West, GBRA, and Tom Fox of SAWS to this meeting to make presentations and answer questions about the Trans Texas Water Plan. The results were positive. We all now have a much more clear concept of the "whys and wherefores" of this extremely important study.

Thanks to your presentation, we all better understand that the Carrizo/Wilcox Aquifer is included in the study, not only because of its location and capacity, but because it has historically been included and is part of the baseline for Phase 1. It has been difficult to understand or accept some of the proposals in the program. The discussion held Tuesday night pointed out the need to update the most recent statistical information on the Carrizo/Wilcox Aquifer.

Because of our low tax rate and the Tri-County "Brush Country" tax base, Evergreen UWCD is unable to contribute any funds to help complete the program study. We can, and will, send you our constructive comments when requested.

Best wishes for your continued success with SARA and the Trans Texas Water Program.

Sincerely,

Clifton L. Stacy, President
Board of Directors

Jim T. Hester
General Manager

CLS/JTH/bgb

TRANS-TEXAS WATER PROGRAM

SAN ANTONIO RIVER AUTHORITY 100 EAST GUENTHER STREET P.O. BOX 830027 SAN ANTONIO TEXAS 78283-0027

1.11-3.6-TAC

May 31, 1994

TO: **Advisory Committee For Public and Technical Input**

FROM: **Steven J. Raabe, P.E., Project Manager**
San Antonio River Authority
Office: (210) 227-1373
Fax: (210) 227-4323

SUBJECT: **Trans Texas Water Program**
West Central Study Area

Enclosed is the West Central Study Area Phase 1 Executive Summary and Figures. The completed Phase 1 Report is being prepared for printing and will be available for distribution by June 15, 1994. If you are interested in a copy of Phase 1 Report, please return the enclosed post card as soon as possible. The report will be bound in two volumes and will be about 3 inches thick.

There will be an Advisory Committee meeting on July 22, 1994 at 9:30 a.m. at the San Antonio Water System Training Room located at 1001 East Market Street, San Antonio, Texas. Please return your comments on the Executive Summary and/or Phase 1 Report by July 30, 1994.

There will be a Statewide PMC meeting held in conjunction with the Texas Water Conservation Association Mid-Year Technical Conference on June 23, 1994 at 9:00 a.m. at the Sheraton South Padre Island Hotel located at 310 South Padre Boulevard, South Padre Island, Texas 78597. Please call me if you need more information on this meeting.

p:\rmc\wpdata\TRANSTEX\LTRS

06-15-94-3

TRANS-TEXAS WATER PROGRAM

SAN ANTONIO RIVER AUTHORITY 100 EAST GUENTHER STREET P.O. BOX 830027 SAN ANTONIO TEXAS 78283-0027

1.11-3.6-TAC

June 15, 1994

TO: **Advisory Committee For Public and Technical Input**

FROM: **Steven J. Raabe, P.E., Project Manager**
San Antonio River Authority
Office: (210) 227-1373
Fax: (210) 227-4323

SUBJECT: **Trans Texas Water Program**
West Central Study Area

Enclosed is the West Central Study Area Phase 1 Report for your information. If you have comments, please return them by July 30, 1994.

There will be an Advisory Committee meeting on July 22, 1994 at 9:30 a.m. at the San Antonio Water System Training Room located at 1001 East Market Street, San Antonio, Texas to discuss the report. Please call me if you need more information on this meeting.

Enclosures

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1.11-3.8 TAC

TRANS TEXAS WATER PROGRAM

WEST CENTRAL STUDY AREA PHASE 1 REPORT

ADVISORY COMMITTEE FOR PUBLIC AND TECHNICAL INPUT

SUBMITTED BY: _____ DATE _____

COMMENTS: _____

PLEASE ATTACH ADDITIONAL SHEETS IF NECESSARY.

PLEASE RETURN TO:

STEVEN J. RAABE, P.E.
SAN ANTONIO RIVER AUTHORITY
P.O. BOX 830027
SAN ANTONIO, TEXAS 78283-0027
(210) 227-1373
FAX: (210) 227-4323

07-12-94-4

TRANS-TEXAS WATER PROGRAM

SAN ANTONIO RIVER AUTHORITY 100 EAST GUENTHER STREET P.O. BOX 830027 SAN ANTONIO TEXAS 78283-0027

1.11-3.6 TAC

July 12, 1994

TO: Advisory Committee For Public and Technical Input

FROM: Steven J. Raabe, P.E., Project Manager
San Antonio River Authority
Office: (210) 227-1373
Fax: (210) 227-4323

SUBJECT: Trans Texas Water Program
West Central Study Area

There will be an Advisory Committee meeting on July 22, 1994 at 9:30 a.m. at the San Antonio Water System Training Room located at 1001 East Market Street, San Antonio, Texas to discuss the West Central Study Area Phase 1 Interim Report. If you have comments, please return them by July 30, 1994.

There will be a West Central Study Area Policy Management Committee meeting to discuss the comments received on the Phase 1 Interim Report on August 10, 1994 at 2:00 p.m. at the San Antonio River Authority Boardroom located at 100 East Guenther Street, San Antonio, Texas.

Additional Phase 1 study was authorized by the West Central Study Area Policy Management Committee on May 24, 1994 and is underway on the City of San Antonio 2050 Plan and the Canyon Lake/Mid Cities Plan. These two recently developed plans are being studied under the Trans-Texas guidelines with results to be issued in a supplement to the Phase 1 Report in September, 1994. The scope of work for the additional study is enclosed for your information.

Development of the Phase 2 scope of work will begin upon completion of the supplemental report.

If you have any questions, please contact me.

Enclosure

p:\rmc\wpdata\TRANSTEX\LTRS

Local/Regional Participants

Austin

Bexar Metropolitan Water District

Brazos River Authority

Corpus Christi

Edwards Underground Water District

Guadalupe-Blanco River Authority

Houston

Lavaca-Navidad River Authority

Lower Colorado River Authority

Nueces River Authority

Sabine River Authority

San Antonio River Authority

San Antonio Water System

San Jacinto River Authority

State Agencies

Texas Water Development Board

Texas Natural Resource Conservation Commission

Texas Parks and Wildlife Department

Printed on Recycled Paper

June 22, 1994

AMENDED SCOPE OF WORK AND SCHEDULE
TRANS-TEXAS WATER PROGRAM
WEST CENTRAL STUDY AREA

San Antonio River Authority
San Antonio Water System
Edwards Underground Water District
Guadalupe-Blanco River Authority
Lower Colorado River Authority
Bexar Metropolitan Water District
Nueces River Authority
Texas Water Development Board

HDR Engineering, Inc.

Austin, Texas

AMENDED SCOPE OF WORK AND SCHEDULE
TRANS-TEXAS WATER PROGRAM
WEST CENTRAL STUDY AREA

June 22, 1994

This Scope of Work and Schedule has been prepared to address additional tasks to be completed as parts of the Trans-Texas Water Program West Central Study Area Phase I analyses presently underway.

ITEM 1 - MAYOR'S 2050 COMMITTEE REGIONAL PLAN (L-20)

Budget

On April 27, 1994, a Recommended Water Resource Plan (Plan) prepared by the San Antonio Water System (SAWS) was presented to the San Antonio Mayor's 2050 Water Resources Committee for consideration. As the Plan involves many interrelated elements which affect the availability and movement of water in both the Edwards Aquifer and throughout the Guadalupe - San Antonio River Basin, the San Antonio River Authority, and the Guadalupe-Blanco River Authority (GBRA) have joined with SAWS in requesting an analysis of the Plan from engineering and environmental perspectives. The Plan will be evaluated at the same reconnaissance level as other Phase I alternatives with regard to cost and environmental elements. Provisions of S.B. 1477 (Edwards Aquifer Authority) will be used in this study in evaluating the purchase of irrigation leases. Specific work tasks and assumptions involved with the analysis of each aspect of the Plan are itemized as follows:

Summary of Work and Assumptions

1.0 Conservation — $1,500

a. Normal (non-drought) conservation will be assumed to be included in demand projections.

b. Additional conservation effects on ground and surface water demands as well as return flows will be as specified by SAWS and provided to HDR and the TWDB for incorporation into aquifer and river basin models.

2.0 Local Reuse $2,000

a. Identify consumptive use at Calaveras & Braunig Lakes and the Tunnel Reuse Project and set these as the first priority for effluent reuse.
b. Existing water rights permits will govern Calaveras & Braunig operations.

3.0 Lease of Irrigation Rights $4,000

a. Determine a fixed annual reduction in Edwards pumpage for irrigation use and simulate effects using TWDB Edwards Model. Baseline irrigation pumpage will likely need to be set based on S.B. 1477 (i.e., 2 ac-ft per acre) with fixed reductions based on lease quantity.
b. Irrigation lease cost as determined by SAWS will be used.

4.0 Recharge Dams $3,500

a. Modify SAWS plan to include size and cost data from EUWD's Phase IVA study on Lower Sabinal, Verde, Hondo, and Frio Projects.
b. Quantify monthly recharge enhancement and provide to TWDB for inclusion in Edwards Aquifer Model run.
c. Estimate impact to yield of CC/LCC System from recharge projects and discuss mitigation options.

5.0 Edwards Aquifer Management & Assumptions (TWDB Staff) $1,500

a. Simulate reduced, uniform pumpage rate for San Antonio considering supply available from new surface water treatment plant.
b. Incorporate reduced aquifer demands as a result of irrigation leases.
c. Incorporate identified recharge enhancement projects.
d. Use EUWD/HDR historical Edwards Aquifer recharge values.
e. Simulations based on the assumptions listed as 5.0a through e will be performed using the TWDB Edwards Aquifer Model (Edwards Model) to obtain changes in

springflow to be included in the Guadalupe-San Antonio River Basin Model (GSA Model).

f. Simulations will be performed with the Edwards Model for both proposed and present SAWS seasonal demand distributions to show increased springflows resulting from SAWS alternative pumping plan.

6.0 Canyon Lake Firm Yield $20,250

a. Determine the firm yield of Canyon Lake under the following scenarios:
   - Edwards Aquifer pumpage/springflow scenario chosen for Mayor's 2050 Committee Regional Plan.
   - Subordination of GBRA hydropower rights only and subordination of both GBRA and Seguin hydropower rights.

   This task will develop two unique estimates of Canyon firm yield.

b. Determine the firm yield of Canyon Lake subject to the transfer of up to three quantities of senior water rights from the lower basin to Canyon Lake. These quantities shall be identical to those selected for Item 1, Part 7b. The Mayor's 2050 Committee Regional Plan pumpage/springflow scenario and full subordination of hydropower rights will be assumed for this task. This task will develop three unique estimates of Canyon firm yield.

c. Refer to Item 2 - Canyon Lake/Mid-Cities Regional Plan, Part 2 for description of other Canyon Lake firm yield analyses and GSA model assumptions.

7.0 Downstream Transfers - Guadalupe Rights Component $35,500

a. Consider alternative diversion points at Lake Dunlap and at Gonzales.

b. Consider water rights senior to Canyon Lake in lower basin under which upstream diversions could be made. Select up to three quantities of such rights which might be available including portions of GBRA rights at the Saltwater Barrier and CP&L rights associated with make-up water for Coleto Creek Reservoir.

c. Include pending application by City of Victoria for water rights based on annual quantity requested.

d. Assume subordination of CP&L once-through cooling rights near Victoria.

e. Assuming Edwards Aquifer pumpage/springflows scenario specified by SAWS and full hydropower subordination, adopt associated Canyon Lake firm yield for analysis of water rights transfers.

f. Perform baseline availability run at Dunlap (Run 1A) and Gonzales (Run 1B) using GSA Model excluding water rights junior to selected rights. Record releases, pass-throughs, and spills from Canyon Lake. Record deficits for senior rights being considered for transfer. (Repeat Runs 1A and 1B for up to three transfer volumes.)

g. Perform availability run at Dunlap (Run 2A) and Gonzales (Run 2B) using GSA Model excluding portion of senior rights being transferred. Fix water passing Canyon Dam to that determined in Run 1. (Repeat Runs 2A and 2B for up to three transfer volumes.)

h. Difference in availability between Run 1 and Run 2 is maximum quantity of water potentially available under selected rights at upstream location.

i. Determine portion of this water which can actually be diverted subject to pump capacity, daily/monthly availability percentage, and summer season demand distribution.

j. Perform simulation run (Run 3) with water actually diverted under transferred rights at upstream location and with selected downstream senior rights included. Record deficits under selected senior rights. Compare flow statistics at various locations on the Guadalupe River with and without the water rights transfer and with respect to Trans-Texas Environmental Criteria.

k. Difference in deficits between Run 1 and Run 3 is quantity which must be made up from SAWS discharges.

l. Size and cost diversion dam, pump station, pipeline, booster station(s), water treatment plant, etc. for all components of this alternative for one selected diversion rate.

m. Evaluate environmental impacts associated with structural improvements and changes in intervening flow regime between upstream diversion points and Saltwater Barrier. Water quality aspects will not be examined in

detail in this phase.

n. Compute and graph changes in instream flows at the points of diversion on the Guadalupe and below Applewhite Reservoir, as well as any changes in B&E inflows and compare to the Trans-Texas Environmental Criteria.

8.0 Downstream Transfers - SAWS Treated Discharge Component $27,000

a. Select annual consumptive use values for Braunig and Calaveras and Tunnel Reuse Project.

b. Modify GSA Model to facilitate delivery of effluent to Applewhite Reservoir, from which the Braunig, Calaveras, and Tunnel Reuse Project needs and mitigation of water rights deficits in the Guadalupe Basin and at the Saltwater Barrier will be satisfied. This will be accomplished by multi-pass solution.

c. Applewhite operations will be governed by permit except when additional releases are necessary. Leon Creek Diversion, as permitted, will be included.

d. Modify GSA Model to add decision logic for releases from Applewhite, Calaveras, and Braunig as necessary to mitigate deficits in the Guadalupe Basin and at the Saltwater Barrier. Releases will be made from (1) Applewhite, (2) Braunig (top 3 feet only), and (3) Calaveras (top 3 feet only) in order of preference. Quantify any utilization of Braunig or Calaveras storage as well as any unmitigated water rights deficits in the lower Guadalupe Basin.

e. Identify source and discharge locations. Cost pump stations, pipelines, and/or storage for delivery of maximum monthly transfer volume as determined in simulations.

f. Evaluate environmental impacts associated with structural improvements and changes in intervening flow regime between Applewhite and Saltwater Barrier. Compare flow statistics at various locations on the Medina and San Antonio Rivers with and without the downstream trades and with respect to Trans-Texas Environmental Criteria. Water quality aspects will not be examined in detail in this phase.

ITEM 2 - CANYON LAKE/MID-CITIES REGIONAL PLAN (G-23)

Recently several communities within the Guadalupe River Basin have determined that continued reliance on groundwater is impractical and that they need to convert to surface water. Planning, as a part of the Trans-Texas Water Program, will be updated to adequately address this shift to surface water prior to determining the amount of water available for interbasin transfer.

It is believed that a firm water supply is available from the Guadalupe Basin for outside of the basin use over the next 20 - 30 years. The supply would be a combination of available Canyon Lake conservation water and the partial use of downstream senior water rights. Environmental screening criteria applied in other Phase 1 studies will be applied to this analysis. Specific work tasks and assumptions are outlined as follows:

Summary of Work and Assumptions

1.0 Immediate Guadalupe River Basin Water Needs

1.1 Canyon Lake Area **$11,000**

a. GBRA provide consultant with past studies and a reconnaissance of existing water demands.
b. Using TWDB high case, with conservation water demand projections and assuming no groundwater is available, consultant will evaluate the projected water needs for the Canyon Lake, Smithson Valley, Bulverde, Wimberley, and Hays County areas which are presently on groundwater, but planning to convert to surface water.
c. Consultant will update and develop costs for water to be diverted from Canyon Lake, treated, and delivered to wholesale customers within the study area based on year 2050 conditions.

1.2 I-35 and Hwy. 78 Corridor **$9,000**

a. GBRA to provide all available information on existing demands.
b. Using TWDB high case, with conservation water demand

projections and estimates of groundwater available from the Edwards Aquifer only, consultant will evaluate the projected water needs in the I-35 and Hwy. 78 corridor of western Comal and Guadalupe Counties which are presently on groundwater but planning to convert to surface water.

c. Consultant will update and develop costs for water to be diverted from Lake Dunlap, treated locally, and delivered to wholesale customers within the study area based on year 2050 conditions.

1.3 Lower Basin $4,500

a. Based on information supplied by GBRA and the TWDB, the consultant will evaluate the projected surface water needs in the lower Guadalupe Basin. TWDB high case, with conservation water demand projections and TWDB estimates of available groundwater will be used.

2.0 Canyon Lake Firm Yield $20,250

a. Determine the firm yield of Canyon Lake under the following scenarios:
   - Edwards Aquifer pumpage/springflow scenarios of 200,000 acft/yr and 400,000 acft/yr.
   - Subordination of GBRA hydropower rights only and subordination of both GBRA and Seguin hydropower rights.

   This task will develop four unique estimates of Canyon firm yield. Refer to Item 1 - Mayor's 2050 Committee Regional Plan, Part 6 for description of other Canyon Lake firm yield analyses.

b. Modify the GSA model to facilitate the computation of Canyon Lake firm yield subject to a range of assumptions including the following:
   - Water rights located upstream of Lake Dunlap and downstream of Canyon Lake which are senior to Canyon Lake, but junior to GBRA and Seguin hydropower rights, will be honored to the

extent possible by passage of inflows to Canyon Lake when computing firm yield under hydropower subordination scenarios.

- Water rights located downstream of Lake Dunlap will be honored to the extent possible by passage of inflows to Canyon Lake when computing firm yield under hydropower subordination scenarios.
- Flow passage criteria established by FERC for Canyon Lake will be included in all simulations.

3.0 Dunlap/Gonzales Diversion

a. Simulations will quantify the additional supply resulting from the transfer of up to three quantities of senior water rights from the lower basin to Dunlap or Gonzales. Refer to Item 1 - Mayor's 2050 Committee Regional Plan, Part 7 for expanded description of water rights transfer analyses.

ITEM 3 - ENVIRONMENTAL — $9,500 (Item 1), $3,000 (Item 2)

a. Environmental work will include a reconnaissance level fatal flaw evaluation of the options being considered. The various project components (e.g., location of pipelines, intakes and outfalls, etc.) will be subjected to an analysis of their potential environmental effects. A reconnaissance level screening of environmental effects will be done comparable to the other Phase I alternatives.

ITEM 4 - REPORT, COORDINATION, AND MEETINGS — $19,750 (Item 1), $7,250 (Item 2)

During this work, the consultant will attend: 1) Two project management meetings; 2) One Technical Advisory Committee meeting; and 3) One public information and participation meeting. The consultant will prepare information for use in coordination and public information and participation meetings.

A supplement to the Phase I interim report will be prepared which will summarize the data collected and alternatives identified (25 copies of supplemental report along with eight unbound camera ready originals).

The report will be completed about 11 weeks following the date the TWDB furnishes their modelling results to the consultant.

Subtotals	
	$124,500 (Item 1)
	$55,000 (Item 2)
TOTAL	$179,500

ITEM 5 - GENERAL ASSUMPTIONS AND GUIDELINES

1. No ground and surface water model linkage will be developed in Phase I. Linked models will be developed in Phase II to refine analyses done in Phase I.

2. Previously established pipeline corridors will be used for costing transmission components of different options.

3. All assessment of water quality impacts will be performed in Phase II.

4. Only fatal flow type environmental analysis will be performed in Phase I.

5. TWDB staff will perform all work related to the set-up, running and processing of output from the TWDB Edwards Aquifer Model.

6. Provisions of S.B. 1477 (Edwards Aquifer Authority) will be assumed to be in place in evaluating the purchase of irrigation leases.

7. The City of Victoria's pending water rights application will be included and grouped with the other water rights in the model. No special flow restrictions for this application will be modeled.

8. Enhanced springflows, as a result of modified seasonal aquifer pumpage by SAWS, will be utilized to satisfy senior water rights including those potentially transferred or acquired by SAWS.

Medina County
Underground Water
Conservation District

Preserve, Protect, Conserve

1100 16th Street, Suite 302
Hondo, Texas 78861
(210) 426-3162 Fax (210) 426-5389

July 13, 1994

Dr. Tommy Knowles
Texas Water Development Board
P. O. Box 13231
Austin, Texas 78711-3231

RE: Trans-Texas Water Program

Dear Dr. Knowles:

The Medina County Underground Water Conservation District Board of Directors has some concerns regarding the "recommended water resources management plan" which will be developed by the Trans-Texas Policy Management Committee during Phase II. We would like these concerns, as outlined below, to be addressed by the policy management committee.

First, if the result of Trans-Texas is to adopt a regional water management plan, we believe the rural areas of the West Central Study Area are not adequately represented and a real possibility exists that their needs will not be addressed. In reviewing Phase I, there is no mention of potential new supplies for the citizens of Medina County while there is a great deal of discussion about current available supplies leaving Medina County.

Upon completion of Phase II, it appears that the most available and affordable supplies of water will be identified and, without a regional entity in place for the Edwards Aquifer region, these supplies will be allocated to the major purveyor in the region, San Antonio Water Systems. It seems that some attempt should be made to insure these supplies will be also be available to other users. Does the policy management committee have a responsibility to provide supply alternatives for Alamo Heights, Converse, Castle Hills and Castroville or is that committee only committed to addressing the needs of San Antonio Water Systems and Bexar Metropolitan Water District?

In his memo dated June 13, 1994, Mike Personett discusses the expected outcome of Phase II and describes a "very high degree of involvement and input from the Technical Advisory Committee". As a member of that advisory committee, our District has not been afforded a high degree of involvement or input. Is a plan being developed to increase the current degree of involvement by the TAC?

If the goal of Trans-Texas is to develop a regional water resources management plan, it must include everyone in the region. If the outcome of the Trans-Texas West Central Study is to determine alternate sources for the major municipal pumpers from the aquifer to insure adequate aquifer supplies for rural users, for which alternative supplies would not be cost effective, then that should be clearly stated in the study.

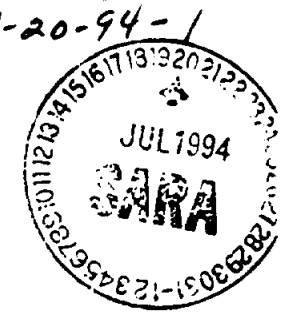
Thank you for your time and consideration.

Sincerely,

Oliver R. Martin
President

cc: Members-West Central Study Area Policy Management Committee

07-20-94-1



TRANS TEXAS WATER PROGRAM

WEST CENTRAL STUDY AREA PHASE 1 REPORT

ADVISORY COMMITTEE FOR PUBLIC AND TECHNICAL INPUT

SUBMITTED BY: E. GERALD ROLF **DATE:** JULY 13, 1994

COMMENTS: I take my assignment seriously as stated in the organization of the TTWP, that is, to (1) comment, (2) provide economic/engineering input, and (3) as a vehicle for public input. With this charge in mind, I submit the following comments which under the TTWP procedures will be included in this submitted form in the TTWP's final reports.

I have reviewed in detail the Phase 1 report and find several subjects to be inadequate, omitted, endorsed without the TAC being included, or ignored.

Examples:

1) The PMC has all but endorsed the City of San Antonio's 2050 Committees so called unanimous endorsement. This Committee was ramroded into authorizing a flawed report forced on them by the most active builder on the Edwards recharge zone, Mr. Jack Willome.

2) I have included herein maps of two dam sites - Upper Cibolo Creek presented to the City of San Antonio, the 2050 Committee, the EUWD, SARA, and SAWS and Cibolo Creek, a proposed dam site on Cibolo Creek in part over the Queen City sand aquifer. The dam site and reservoir would overlie a large fault that is subject to movement due in part to the 100's of oil wells drilled along this fault including the reservoir site. These wells are capable of 35 to

50,000 barrels oil production each and set a value of up to $950,000 per 40 acre location. The wells have a sour gas component. There is no excuse for continuing to consider the Stockdale, Wilson County location as a dam site on Cibolo Creek. I would like to know why HDR Engineering and the TWDB have not condemned this site in favor of the Upper Cibolo Creek site submitted in detail by Arthur Postel, Civil Engineer and endorsed by the State Senate's Chairman of the Water Subcommittee, Senator Carlos Truane. I recommend that the Upper Cibolo Creek dam site submitted herein be included in the TTWP studies and that the Cibolo reservoir (S-15) be dropped from any further consideration.

3) I adamantly disagree with the HDR's designation that Dam Site 7 (G-19) on the Guadalupe upstream from Canyon Lake identified as a "minor reservoir". This site has greater storage, lower costs, and a comparable yield to that of the Applewhite site. Its evaporation loss is less than sites on the Coastal Plain, storage is greater, acreage required much lower. I see no reason other than GBRA politics that this reservoir is not already under construction. The fact that water from Dam Site 7 is at an elevation of 1242' versus 400 feet or less for Coastal Plain sites and has no outlandish energy costs to move water uphill 100's of feet. The

location, potential drought of record drawn down of the 600,000 feet storage, elevation, annual yield, low comparable costs require this site to be redesignated and recommended as the number one recharge/storage reservoir site for this area. I recommend the Management Committee study Dam Site 7 on the same basis as the geologically poor Applewhite site.

4) I find it irresponsible that this program study does not include the Clopton Crossing dam site as one of the most important, logical and necessary sites. This dam site serves multipurposes - flood control, recharge for San Marcos Springs, recreation in a very popular area. It has no draw backs even the high acreage costs are acceptable as the acres required are less than half those necessary for flat Coastal Plain sites. As an example, the Cuero (G-16) site requires 57,500 acres. Why the GBRA refuses to endorse this site is a mystery to any logical assessment of possible locations. Particularly, as the TTWP is based on the assumption that all waters should be considered possibly available and no location should be ~~to~~ omitted from our considerations. I recommend Clopton Crossing dam site be given a high priority for study and consideration. Why the GBRA management has not enthusiastically endorsed construction is hard to

understand. I request Mr. Welsch of the Management Committee to discuss with the TAC GBRA's position as relates to Clopton Crossing and Dam Site 7. Land costs are not a reason.

5) Finally, unlike San Antonio's sheep ladened 2050 Committee, I feel the TAC of the TTWP has opinions, ideas, recommendations and a backbone. We do not believe in consensus if it means this Management Committee takes on the character of a Comintern. Technical advisors are to advise and recommend and the Management Committee is obligated to listen and sincerely consider all recommendations. You cannot dismiss our recommendations out of hand and have any semblance of creditability.

LCRA
THE POWER TO MAKE A DIFFERENCE.

July 21, 1994

Mr. Steven Raabe, P.E.
San Antonio River Authority
P.O. Box 830027
San Antonio, TX 78283-0027

Dear Steve:

The purpose of this letter is to communicate LCRA's comments on the Phase I report on the West Central Study Area Trans-Texas Program Study transmitted in your memorandum of June 15, 1994.

Volume 1

Water Demand Projections

LCRA staff have evaluated the water demand projections in this report. We find this information reasonable and have no objection to its use in the study, with the notable exception of the projected water demands for irrigated agriculture in the lower Colorado River Basin.

In the case of the projected irrigation water demands, HDR projections are radically different from those of LCRA for the LCRA ten-county statutory water district. On Page 2-30, the total irrigation demands projected by HDR, for the ten counties, are 567,000 and 500,000 acre-feet annually for years 2000 and 2030, respectively.

LCRA has prepared independent projections of future water demands in the LCRA water district. These projections are reported in the LCRA publication LCRA Long-Term Water Use Forecast Report prepared in Dec. 1988. In contrast to those given by HDR, LCRA's projected irrigation demands for three alternative levels of demand are:

TABLE 1. LCRA Water Demand Projections of Irrigation (in acre-feet)

Case	Year	
	2000	2030
Low	604,000	587,000
Base	758,000	736,000
High	943,000	915,000

LOWER COLORADO RIVER AUTHORITY P.O. BOX 220 AUSTIN, TX 78767-0220 (512) 473-3200 (512) 473-3298 FAX

As evident from Table 1, the HDR projections are significantly less than the low range of water demands projected by LCRA. The cause of the difference between the LCRA and HDR projections is a major disagreement in the expected water demands for rice irrigation in Colorado, Wharton and Matagorda Counties.

The current (1990) irrigation water use in the LCRA district is about 760,000 acre-feet. The Phase 1 report does not justify the large projected decline of about 200,000 acre-feet in water use by irrigation as early as year 2000. The HDR projection for year 2000 irrigation water demands represents a decline of 25% from the 1990 actual use. Such a drastic drop needs a great deal more justification than is given in this report.

I understand that water demand projections are subject to differences of opinion. However, LCRA strongly objects to these water demand projections being the sole basis for the analysis of alternatives in the Trans-Texas Study. An alternative set of projections should also be used, and this alternative set should include more realistic irrigation water demand projections.

Water Supply Projections

Figure ES-10 on Page ES-19, Figure 2-31 on Page 2-106, and Table 2-38 on Page 2-111 are in error. They indicate that the water supply from the Colorado River is equal to 1.917 million acre-feet per year. This total is not consistent with the text which states, on Page 1-105, that "... dependable supply from existing sources of the Lower Colorado Basin would be approximately 1,089,521 acft per year,..." These figures and table need to be corrected to reflect the estimated dependable water supply. LCRA has no objection to the use of the report's estimate of total water supply (1,089,521 ac-ft per year) since it is reasonably close to LCRA's own estimate.

Volume 2

Beginning on Page 3-459, the report discusses several alternatives for interbasin transfer from the Colorado River in the vicinity of Columbus. The water availability estimate for the off-channel storage alternative (C-17) does not seem to include releases for maintenance of instream flows or freshwater inflows to Matagorda Bay. I understand that the environmental criteria (Appendix C) were not imposed on existing water rights and that this alternative involves the purchase of existing irrigation rights. However, when new reservoirs are assumed to be constructed then the environmental criteria should be applied to these projects. There will be a significant flow reduction to the Matagorda Bay system as a result of constructing this reservoir.

For the Shaws Bend alternative (C-18), the reservoir's firm yield

estimate is arbitrarily reduced from 128,000 to 100,000 acre-feet per year to reflect required releases for downstream aquatic habitat preservation. The report correctly notes that should Shaws Bend be considered in Phase II then a more detailed analysis will be required. Included in that analysis should be an entire new assessment of the water supply from the reservoir. The yield estimate from Shaws Bend in this study was based on the reservoir acting as a regulating reservoir for meeting downstream irrigation water demands. That will not be the case if the reservoir acts as an interbasin transfer point.

RECOMMENDATIONS FOR PHASE II

Any alternatives considered in Phase II involving the export of water from the Colorado River Basin should consider the following impacts on the basin of origin:

- future costs to the citizens in the Colorado River Basin for replacement of permanent water supplies exported from the basin;
- economic (including tourism and recreation) and environmental impacts from increased water shortages and reduced lake levels in the Highland Lakes during droughts;
- reduced freshwater inflows to bays and estuaries and associated lost biologic productivity and reduced sport and commercial fishery harvests; and
- reduced instream flows below the reservoirs.

For any new reservoirs in the Colorado River Basin evaluated in Phase II, the water availability should be assessed in a manner consistent with the environmental criteria given in Appendix C of the Phase I report.

Thank you for the opportunity to provide review comments to these draft reports. Please contact me at 1-512-473-4064 if you have any questions regarding these comments.

Sincerely,

Quentin Martin

Quentin W. Martin
Manager, Water and Wastewater
Engineering

TEXAS WATER DEVELOPMENT BOARD

July 21, 1994

SJR —
SR —
FRW —
File 1.11-3.6

Mr. Oliver Martin, President
Medina County Underground
Water Conservation District
1100 16th Street, Suite 302
Hondo, Texas 78861

Dear Mr. Martin:

I appreciate your taking the time to write me with your concerns about the Trans-Texas Water Program. The issues you raise are very timely and should be addressed by the Policy Management Committee (PMC) for the West-Central Area before Phase II of the program gets underway. I gather from your letter that you would agree that it is very important that there be a consensus regarding the outcome or product of this planning process.

As the Water Development Board's representative on the West-Central PMC, I will see that the specific issues raised in your letter are considered by that group. I would like to note that considerable discussion has already occurred in meetings of the overall PMC regarding ways to improve public involvement in the Trans-Texas Program. Specifically, TWDB has been directed by the overall PMC to retain outside services for an assessment of current public involvement efforts and management structures. This assessment would include recommendations for improving this element of the program. We are currently working on a scope-of-work for this effort with the University of Texas Center for Public Policy Dispute Resolution and hope to have this assessment underway shortly.

As always, please feel free to call me if I can be of further assistance (512/463-8043).

Sincerely,

Tommy Knowles

Dr. Tommy Knowles
Deputy Executive Administrator
Office of Planning

cc: Members - West-Central Study Area Policy Management Committee

1.11-3.6 TAC

TRANS-TEXAS WATER PROGRAM
WEST-CENTRAL STUDY AREA

ADVISORY COMMITTEE FOR PUBLIC AND TECHNICAL INPUT

JULY 22, 1994 9:30 A.M. SAWS

AGENDA

I.	WELCOME	Fred N. Pfeiffer San Antonio River Authority
II.	INTRODUCTORY REMARKS	Steven J. Raabe, P.E. San Antonio River Authority
III	UPCOMING EVENTS	Steven J. Raabe, P.E. San Antonio River Authority

Deadline for comments on Phase 1 Interim Report - July 30, 1994

West-Central Study Area PMC meeting - August 10, 1994 2:00 p.m., San Antonio River Authority Board Room

Phase 1A Additional Study presently underway on the City of San Antonio 2050 Plan and the Canyon Lake/Mid Cities Regional Plan

Phase 1A Supplemental Report scheduled for completion in September

IV.	DEMAND AND SUPPLY PROJECTIONS	Dr. Herb Grubb HDR Engineering, Inc.
V.	OVERVIEW OF WATER SUPPLY ALTERNATIVES	Ken Choeffel, P.E. HDR Engineering, Inc.
VI.	OPEN DISCUSSION	
VII.	CLOSING REMARKS	Steven J. Raabe, P.E. San Antonio River Authority

p:\rmc\wpdata\TRANSTEX\AGENDA

1.11-3.6 TAC

TRANS TEXAS WATER PROGRAM
WEST CENTRAL STUDY AREA

ADVISORY COMMITTEE FOR PUBLIC AND TECHNICAL INPUT

JULY 22, 1994

NAME	ORGANIZATION	ADDRESS	PHONE NO.	FAX. NO.
Hugh Grubbs	HDR Eng.	Austin 78704 3000 S IH 35	512/442-8501	442-5069
DAVID WHEELOCK	" "	" "	" "	" "
Mary E. Conley	NRA	Rt 2, Box 6851, Pipecreek	535-4050	
Dennis Crowley	TWDB	1700 N Congress	512-463-7976	512-463-9893
Jerry Loessley	SWTSU-EARDC	San Marcos, TX 78666	512 245-2329	512 245-7669
Paul Price	Paul Price Assoc	3006 Bee Caves rd	512 3290155	329 0102
JIM T. HESTER	EVERGREEN U.W.C.D.	Austin P.O. Box 155 Jourdanton, TX	210-769-3740 Ph	
R L CHESSER JR	RANCHER	P.O. Box 45787 Houston	77245	
MIKE NIECKE	SAWS	P.O. 2449	S.A.	78298
[illegible]	[illegible]	[illegible]	[illegible]	
Tom Colbert	Reg. C. Air Govt			733-7974
RANDY MOSS	TX PARKS & WILDLIFE	P.O. Box 1685	SAN MARCOS	TX
Judi Austin	HQ AETC/CEOE	266 F Street West-	Randolph AFB	TX

1.11-3.6 TAC

TRANS TEXAS WATER PROGRAM
WEST CENTRAL STUDY AREA

ADVISORY COMMITTEE FOR PUBLIC AND TECHNICAL INPUT

JULY 22, 1994

NAME	ORGANIZATION	ADDRESS	PHONE NO.	FAX. NO.
ebbie Allsup	GLO	1700 N. Congress Austin		
R.L. WRIGHT	UNION CARBIDE	3904 JOHN STUCKEMEYER VICTORIA 77904		
Tommy Knowles	Tx Water Development Bd.	PO Box 1849 Austin	512 463-8047	
Greg Ruthe	Edwards (UWD)	Box 662 Uvalde Tx	210-426-5696	
Bruce A. Mauller	TNRCC	PO Bx 13087 Austin Tx 78711	512/239-4809	
Clyde Rowland	City of Lakeway	711 MARINER AUSTIN 78734	512/261-5922	
Mark Jordan	TNRCC	POBox 13087 Austin 78711	(512)239-4800	
Ken Choffel	HDR	3000 S. IH 35 Austin	78704 512 442-88	
Luana Buckner	MCUWCD	1613 Ave K Hondo	426-3	
JSwIT ARTZUCKLE	Quintana Petroleum	Box 1257 ERCA 80 Tx	409-543145	
Henry H. Vollentine	Gonzales County	PO Box 80 Gonzales	78629	210.672 23
Calvin E Spencer	Gonzales County	PO Box 23 Gonzales	78629	210-672-2
W.E. (BILL) WEST	GBRA	Seguin	Tx 78155	

1.11-3.6 TAC

TRANS TEXAS WATER PROGRAM
WEST CENTRAL STUDY AREA

ADVISORY COMMITTEE FOR PUBLIC AND TECHNICAL INPUT

JULY 22, 1994

NAME	ORGANIZATION	ADDRESS	PHONE NO.	FAX. NO.
H. Keith [illegible]	EWCI	104 So. Reed Pleasanton	210-569-3855	210-569-385
Tom Brereton	SAWS		496-7419	496-7570
Con Mims	NRA	PO Box 349 Uvalde, TX 78802-0349		210/ 278-6810
Quentin Martin	LCRA	P.O. Box 220 Austin, TX 78767	512-473-4064	
Tom Fox	SAWS	SA		
[illegible] Dabilek	"	SA		
Robert Wagner	Zavala Co. WID #1	Crystal City TX 78839		
Evelyn Bonavita	LWV-SA	334 Royal Oaks S.A. 78209		
[illegible] [illegible]umiel	SA Express News		251-7380	
Brooke [illegible]	Bur/Reclamation	300 E 8th St. Austin, Tx		
Warren R. [illegible]	City S.A. Citizen	226 [illegible] S.A. TX. 78209		
[illegible]ce Angela	Chem Fill	San Antonio	277-2081	

1.11-3.6 TAC

TRANS TEXAS WATER PROGRAM
WEST CENTRAL STUDY AREA

ADVISORY COMMITTEE FOR PUBLIC AND TECHNICAL INPUT

JULY 22, 1994

NAME	ORGANIZATION	ADDRESS	PHONE NO.	FAX. NO.
SAM VAUGH	HDR	AUSTIN	512-478-8501	
DAVID WELSCH	GBRA	Box 271, Seg	210/379-5822	(9-974)
Bob Hall	UGRA	PO Box 1278 Kerrville, 78028	210-896-74	
CLARKE CHRISTENBERRY	GALVESTON ICE CO	P.O Box 428 GALVESTON TX 77552	409-758 34	
Gene W. Barkemeyer	USDA-SCS	101 So. Main Temple TX 76501	817-774-2	
William Jackson	NOAA/NMFS	4700 Ave U GALV. TX 77551	409/766-3699	
Jack C. Nelson	LNRA	Edna TX 782 5229		
Wayne Rothburn	SAWS			
RALPH RAMSEY		R.2, Box 78 Dolia/Lane		
Shelley Whitworth	AACOG			
Bill Johnson	CH2M Hill	4545 NE Loop 410 78411	512-373081	

1.11-3.8 TAC

TRANS TEXAS WATER PROGRAM

WEST CENTRAL STUDY AREA PHASE 1 REPORT

ADVISORY COMMITTEE FOR PUBLIC AND TECHNICAL INPUT

SUBMITTED BY: Thomas M. Culbertson **DATE** July 22,1994

COMMENTS: Our Texas State Constitituion needs to be updated, to utilize the knowledge in the field of earth science. Modern Hydrology could do much for solving water issues.

But this does not give an excusee to jumble sociology, engineering, politics, and the accectance of an illeg-l bill, such as SB 1477, into some sort of an unwarkable water plan.

The city of San Antonio has finally accepted the recommendations of its 1992 water committee and passed an ordinance which would encourage conservation through a proper rate schedule which would provide an economic incentive to those water users who save water, an a penalty to the wasters. This plan should be given an opportunity for trial before jumping into any surface water plan, which would increase waste through evaporation and leakage .

The perspective of the Trans-Texas Water Program should be based on the fact that there is more precipitation to the east . Plans should consider the elevation of the water as well as the amount of surplus water in the east.

PLEASE ATTACH ADDITIONAL SHEETS IF NECESSARY.

PLEASE RETURN TO:

STEVEN J. RAABE, P.E.
SAN ANTONIO RIVER AUTHORITY
P.O. BOX 830027
SAN ANTONIO, TEXAS 78283-0027
(210) 227-1373
FAX: (210) 227-4323

Thomas M. Culbertson, Hydrologist

TRANSTEX
06-28-94-1

1.11-3.6 TAC

TRANS TEXAS WATER PROGRAM

WEST CENTRAL STUDY AREA PHASE 1 REPORT

ADVISORY COMMITTEE FOR PUBLIC AND TECHNICAL INPUT

SUBMITTED BY: JOHN H. SPECHT **DATE** 6/23/94

COMMENTS: REF. THE ATTACHED COMMENTS —

PLEASE ATTACH ADDITIONAL SHEETS IF NECESSARY.

PLEASE RETURN TO:

STEVEN J. RAABE, P.E.
SAN ANTONIO RIVER AUTHORITY
P.O. BOX 830027
SAN ANTONIO, TEXAS 78283-0027
(210) 227-1373
FAX: (210) 227-4323

JOHN H. SPECHT
Rt.1 Box 29A
Marion, Texas 78124

June 23,1994

Comments offered on the Trans-Texas Water Program, West Central Study Area phase 1 report draft:

With reference to ES 11 and Table ES 4 (also Population and Demand Projections 2-109), water supplies from the Edwards aquifer are attributed to SB 1477 and it is inferred that these legislatively determined amounts (450,000 acre feet per year through 2007 and 400,000 acre feet per year thereafter) are firm supplies. This presentation is misleading to the public and possibly to various decision makers who will use this study to guide the actions necessary to assure a long term water supply for their constituency.

It is important to clearly qualify the pumpage figures specified in SB 1477. The Act clearly states that in times of drought, pumpage from the aquifer will have to be reduced sufficiently to protect endangered species and to comply with applicable federal and/or state imposed limitations. Models of the Edwards aquifer and actual experience in the 1950's drought clearly demonstrate that the firm yield of the Edwards aquifer is probably slightly less than 200,000 acre feet in the critical year in a repeat of the drought of record.

While the average use of the Edwards aquifer will be in the range of 400,000 to 450,000 acre feet per year, it is of obvious importance to recognize the critical year availability of water from the aquifer. Planning and actual development or acquisition of supplemental water supplies for the region must be based upon the availability of water supplies to meet the regions requirements during a repeat of the drought of record.

I strongly urge that the availability of water from the Edwards aquifer be more accurately explained in the study report, especially in the executive summary.

TRANSOET
07-05-94-3

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE

Habitat Conservation Division
4700 Avenue U
Galveston, Texas 77551-5997

June 29, 1994 F/SEO22:WJ

Mr. Steven J. Raabe, P.E.
San Antonio River Authority
P.O. Box 830027
San Antonio, Texas 78283-0027

Dear Mr. Raabe:

The National Marine Fisheries Service (NMFS) submits the following comments regarding the "Phase I Report: Trans-Texas Water Program, West Central Study Area, Volumes 1 and 2" dated May 1994. These comments are general in nature and are in addition to comments we submitted to you on March 11, 1994.

Based on our summary data of the Phase I Interim Report, presented in the Table titled Proposed New Reservoir Construction, Reduction in Average Estuarine Inflow (acft/yr) listed below, we request the Phase II Study Report contain a section specifically addressing the cumulative impacts from reduced freshwater streamflows to the bays and estuaries from all of the proposed projects. This should include (1) Type 1 reservoirs; (2) Type 2 reservoirs; (3) interbasin transfers; (4) irrigation transfers; (5) aquifer recharge (by natural and imported recharge); and (6) springflow augmentation.

Specific questions we request be addressed are:

1. What does all the reduction in average estuarine inflow (acft/yr) add up to on each primary river and tributary?

2. How are the freshwater inflow needs of the bays and estuaries computed in relation to "unappropriated streamflow" potentially available under each scenario in the Phase I report? How do these numbers correlate with potential maximum diversion rates?

There are 10 counties identified as being in the West-Central and South-Central Study Areas. How will these counties needs be integrated in each of the proposed study areas? The counties are: Atascosa, Calhoun, Colorado, DeWitt, Fayette, Goliad, Matagorda, Refugio, Victoria, and Wharton.

Proposed New Reservoir Construction

Reduction in Average Estuarine Inflow (acft/yr)

Nueces River Basin - Nueces Estuary

Project	Inundated Area (acres)	Capacity (acft)	Reduction (acft/yr)
Montell	6,190	252,300	5,510
Upper Dry Frio	1,800	60,000	1,400
Concan	3,840	149,000	2,400
Upper Sabinal	3,110	93,300	2,800
Upper Hondo	2,000	47,000	1,400
Upper Verde	880	23,000	800
Indian Creek	7,650	61,750	2,998
Lower Frio	1,190	17,500	2,594
Lower Sabinal	1,430	8,750	2,566
Lower Hondo	1,260	2,800	1,134
Lower Verde	1,730	3,600	728
Gradalupe-San Antonio River Basin - Guadalupe Estuary			
Cloptin Crossing	?	24,400	16,000
Upper Blanco	?	24,290	11,400
San Geranimo	330	3,500	?
Leon/Helotes/Govt.	1,380	25,200	?
Cibolo Dam 1	500	10,000	?
Dry Comal	1,000	2,075	?
Lower Blanco	1,052	35,230	?
Applewhite	2,500	45,250	?
Cibolo	16,700	409,700	59,000
Goliad	28,147	707,500	167,000
Cuero	41,500	1,167,000	249,500
Lindenau	26,875	606,208	96,800
McFadden	1,264	9,200	3,800
Guadalupe Dam 7	12,830	600,000	?
Gonzales	21,370	560,000	?
Lockhart	2,910	50,000	?
Dilworth	15,400	275,000	?
San Marcos Diver.	500	5,900	23,500
Colorado River Basin - Matagorda Bay			
Shaws Bend	13,398	132,220	?
Brazos and Sabine River Basins - Brazos and Sabine Estuaries			
Allens Creek	434	3,407	?

In addition, the NMFS would appreciate close interagency coordination during Phase II studies. We especially request involvment in the development of coordinated system operations within the Guadalupe-San Antonio River Basins, Colorado River Basin, Brazos-Sabine River Basins, and the Nueces River Basin.

The opportunity to review and comment upon the Phase I documents is appreciated. If there are any questions, please call William Jackson at (409) 766-3699.

Sincerely,

Donald Moore, Chief
Galveston Field Branch

cc:
F/SEO2 - A. Mager
F/SEO22 - W. Jackson

GUADALUPE-BLANCO RIVER AUTHORITY

July 5, 1994

Mr. Fred Pfeiffer, General Manager
San Antonio River Authority
and Administrator, West Central Study Area,
Trans Texas Water Program
P. O. Box 830027
San Antonio, Texas 78283
(copies to other recipients as attached)

Re: Trans-Texas Water Program
West Central Study Area
Phase I Interim Report

Gentlemen:

The Guadalupe-Blanco River Authority has reviewed the Phase I Interim Report for the West Central Study Area of the Trans Texas Water Program and offers the following comments:

Comment 1

Volume 1 of the report presents an extensive analysis of water supplies, demands, and shortages in an assumed repetition of the drought of record. The analysis indicates the existing and projected demands for water in the Edwards region, the existing supplies of water that can be used to satisfy the demand, and a summary of existing and projected shortages that need to be satisfied by obtaining additional supplies.

In all situations where surface water is considered supplies are based only on a firm yield basis, but in the instance of the Edwards Aquifer, the maximum use specified in Senate Bill 1477 is used as the available supply. This is "mixing apples with oranges." The minimum standard that should be used in this analysis is to assume a repetition of the drought of record. Under historic drought conditions the firm yield of the Edwards has previously been determined to be approximately 200,000 acre-feet per year.

As an example, the supply shown to be available from the Edwards Aquifer of 450,000 acre-feet per year -- is more than twice the firm yield of the Edwards. Plugging in 450,000 acre-feet per year as the amount of water that can be supplied from the Edwards results in the erroneous conclusion that only slightly more than 100,000 acre-feet of water per year from additional supplies is needed to satisfy immediate (year 2000) demands.

When the Edwards firm yield of 200,000 acre-feet per year is used in a traditional drought-of-record analysis, the immediate (year 2000) shortage will be shown to be over 350,000 acre-feet per year. This conclusion obviously affects the choices needed to be made to eliminate the shortage, and how quickly action must be taken.

For consistency and to accurately identify the amount of shortage during drought conditions, we suggest that the charts and tables be amended to show the firm yield of the Edwards at approximately 200,000 acre feet. Further, GBRA urges that Volume 1 be amended to reflect the 200,000 acre-foot-per-year Edwards firm yield and to clarify that pumpage as high as 450,000/ 400,000 acre-feet is not available during droughts.

Comment 2

In Section 3.17 of Volume 2 of the report, two of the four scenarios properly assume a fixed Edwards pumpage rate of 200,000 acre-feet per year. We believe this analysis correctly indicates the amounts of shortage in the region.

The remaining two scenarios assume a fixed pumpage rate of 400,000 acre-feet per year, even through a repeat of the drought of record. We recognize that this amount is specified in S. B. 1477 as a maximum permitted withdrawal, but only until December 31, 2007. S.B. 1477 also states that withdrawals must be limited to ensure that springflows are not affected during critical drought conditions, and that after December 31, 2012, minimum springflows must be maintained to the level required by federal law. Pumping 400,000 acre-feet through the drought of record would cause both the Comal and San Marcos Springs to go dry in violation of S.B. 1477 and the Court order.

We suggest that the report include an explanation that the pumpage levels of 450,000/ 400,000 acre feet were specified in S. B. 1477, however the Federal Court has found the pumpage assumption to be unacceptable under federal law during drought conditions.

Comment 3

An important component of the water supply planning within the Guadalupe and San Antonio River Basin is the estimate of springflow at Comal and San Marcos Springs. Early in the planning effort it was agreed to use the existing TWDB model in Phase I. It was understood that the TWDB model has a tendency to predict higher springflow, particularly during drought conditions.

Due to the importance of springflow, GBRA recommends that a section be added to discuss the methodology used to calculate springflow and include a discussion of the calibration process. In Phase II, consideration should be given to recalibrating the existing Edwards groundwater model or developing a new model. To obtain realistic water supply options, sound springflow data is a must.

Comment 4

For projects which involve both storage reservoir and run-of-river pump stations (such as the Cuero II Reservoir project) two environmental screening criteria were applied. The storage reservoir was evaluated under the "reservoir environmental criteria" while the pump station was evaluated under the "instream flow and bay and estuaries criteria". We believe these types of projects should be evaluated only under the "reservoir criteria". This would assure that all projects are evaluated on an equal basis.

In Phase II, consideration should be given to reevaluating projects which involve both storage reservoirs and pump stations using the same environmental screening criteria as stand alone reservoirs.

Comment 5

Based on results of the study it appears that the initial environmental screening criteria is too broad. While we recognize that the original criteria was developed only for screening, "sensitivity analysis" which compare the screening criteria with actual criteria indicates that the screening criteria requires flows in excess of environmental needs and substantially reduces amounts of water available for meeting regional water needs.

We suggest that environmental criteria for Phase II more accurately reflect existing permitting criteria and that yields of potential projects be developed based on the new criteria.

In the Guadalupe River Basin substantial work has been completed on both instream flow needs and bay and estuaries. We encourage the use of this data for refinement of the amounts of water that are actually available.

Comment 6

The report should be corrected to reflect that Canyon reservoir has a conservation capacity of 382,000 acre feet (page 3-331), and that surface area full conservation pool is 8,231 acres.

Comment 7
The firm yield of Medina Lake which is reported at 8,770 acre feet should be confirmed. To our knowledge the firm yield has not been fully studied.

Comment 8
For the Guadalupe River Basin the supply tables report both consumptive permits (272,327 acre feet) and once through permits (587,500 acre feet), while hydroelectric rights have evidently been excluded. The once through permits need to be reviewed to assure that they were not reported twice, once under the consumptive category, and again under the once through category.

Comment 9
Alternatives G-10 through G-12 are not described or shown with cost estimates. Although these water supply options are not listed because they are not considered stand alone, firm sources, we believe they can be developed as firm sources by supporting periodic low flow periods with stored water from Canyon Reservoir. We believe these options need to be treated as other firm sources.

Comment 10
It would better define the regional water needs if the present and anticipated uses by SAWS were listed separate from the Edwards Region and the San Antonio area.

Comment 11
It should be clarified that when existing run of river permits are moved to make water available to meet regional needs, those permits should keep their priority date and should not require rehearing.

Thank you for consideration of these comments. We will be available to discuss this matter further, and suggest that when the Addendum and Executive Summary is issued it present a clear picture of the amounts of additional water necessary to supply the needs of the region under each scenario.

Sincerely,

William E. West, Jr.
General Manager

copy: Craig Pedersen
Texas Water Development Board

Con Mims
Nueces River Authority

Joe Aceves
San Antonio Water System

Rick Illgner
Edwards Underground Water District

Tom Moreno
Bexar Metropolitan Water District

Mark Rose
Lower Colorado River Authority

Honorable John Hall
Texas Natural Resource Conservation Commission

Herb Grubb
HDR Engineering

Larry McKinney
Texas Department of Parks and Wildlife

07-07-94-1

1.11-3.6 TAC

TRANS TEXAS WATER PROGRAM

WEST CENTRAL STUDY AREA PHASE 1 REPORT

ADVISORY COMMITTEE FOR PUBLIC AND TECHNICAL INPUT

SUBMITTED BY: Cole Rowland DATE 7/5/94

COMMENTS: (1) Your Phase I Report shows that the Colorado Basin will become a deficit basin in 2020. Considering the section (49d) of the TX constitution which prohibits the use of state funds for water projects contemplating inter-basin transfers when the water will be needed within 50 years, shouldn't the Colorado River alternatives be dropped from consideration?

(2) Could you tell me how the funds for Trans-Texas are allocated to parts of the project? In other words, do contributions from individual agencies go into a common account, or do certain agency contributions get set aside for particular parts of the program?

PLEASE ATTACH ADDITIONAL SHEETS IF NECESSARY.

PLEASE RETURN TO:

STEVEN J. RAABE, P.E.
SAN ANTONIO RIVER AUTHORITY
P.O. BOX 830027
SAN ANTONIO, TEXAS 78283-0027
(210) 227-1373
FAX: (210) 227-4323

Coleman Rowland
711 Mariner
Austin, TX 78734-4342

July 25, 1994

Steven J. Raabe, P.E., Project Manager
San Antonio River Authority
P.O. Box 830027
San Antonio, TX 78283-0027

Dear Steve:

According to the Governor, the Trans-Texas Project "does <u>not</u> envision any pipeline transporting water from Lake Travis to San Antonio." (see enclosure). Since Governor Richards has so decreed, can we safely assume that alternatives C-13 A-F will be dropped from consideration?

Yours very truly,

Encl.

STATE OF TEXAS
OFFICE OF THE GOVERNOR
AUSTIN, TEXAS 78711

ANN W. RICHARDS
GOVERNOR

June 9, 1994

Mr. Cole Rowland
Chairman, Water Committee
City of Lakeway
711 Mariner
Austin, Texas 78734

Dear Mr. Rowland:

Thank you for writing to let me know of your concerns about a Trans-Texas working group meeting scheduled by the Water Development Board for June 23 in South Padre Island.

I understand that the working group chose this meeting date and location because the Texas Water Conservation Association (TWCA) is meeting there at the same time. Many of the working group members will also be participating in the TWCA's conference.

My office contacted Craig Pedersen, Executive Director of the Texas Water Development Board (TWDB) to urge that the Board make every effort to allow you and others from your community to participate in the Trans-Texas planning process. Most meetings of the working group have been held in Austin, and Mr. Pedersen will ensure that other meetings are held in this area to accommodate all interested parties.

Incidentally, Mr. Pedersen also informed my staff that the Trans-Texas project does not envision any pipeline transporting water from Lake Travis to San Antonio.

I hope this information is useful to you.

Sincerely,

Ann Richards

ANN W. RICHARDS
Governor

cc: Craig Pedersen, Executive Director,TWDB

KINSLOW
07-25-94-2

1.11-3.6 TAC

TRANS TEXAS WATER PROGRAM

WEST CENTRAL STUDY AREA PHASE 1 REPORT

ADVISORY COMMITTEE FOR PUBLIC AND TECHNICAL INPUT

SUBMITTED BY: Medina County Underground Water Distri **DATE** 7/26/94

COMMENTS: The charts used on water demands which include 1990 pumpage (p. ES-8; 2-35; 2-52) should include a footnote or some other explanation that the figures represent all water; not just Edwards pumpage. Some attempt should be made to explain the discrepancy between the price (or worth) of Edwards irrigation water as determined in Sec. 3.6.5 (pg. 3-139) and the price of $150 per a/f assessed by SAWS and included in Figure ES-12. In Sec. 3.6.4 (pg. 3-134) the assumption is made that 68,900 a/f could be saved through conversion of 107,683 acres to LEPA. It should be noted, especially if this alternative is included in Phase II, that according to TWBD's irrigation survey, in 1989 , 30% of the acres irrigated by groundwater were already under sprinkers in Medina and Uvalde counties. Thus the amount of water which could be "saved" would seem to be less.

PLEASE ATTACH ADDITIONAL SHEETS IF NECESSARY.

PLEASE RETURN TO:

STEVEN J. RAABE, P.E.
SAN ANTONIO RIVER AUTHORITY
P.O. BOX 830027
SAN ANTONIO, TEXAS 78283-0027
(210) 227-1373
FAX: (210) 227-4323

SAN ANTONIO RIVER AUTHORITY

EXECUTIVE COMMITTEE
Chairman — Winston W. Lorenz
Vice Chairman — Martha Clifton McNeel
Secretary — H. B. Ruckman, III
Treasurer — Otis L. Walker
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GENERAL MANAGER
Fred N. Pfeiffer

1.11-3.6-TAC

July 26, 1994

Policy Management Committee
West-Central Study Area
Trans Texas Water Program
c/o San Antonio River Authority
P.O. Box 830027
San Antonio, Texas 78283-0027

RE: PHASE 1 INTERIM REPORT
WEST-CENTRAL STUDY AREA

The San Antonio River Authority has reviewed the Phase 1 Interim Report for the West-Central Study Area of the Trans Texas Water Program and offer the following comments:

1. In Alternatives L-11 Exchange Reclaimed Water for Edwards Irrigation Water, L-12 Exchange Reclaimed Water for BMA Medina Lake Water and L-13 Reclaimed Water Reuse, the amount of return flow from the SAWS Wastewater Treatment Plants available for these options has been determined based on monthly flows from the treatment plant and monthly demands for CPS cooling water. While this analysis is sufficient to determine the average monthly availability of return flows which could be used for reuse, it does not adequately address the daily variability of return flows that are available to meet the demands of CPS cooling water, reuse and maintenance of flow in the downstream reaches of the San Antonio River.

2. We recommend that any Phase 2 analysis of reuse or reclaimed water availability be done on a daily timestep. The daily variations in return flow from the SAWS Wastewater Treatment Plants can then be compared to the actual diversion capacity of the various users of reclaimed water to insure that existing cooling water demands and downstream flow requirements are met.

These comments are offered for your consideration. Please contact me or Steve Raabe if you have any questions.

Sincerely,

FRED N. PFEIFFER
General Manager

FNP:SJR:rmc
p:\rmc\wpdata\TRANSTEX\LTRS

EVERGREEN UNDERGROUND WATER CONSERVATION DISTRICT

210-769-3740 Fax: 210-769-2492 1-800-259-3740

P.O. Box 155 1306 Brown

JOURDANTON, TEXAS 78026

July 26, 1994

Mr. Steven J. Raabe, P.E., Project Manager
Trans Texas Water Program
West Central Study Area, Phase 1
San Antonio River Authority
P.O. Box 830027
San Antonio, Texas 78283-0027

Dear Steven:

The Board of Directors of the Evergreen Underground Water Conservation District have reviewed Volumes 1 and 2, Trans Texas Water Program, West Central Study Area, Phase 1 Interim Report. We have the following comments concerning the sections pertaining to the Carrizo\Wilcox Aquifer:

We have been told that the Carrizo\Wilcox Aquifer is in the TTWP as a source of water for transfer and as a source for artificial storage and recharge only because this aquifer has historically been used as a base for water studies. If this is so, can we expect that Phase 2 of the TTWP will not contain the Carrizo\Wilcox Aquifer as a source of water available for trade, transfer, and\or recharge?

The Board thinks that inaccurate or out-of-date information was used in Phase 1 studies of the Carrizo\Wilcox as pertains to the Acre Feet available for trade, transfer and\or artificial recharge. See attached copy of pumping\recharge data compiled by the Texas Water Development Board, provided to Evergreen U.W.C.D. on July 21, 1994.

The Carrizo\Wilcox Aquifer must be managed as a "renewable resource;" one that is only partially replenished each year.

The Evergreen Underground Water Conservation District will not allow demand for large amounts of water from areas outside of the District to reduce the quantity of water for irrigation, municipal and residential water wells. The district rules will be enforced to prevent this happening.

The projection of reduction in irrigation water demands for Frio, Atascosa, and Wilson Counties are disputed. The Board of Directors of Evergreen Underground Water Conservation District do not agree with the levels of decrease in these three counties as they are not justifiable projections.

The Evergreen Underground Water Conservation District of Atascosa, Wilson, and Frio Counties, which is a special legislative district, has jurisdiction to regulate any artificial recharge facilities, new wells, well spacing and production, and transfer of Carrizo water or any other aquifer water out of the District. Therefore, we are certain that both HDR Engineering, Inc., and LBG-Guyton Associates are very aware of the possibility that no large water wells or water well fields will be drilled in Atascosa and Wilson counties and no water will be transported out of the District, without approval, in accordance with the rules of the District.

The Carrizo\Wilcox Aquifer is a part of the underground water system in the West\Central Study Area. However, the Carrizo\Wilcox is a declining aquifer and should be shown the same respect and protection as the Edwards Aquifer is receiving today. The Carrizo\ Wilcox Aquifer should not be depleted to save the Edwards Aquifer. The Evergreen U.W.C.D. Board of Directors have been mandated by the State Legislature and elected by it's constituents to preserve and protect the Carrizo\Wilcox Aquifer. We will do that to the best of our abilities.

In conclusion, the Board of Directors of the Evergreen Underground Water Conservation District hereby requests that all charts and graphs used in Phase 2, West Central Study Area will omit any reference to the use of the Carrizo\Wilcox Aquifer as part of the Trans Texas Water Plan.

Sincerely,

Clifton E. Stacy, President

Carl E. Ray, Vice-President
Wilson Co

Kenneth Stephens, Sec.\Treas.
Frio County

Robert Hausser, Jr.
Atascosa Co.

Richard A. Hoover
Wilson County

William O. Lamb
Aggieland

William H. Ruple
ATASCOSA COUNTY

Evergreen U.W.C.D.

1991 Ground Water Pumpage Summary Of Carrizo-Wilcox Aquifer
Compiled By The Texas Water Development Board
Units: acre-feet

County: Atascosa

Municipal	Manufact.	Power	Mining	Irrigation	Livestock	Total acre-feet
2,917	0	6,637	1,428	48,684	128	59,794

County: Frio

Municipal	Manufact.	Power	Mining	Irrigation	Livestock	Total acre-feet
3,001	0	51	222	88,548	92	91,914

County: Wilson

Municipal	Manufact.	Power	Mining	Irrigation	Livestock	Total acre-feet
3,384	0	0	285	10,818	183	14,670

Estimated Average Recharge To The Aquifer In Each County
By: Alexander & Richards (1966) For Atascosa & Frio Counties
By: Barnes (1956) For Wilson County

County	Total acre-feet Of Recharge	Surplus Or Deficit Water Supply
Atascosa	13,000	-46,794
Frio	10,000	-81,914
Wilson	26,000	11,330

Southwest Texas State University
San Marcos, Texas 78666-4616 (512) 245-2329
Fax (512) 245-2669 e-mail: glenn@sebor gia.ear dc.swt.edu

Edwards Aquifer Research
and Data Center

July 27, 1994

Steven J. Raabe, P.E., Project Manager
Trans-Texas Water Program, WCStudy Area
SARA, 100 E. Guenther St., P.O. Box 830027
San Antonio, Texas78283-0027

RE: Comments on Phase I Interim Rept. West Cent. Study Area (Trans-Texas Water Program)

Dear Steven:

I would like to make the following comments. First I would like to say that this approach to determination of the most feasible way to supply the water needs of the region is to be commended. I would thank the sponsors of the project for their foresight. Second I will provide a series of comments on portions of the report. They will appear with page references:

- 3-42 (¶ 2) I am concerned with the L-13 option of recharging the aquifer with treated wastewater, unless that wastewater had undergone tertiary treatment and dechlorination. It is logical to mix such water with surface water first and allow it to flow across the recharge zone (this is addressed in other options). Temperature and organic loading are important considerations for the unique groundwater community. Oxygen depletion could be a real concern if very much organic loading occurs. Additionally there is the concern for viruses and Giardia, since they may pass conventional treatment. Filtration with anthrafilt would be essential at the end of the process.

- Tab. 3.2-6 The genus of the amphipods listed is *Stygobromus*, misspelled in this table.

the Texas Blind Salamander is only found in Hays Co., some distance from Alternative. vicinity L-11.
I do feel that options L-12A and L-12B make a lot of sense. They potentially have less environmental impact than other options.

- Fig. 3.4-1 Alternative L-13B does not indicate tertiary treatment, but rather mixing with Calaveras Lake Water, which is already primarily treated wastewater, even though it has flowed first in the bed of the San Antonio River. Tertiary treatment, including filtration with an anthrafilt carbon filter would be essential to removing concerns for injection into the Edwards Aquifer. The site for injection proposed in Medina Co. is much preferred over any consideration of injection in Comal or Hays Counties. The injection would augment the Edwards and this accompanied with reduced pumping of the aquifer should assist in maintaining adequate spring flow at Comal Springs. If Comal Springs are protected, it follows that San Marcos Springs should be adequately protected. These comments also relate to ¶ 1 on page 3-111.

- Tab. 3.8-3 *Stygobromus* is misspelled in four places.

- Section 3.10 Spring flow augmentation is a misnomer. River augmentation or Aquifer augmentation can occur, but spring flow augmentation is highly doubtful at best. Reason: This type of augmentation assumes that a groundwater mound can be created in the vicinity of the springs. Pump tests in the general vicinity have difficulty creating draw down in the wells. The area is highly transmissive, and very porous. When the aquifer water level is below the lip of the springs, water added to the spring area will recharge through the spring openings. In the UT Draft Augmentation report a number of scenarios were considered. None had sufficient merit to be considered feasible, due to inadequate assurance of success, most had considerable environmental impact, and some would create considerable liability for impact on nearby Municipal Water Wells. Some were laughable if not ridiculous Ex. Scenario that would suggest grouting up the aquifer formation on either side of the spring areas. The entire idea of Augmentation of Spring flow by any of the suggested scenarios is flawed due to reasonable concern for the ability to create a Groundwater mound in Spring Areas, and the potential impact of draw down of the aquifer below historic levels, thereby allowing water quality to be degraded due to the highly probable mixing with saline water, that has been shown to

be under the fresh water in the Comal Springs area, and is likely in the San Marcos Spring area. One should keep in mind that the proximity of saline water to the fresh Edwards water in San Marcos and New Braunfels is a major concern. The area of fresh, artesian Edwards water is very narrow in these areas. An example of this is the highly saline well in the Edwards a stones throw from the San Marcos Spring area (a few hundred feet). This well has a salinity of > 8,000 mg/l and a conductivity > 13,000 µmhos/cm throughout the Edwards formation.

Consider that during the drought of the 50's numerous wells (≈ 40) showed decreased water quality (Information provided at TNRCC hearing on the Edwards). Small segments of Edwards Aquifer in the Barton Springs and Northern Segment have shown decreased water quality in wells and springs during drought. These areas are hydrologically separate from the San Antonio Fault Zone Edwards Aquifer, but geologically they are very similar (they could be considered as microcosms of what may happen in the larger San Antonio portion). A USGS study in Austin documented the water quality changes in Barton Springs, and nearby wells during a drought. In Round Rock, the city had to switch from using their City wells during a mid 80,s drought when the water in the wells became saline within a two week period. Round Rock was fortunate to have Austin next door to supply them during the crisis and until they were able to secure an assured supply of surface water from Lake Georgetown.

3-186 ¶1 I do not concur that augmenting the flow of Comal and San Marcos Springs is "feasible from geological, biological and hydrological perspectives" under any condition. My overall impression of the draft Augmentation report from UT was that it was poorly done, inadequately thought out and false logic was used often. The underlying premises were false and it should be totally disregarded. It reflects a lack of professionalism and poor science.

Tab. 3.10-1 Consider that the Endangered Species Act requires protection of the **Natural habitat** of the Endangered or Threatened species and maintenance in an artificial situation will not be considered meeting the criteria of the act. In addition, it should be pointed out that *Eurycea nana* has not been propagated in captivity. It apparently requires the water flowing out of the springs to produce the proper environment for its eggs, which it deposits in the gravel substrate of the springs.

3-235 The Applewhite Reservoir seems to be a logical part of the overall plan to provide adequate water to San Antonio. If San Antonio is going to be able to store water for reuse, irrigation, injection or for use during drought it must have a storage facility. Since Applewhite is partially completed and would provide that storage it makes sense to finish its construction. The Alternative S-14B (Delivery of water to the recharge zone) has merit, but must consider the level of treatment afforded the water. Since this water will likely recharge the aquifer with little attenuation of any contained contaminants, it must be treated with tertiary treatment, including anthrafilt filters. It must then be dechlorinated.

I welcome the opportunity to comment on this study and commend HDR for some excellent work.

Sincerely,

Glenn Longley, Ph.D.
Director

TEXAS WATER DEVELOPMENT BOARD

July 28, 1994

Mr. Steve Raabe, P.E.
San Antonio River Authority
P. O. Box 830027
San Antonio, Texas 78283-0027

Dear Steve:

Re: Comments on West-Central Study Area Phase 1 Interim Report

Attached for your review are comments on the above-referenced report. If you have any questions or comments, please call Dennis Crowley at (512) 463-7976.

Sincerely,

Tommy Knowles
Deputy Executive Administrator

ATTACHMENT NO. 1

COMMENTS ON WEST-CENTRAL STUDY AREA PHASE 1 INTERIM REPORT

POPULATION, WATER DEMAND AND WATER SUPPLY PROJECTIONS

Page 2-95, first full paragraph:

> The report states that the GBRA hydroelectric power generation is 600 cfs at Dunlap. Permit 4167 (Application 4445), issued to GBRA in 1985, is for hydroelectric power generation at Canyon Lake with an authorized maximum flow rate of 600 cfs. However, Certificate of Adjudication 5488 states that the authorized maximum flow rate is 1300 cfs at Lakes Dunlap, McQueeney, Placid and Nolte, with a priority date of April 1, 1914.
>
> The effects of assuming the 600 cfs, rather than the 1300 cfs, need to be assessed or clarified as to why it is more appropriate.

CONSERVATION

The water conservation portion of the report, as stated above, is adequate for "first" analysis of the costs and potential savings, but the reviewer felt that more specific water use data for the study area is needed to fully support the conclusions of this section. Specific local data that would be helpful includes:

1. Population, age and employment information (plumbing estimates),
2. Average and dry year per capita water use for area and major cities in the area,
3. Average and dry year seasonal use (TWDB has this information), and
4. Estimates of the breakdown of residential, apartment, commercial, institutional, and industrial water use to the extent possible.

Other comments include:

1. Page 3-59 - The latest water plan material estimated that plumbing retrofit will result in a 21.7 GPCD savings instead of a 17.8 GPCD savings as used in the 1992 water plan update. Since the study is based on the 1992 projections, it may not be appropriate to change to the new number, but it may be appropriate to mention that, based on latest studies in California, savings are likely to exceed the conservative

17.8 GPCD used in the study.

2. Page 3-62 - Landscape watering conservation was estimated to result in a savings of 10 GPCD. The basis of this estimate - i.e. how much seasonal use was assumed in the first place for both average and dry years - should be presented. From the information presented, it is assumed that a 30 percent reduction was used which implies that seasonal water use in the area is 33.3 GPCD.

3. Page 3-63 - Estimates of savings in both residential and in commercial settings should be made.

4. Page 3-64 - Please provide additional explanation of the difference between "Stand Alone, and Combined Measures" in Table 3.1-1.

5. Page 3-71 - On the fourth and fifth lines on this page, the report states that the savings will be "28 GPCD in addition to the 18 GPCD." The 28 GPCD savings includes the 18 GPCD (See Table 3.1-1).

WATER REUSE

The water reuse section (3.2) provides an adequate coverage of the topic for these purposes. The comparative information that this study provides for the several reuse possibilities is especially helpful in understanding the over-all context of reuse in this area. Several small items were noted and are presented below:

1. Pages 3-77 through 3-79 - The relation between the maximum diversion rate and annual water availability needs to be better described in the text to indicate that the reason that a certain diversion rate does not result in an equivalent availability over a 12 month period is that when all existing water rights and reuse commitments are considered, wastewater at that diversion rate is not always available. This is described if one combines several parts of the text, but an explanation in the form of even a foot note for Figure 3.2-2 would be helpful.

2. Irrigation of food crops with treated effluent - At several places in the report, adjustment to how much reuse can occur is limited to "non-food crop" agricultural irrigation. Chapter 310 {§Section 310.8(1)(A)} allows effluent to be used on food crops if it meets quality criteria. The report should be changed to reflect this.

DEMINERALIZATION OF EDWARDS "BAD WATER"

3.7.1 TWDB staff believes that the third sentence, which begins "Due to the comparatively high costs..." is erroneous and should be replaced with a sentence such

as "These processes are chosen when they are demonstrated to be the lowest cost alternative that will produce water of the desired quality for the intended purposes, regardless of location.

The last paragraph of this section states that the only alternative considered here is to desalt water south of the "bad water line". However, it could be argued from the other information in this part (Section 3.7)of the report that pumping from this part of the aquifer could actually induce fresh water into this part of the aquifer thereby moving the "bad water line" further to the southeast.

3.7.2 The monitor wells that transect the "bad water line" in Bexar, Comal, and Hays Counties should be discussed in more detail here to give that information more creditability. The present discussion and "conclusions" are only conjecture and not based on any readily available data. The argument could be made here that since the fresh water and saline water portions of the aquifer are interconnected, you could increase the size and volume of the fresh water zone by pumping out the saline water.

The next to last paragraph of this section states that desalting processes are very sensitive to water quality changes and that costs could rise dramatically if the feedwater quality deteriorates. While this statement is generally true, ground water quality does not change rapidly, as a rule, and in this case, the quality may actually improve with pumping because the highest porosity and permeability occurs in the fresh water portion of the aquifer.

The final paragraph in this section refers to a brine production rate of 10 percent, which in turn means that the desalting process is designed for a 90 percent recovery of fresh "product" water. This presents two problems with the remaining discussion of Section 3.7. First, 90 percent recovery is considered in the design of plants treating raw water with a total dissolved solids content of about 3,000 mg/l or less. If this is what the author intended, the cost information in Table 3.7-2 is incorrect because it is too high. The cost information in Table 3.7-2 may more closely represent treating water with 10,000 mg/l dissolved solids, in which case the 90 percent recovery rate is not economically achievable. Second, the saline water availability over the planning horizon essentially assumes that there will be no recharge, and that is incorrect. This assumption indicates "mining" of the aquifer which requires the saline water not be in hydrologic contact with the fresh water portion of the aquifer.

3.7.3 In the final paragraph, 90 percent recovery of product water from raw water containing 10,000 mg/l would generate a waste brine containing about 99,000 mg/l dissolved solids. TWDB staff is not aware of a membrane plant that has accomplished this level of removal efficiency. Reverse osmosis has consistently been demonstrated to treat that quality of water, but recovery is reduced to 50-60 percent for technical and economic reasons. The limited discussion of brine disposal methods also indicates the author has not investigated all possibilities. For example, oil production

immediately down-dip from the "bad water line" in the Edwards and other formations offers two more possibilities for brine disposal recompleted, old oil wells or water flood projects in the area.

3.7.5 The third from last paragraph regarding the BRA Lake Granbury system fails to point out that part of the costs that are higher than design are the result of TNRCC requirements for redundancy of certain equipment and personnel, and some of these will not be required in future plants once the Commission becomes convinced of the reliability of reverse osmosis and electrodialysis reversal plants. Nevertheless, at $1.99/1000 gallons, this is still the least expensive source of supply of water that exceeds drinking water requirements.

The reference to the energy intensive nature of membrane processes in paragraphs two and five is misleading and the reference to an inadequate power supply in paragraph eight is incorrect. The membrane processes, and reverse osmosis in particular in this discussion, will require 5-10 kilowatt hours per 1000 gallons of product water when treating the quality of raw water discussed in the report. In addition, there is currently a surplus of electrical generating capacity in Texas.

The information given in the last paragraph and Table 3.7-2 would be much more meaningful if the approximate number of wells, length of pipelines, and consumption of energy and consumables was given. As given, it is not possible to make comparisons with known systems and cost data from elsewhere.

ENVIRONMENTAL

SPRINGFLOW AUGMENTATION STUDY

Preliminary results from the incomplete springflow augmentation study were cited by HDR in the Draft Phase 1 Report for the West Central Area without any caveats about probable changes in the final results. Recharge factors, water availability, and environmental impact assessments reported in the preliminary draft springflow augmentation report were intended for review purposes only and not for public use or quotation (see Executive Administrator's March 4, 1994 transmittal letter to local sponsors). In fact, the principle investigators acknowledged that the early draft springflow augmentation report contained significant errors and omissions which would be corrected in the draft final report. A complete draft of the springflow augmentation report will be available in August 1994, and it will include major revisions and corrections to the preliminary draft of March 1994 as reported by the report authors.

Nevertheless, it is appropriate for HDR to state in their TTWP Phase 1 Report that a study of springflow augmentation is being performed and that a draft final report will be available in August 1994. These studies have indicated that springflow augmentation is expensive and of questionable feasibility. At present, we are not aware of any method that is fully feasible; that is, physically, chemically, biologically, and socio-economically feasible for successful preservation of all endangered species dependent

upon the major springs at San Marcos and New Braunfels, Texas.

GENERAL

Plant and animal species listed by the USFWS and TPWD as endangered or threatened, or those with USFWS candidate listing status, were identified if they occurred in the area of each alternative, as we requested. Unfortunately, the animals, plants, and communities listed by the Texas Organization of Endangered Species (TOES) was not included, although we asked their inclusion at our last TAC meeting. It would still be appropriate to provide TOES listings, which are considered by most biologists in the State to be the leading edge of the science from which the other two agencies get their information.

Two C2 (Blue Sucker and Guadalupe Bass)and one C1 (Cagle's Map Turtle) species listed by the USFWS are described as having been observed within the Lindenau Reservoir site area. This statement is a significant error. The report references the F.C. Killebrew (1991) study funded by the Board for the observation of the Cagle's Map Turtle in the Lindenau Reservoir site area. In fact, Dr. Killebrew reported observations only in the Guadalupe River, which would affect the Cuero Reservoir project but not the Lindenau Reservoir project. TWDB staff is also unaware of any collection records of the Blue Sucker or Guadalupe Bass in Sandies Creek at the Lindenau Reservoir site; however, Table 3.22-2 reports their occurrence there. TWDB staff and consultants conducted extensive fishery collections in Sandies Creek and did not find these two species (Mathews and Ahle 1991). Furthermore, staff would not consider the habitat suitable for these species, which tend to prefer large fast to moderately flowing rivers. Sandies Creek is a small flowing tributary. If any of these species are present, "it would render this reach unsuitable for the construction of an impoundment," according to the Phase I report (page 3-378). Staff would agree with that statement, but their occurrence is not documented for the Lindenau Reservoir site. Two of the species (Cagle's Map Turtle and Blue Sucker) do occur in the proposed Cuero Reservoir site, and thus, that area may be considered inappropriate for impoundment. The report does not consider the effect of the proposed off-channel reservoir at Santa Clara Creek (alternative G-14, pages 3-322-3-323) on the Cagle's Map Turtle, although they list it in Table 3.19-1 of their report as occurring in the project area.

A point of confusion may be the TPWD report of listed species in their Board funded document entitled "A Natural Resource Survey for Proposed Reservoir Sites and Selected Stream Segments in Texas". The Natural Heritage Program lists species by county, so if a listed species occurs in the county of a proposed reservoir project, but not in the project area itself, it is still listed as occurring in the project area. This was the case for the Cagle's Map Turtle occurrence in the Guadalupe River of Gonzales and DeWitt Counties. Although the species does not actually occur in the Lindenau Reservoir site area, TPWDs lists it as occurring there because both the species and proposed reservoir occur in these counties. Staff believes this is a characteristic of TPWD's listing procedure that leads to confusion, such as we see in this case.

Editorial review comments include misspelling "Balconian Biotic Province" (page 3-225), referring to "Cuero Reservoir" site by its old name of "Cuero I Reservoir" site (page 3-356-357), and referring to Cagle's Map Turtle as a "C1" species in Tables 3.21-2 and 3.22-2, but as a "3C" species in Table 3.19-1. While the first two are somewhat minor editorial comments, the later categorical error is of some regulatory significance.

cc: Regional Director, Billings, Montana, Attention: GP-700
Area Manager, Oklahoma City, Oklahoma, Attention: OT-100

TRANSTEX
D-21-94-1

United States Department of the Interior
BUREAU OF RECLAMATION
Great Plains Region
AUSTIN RECLAMATION OFFICE
300 East 8th Street, Room 801
Austin, Texas 78701-8225

IN REPLY
REFER TO:

TX-700G
PRJ-4.00

July 29, 1994

Mr. Steven J. Raabe
San Antonio River Authority
P.O. Box 830027
San Antonio, Texas 78283-0027

Subject: West Central Study Area Technical Advisory Committee Review Comments, Phase I Interim Report, Trans-Texas Water Program

Dear Mr. Raabe:

Thank you for providing the draft interim report for our review. The report appears to meet the Phase I objectives of displaying population, water demand and water supply projections and a general evaluation of water supply alternatives to consider for meeting present and future water demands.

Although the report mentions that the Policy Management Committee (PMC) will select the most attractive options for more detailed study in Phase II, it is confusing to the reader to understand how the Policy Management Committee can effectively utilize the information as presented to make a well informed decision regarding which alternatives should be eliminated from further study and which alternatives stand out and should be studied in more detail. We think the report could be strengthened by adding a chapter that ranks the alternatives using a type of a matrix with weighted parameters which could assist the PMC in making such determinations. This chapter could also include a section which summarizes the investigation findings and presents an outline of the recommended activities to be conducted during the second phase of the program.

We appreciate the opportunity to comment on the report and look forward to our continued involvement in this study.

Sincerely,

Fred R. Ore
Austin Reclamation Representative

EDWARDS UNDERGROUND WATER DISTRICT

COMMENTS ON INTERIM REPORT
WEST CENTRAL STUDY AREA
TRANS TEXAS WATER PROGRAM

2.0 POPULATION, WATER DEMAND, AND WATER SUPPLY PROJECTIONS

Section 2.2.2.4 Irrigation and Water Demand Projections for Counties of the Edwards Aquifer Area, Page 2-51 and Table 2-14

TWDB predicts that by year 2010, approximately 90,000 acre feet of irrigation water demand in the Edwards Aquifer Area will disappear. Improved irrigation efficiency and reduced acreages due to poor economic conditions are given as the reasons for this reduction. In two water supply alternatives examined later in the report, it is proposed that 1) City of San Antonio wastewater will be exchanged for Edwards irrigation water (L-11) and 2) Edwards irrigation water will be purchased or leased for municipal or industrial use (L-15). Those examinations do not completely acknowledge the reductions predicted here. The reconciliation of demand and supply figures should avoid double counting the reduction in demand that is predicted to occur and the proposed new supply from conversion of irrigation supply to other uses.

Section 2.2.3.2 Page 2-26 and Table 2-19

Note the significant increase in the predicted industrial demands in the Guadalupe Basin Adjacent Area, especially the jump from 1990 to 2000. These projections seem high given the last forty year's history of industrial demand in that area. For purposes of this report the sponsors agreed to accept the TWDB projections without argument. This is noted for future reference only.

Section 2.3.1 Groundwater Supply Projections Page 2-84 and Table 2-27 Page 2-87

The Edwards Aquifer component of groundwater supply in the Edwards Aquifer counties is pulled out and presented as a total at the bottom of the Table. This was probably done to avoid an insupportable division among the counties of the Edwards Aquifer supply available under S.B. 1477. However, the presentation in this manner does not allow the table to be used for its intended purpose of comparing present use or future use to the available supply. If the Edwards Aquifer supply must be presented as a whole number for all Edwards Aquifer counties, then those county water use amounts should be grouped for the comparison.

05-10-44-1

[redacted]

EDWARDS UNDERGROUND
WATER DISTRICT

2.5-2.3-6.2

August 10, 1994

Policy Management Committee
West Central Study Area
Trans Texas Water Program
c/o San Antonio River Authority
P. O. Box 830027
San Antonio TX 78283-0027

Re: Phase I Interim Report
West Central Study Area

Gentlemen:

The Edwards Underground Water District has completed a review of the subject report and offers the following comments for the Policy Management Committee's consideration at the August 10, 1994 Committee meeting.

Sincerely,

Rick Illgner
General Manager

/ST-S
cc: Greg Rothe w/o attachments

1615 N. St. Marys · P.O. Box 15830
San Antonio Texas 78212-9030
210-222-2204
FAX 222-9869

Section 3.3 Exchange Reclaimed Water for BMA Medina Lake Water (L-12)

In Section 3.3.1, page 3-91, first paragraph, the report indicates that the current annual irrigation demand supplied by BMA is approximately 35,000 acre feet per year. This should be indicated as the average amount. The use of this amount (35,000 acre feet), whether identified as current annual irrigation demand as indicated in the report or as an average use which is suggested here to be more accurate, is misleading in terms of the further examination of this alternative.

Irrigation demand in the BMA system in recent drought years has twice been over 60,000 acre feet per year. To begin the analysis as if only 35,000 acre feet per year is used by irrigators substantially understates the amount of irrigation demand to be offset, and thus understates the amount of reuse water required. The result is an understatement of the cost of this alternative. There is more explanation on this when in the discussion of Alternative S-13 later in this report.

Section 3.4 Reclaimed Water Reuse (L-13)

It is not clear in the narrative discussion of SAWS reuse projects which are proposed and which are in operation. Likewise it is not clear in the description of the water availability analysis which reuse project(s) amounts will take priority over the availability of water for the recharge option being examined here.

The purpose of the comment is to have the report make clear which SAWS reuse projects are considered before determining water availability for the exchange alternatives with BMA and Edwards irrigation and also the proposed 2050 Plan reuse of the wastewater stream. And there should be a reference here to the same (or different?) instream flow criteria applied as a priority over water available for reuse in this alternative. All of the reuse alternatives examined in this report should have the same criteria of instream flow requirements and dedication to present uses or the differences should be noted.

Section 3.6 Purchase (or Lease) of Edwards Irrigation Water for Municipal and Industrial Use (L-15)

A reminder here of the earlier comment that some of the water proposed to be available for purchase or lease in this alternative is water that will not be pumped in the future according to the projections made by TWDB. This analysis assumes that the entire area is irrigated with pivots or linear move systems which are amenable to LEPA conversion. Probably less than 50% of the irrigated acres have these kinds of systems and a large percentage not presently having these systems are in field configurations that do not allow their use. The amount of water available under this alternative from the measures indicated is probably overstated.

Section 2.3.2 Surface Water Supply Projections Page 2-89 and Table 2-28 and Table 2-24 and Table 2-34 Page 2-109

Presentation of average supply amounts for Medina Lake and Applewhite Reservoir for purposes of comparing available supplies to current or projected demands is misleading. These amounts will not be available in a drought, and as such the presentation overstates the supply in comparison to the demand. Also see Figure 2-27 on page 2-99 as an example of this problem. The shortages for the Edwards Aquifer Area supply (surface and groundwater) as compared to the TWDB projections of the total water demand will be greater during a drought than those presented in this report.

S.B. 1477 may require reductions in supply available from the Edwards Aquifer below the acre-feet per year thresholds. This applying, the gap between demands and supplies will further widen. Though the nature of this report may necessitate the generalized presentation shown, the report should note that the supplies from the Edwards and surface supplies be less than those shown during a drought.

Section 3.2 Exchange Reclaimed Water for Edwards Irrigation Water (L-11)

The findings here indicate that approximately 38,000 acre feet is available from City of San Antonio wastewater return flows for purposes of exchange for Edwards irrigation water. A commensurate 38,000 acre feet of water may not be available from the Edwards Aquifer under this alternative. The concern is 1) that the monthly irrigation demand curve presented in Table 3.2-7 on page 3-86 (taken from the BMA surface irrigation system demand) is too flat to be representative of the Edwards irrigation use and 2) the sizing of the pipelines to provide 2.3 gallons per minute per acre is too low in comparison to the 6-10 gpm/acre required for most crops. The first condition understates the amount of Edwards Aquifer pumping that could be displaced by this alternative, and the second understates the cost of facilities to displace an equal amount of Edwards pumping.

If the purpose of this alternative is to displace the Edwards irrigation use, then some recognition in the report is necessary to indicate that the 38,000 acre feet available from the reuse stream does not necessarily equal 38,000 acre feet available for use from the Edwards Aquifer. The cost of this alternative should be computed by dividing the cost of the facilities to deliver the 38,000 acre feet by the lesser amount of Edwards irrigation demand offset and available for other uses.

The narrative in section 3.2.2, page 3-75 and continuing on the next page, does not clearly represent which instream flow criteria were applied for purposes of determining the reclaimed water available in Table 3.2-3 on page 3-77. A clarification would help the reader.

Section 3.30 Shaws Bend Reservoir (C-18)

A reservoir with a conservation storage capacity of 132,220 acre feet as indicated on page 3-473 will not likely provide 100,000 acre feet of firm yield as indicated page 3-475. Downstream water rights and instream flow criteria are probably not included. This should be confirmed and noted in the report and in the tables.

OTHER COMMENTS

The collective conclusions of the personnel that prepared the report would be helpful to the sponsors. Any concluding or summarizing remarks about the relative merits of the alternatives by the consultant based on their close working knowledge with the information over the past several months will be very useful to the sponsors in the future as they consider these alternatives for further planning and development. A conclusions section should be added to the report.

Section 3.8 Natural Recharge - Type 1 Projects (L-17)
Section 3.9 Natural Recharge - Type 2 Projects (L-18)

The report presents the drought condition recharge enhancement (1947-1956) for the recharge projects previously studied by EUWD in the Nueces Basin. The average condition recharge enhancement amounts should be presented in Table 3.8-4 on page 3-169 as they have been for the Guadalupe Basin Projects in Table 3.9-1 on page 3-174.

Section 3.13 Medina Lake (S-13)

In the paragraph at the top of page 3-223, the consultant reports that for drought conditions 20,250 acre feet per year of additional recharge enhancement will occur if the lake is operated on a firm yield basis. It is not clear whether this is the predicted recharge enhancement above the historical amount occurring from historical operation of the Lake or above the amount that would occur if the lake was operated at a maximum diversion of 66,000 acre feet per year. It to be the latter, but clarification on this is needed.

In Table 3.13-1 the analysis included $9,570,000 in the cost estimate from the analysis in Section 3.3. See the comments on that section to support the belief that this amount understates the amount of reclaimed water (and thus the cost for it) that would be necessary to offset the entire (up to 66,000 acre feet per year) amount of irrigation use from Medina Lake to make the water available for this alternative. This problem has the effect of understating the unit cost of this alternative.

Section 3.14 Applewhite Reservoir (S-14)

An explanation of the term "maximum firm yield" in the first full paragraph on page 3-238 is needed. Also note the description of the recharge enhancement from operating Medina Lake in a firm yield mode in the last paragraph on page 3-238. This seems to confirm the opinion offered in the previous paragraph that the recharge enhancement numbers reported here represent the increase in recharge enhancement over what would be available under a maximum diversion of 66,000 acre feet per year.

Section 3.24 Guadalupe River Dam No. 7 (G-17)

The narrative in this section indicates that an additional 33,300 acre feet per year of firm yield could be created by combining the operation of proposed Dam No. 7 with Canyon Lake. As the narrative further indicates, the Trans Texas Environmental Criteria were not applied. Table 3.24-1 on page 3-415 should have a footnote added to indicate that the Trans Texas Environmental Criteria will likely reduce the annual project yield.

states is 57,970 acre-feet per year. Depending upon the operational management of the reservoir system BMA also believes that that number too, in fact, may be significantly higher. Moreover, based upon BMA's own operational experience during recent years, BMA has on an average delivered approximately 40,000 acre-feet of water for irrigation purposes on an annual basis without having the Lake go dry.

Additional information regarding the expected reliable yield on an annual basis from Medina Lake was developed as part of a regional water supply study sponsored by the Texas Water Development Board under the direction of the Bexar Metropolitan Water District entitled "Southern Bexar County - Medina Valley Surface Water Supply Study," prepared by Michael Sullivan & Associates, Inc. of Austin, Texas. While BMA does not fully support the limited data and results contained in that report, BMA would concur that the higher average annual water amounts available from Medina Reservoir described by Mr. Sullivan more accurately reflect the potential value of the reservoir system to solving the municipal water supply problem of the region.

2. BMA would urge the Trans-Texas Program to emphasis the fact that Medina Lake, an existing surface reservoir, provides a readily available short term element to the solution of present water supply crisis. Moreover, BMA's Medina Lake also provides a portion of the long term solution to the long term water supply crisis in the region. BMA believes that this unique feature of the Medina Reservoir is under-emphasized in the study. This fact should elevate Medina Reservoir on the priority list of items of alternatives to be considered as part of the regional solution to the municipal water supply crisis.

3. Section 2.4, "Water Demand and Supply Comparisons" addresses S.B. 1477 and the assumption that its provisions apply to quantities of water that could be withdrawn from the Edwards Aquifer. It does not appear that the analyses also incorporates the features of Section 1.44 of S.B. 1477 and the vital role the Medina/Diversion Reservoir system plays in that provision. Specifically, Section 1.44 authorizes the use of surface water for recharge purposes and the ability of the public entity responsible for the recharge to claim credit for recharge quantities of water that could be recharged and withdrawn at different points in the reservoir. This feature would be extremely important if implemented, as Medina/Diversion Reservoir system could be managed in a way, either through enhanced natural recharge or artificial recharge, to directly move surface water into the Edwards Aquifer. Recharge would avoid losses from evaporation and seepage, and make that water available to present or future Edwards Aquifer users above and beyond historical pumpage allocations.

BEXAR-MEDINA-ATASCOSA COUNTIES

WATER CONTROL AND IMPROVEMENT DISTRICT NO. 1

P. O. Box 170

NATALIA, TEXAS 78059

Phone (210) 663-2132

August 16, 1994

Trans-Texas Water Program
c/o San Antonio River Authority
100 East Gunther Street
P.O. Box 830027
San Antonio, Texas 78283-0027

via Telecopier
(210) 227-4323

Attn: Steven J. Raabe, P.E., Project Manager

Re: Trans-Texas Water Program - West Central Study Area

Dear Steve:

I am writing to you as the President of the Bexar-Medina-Atascosa Counties WCID No. 1 ("BMA") to provide you with comments on the Phase I Interim Report for the Trans-Texas Water Program, West Central Study Area, dated May 1994. First, let me commend the team which prepared the report for the obvious and substantial effort involved in compiling all of the information and analyses. Let me also advise that the focus of my comments will be related to the Study's analyses of Medina Lake and its potential development as a municipal water supply to ease the ongoing crisis created by overdrafting of the Edwards Aquifer.

Set forth below are my comments regarding the study report. For your convenience, I have attempted to divide my comments to address issues raised in Volume I and Volume II separately.

Volume I

1. At page 2-91 (and correspondingly Table 2-2A), the Report states that the maximum firm yield of Medina Lake is only about 8,770 acre-feet per year. First, clarification regarding the point of diversion at which that firm yield would exist is needed. Additionally, BMA believes that the firm yield of the Medina Reservoir is actually in excess of that number. Additional studies are necessary to reflect more accurately the firm yield of the reservoir. However, in any event, the focus of the Trans-Texas study and the utility of Medina Reservoir system to facilitate a solution to the water supply problems of the region, mandates the need to focus more on the average supply number, which your study

would BMA farmers be forced to farm crops irrigated only with the reclaimed water.

5. At page 3-94 the Report states that an estimated 80% of BMA's irrigated acreage is planted in "crops suitable for reclaimed water irrigation." Based upon BMA's institutional knowledge of the area, there is serious question whether or not 80% of BMA's irrigated crop land is actually planted in crops suitable for reclaimed water irrigation. Further documentation, and possibly investigation, should be provided to verify these estimates which appear to be high.

6. At page 3-219, reference is made at the end of the first paragraph of Section 3.13.1 to the effect that Medina Lake "inundates approximately 5,575 acres at conservation pool level." It would be a helpful reference to cite the elevation, Mean Sea Level, at which the conservation pool level exists.

7. At page 3-221, the discussion of the firm yield or dependable annual supply of service water from Medina Lake without shortage through the drought of record appears to have no discussion of the historical operation of Medina Lake. Specifically, prior to the drought, the gates of Medina Dam were left open on a continuous basis. Since that time, the District has regulated the gates to minimize releases during times when water was not necessary for diversion for irrigation purposes. Accordingly, it is anticipated that stored water would be available for a longer period of time in the event of a reoccurrence of the drought of record.

8. Figure 3.13-2 contains as part of its "notes" a reference to hydro-power rights subordinated to 600 cfs at Lake Dunlap. It would appear that this reference is a mistake as it has no application to Medina Lake and/or HDR's alternative S-13. Similarly, in Figure 3.21-2 which appropriately makes reference to Lake Dunlap, there is a reference to "Applewhite Reservoir" included in the "notes." That reference does not appear to be appropriate.

9. Also in Figure 3.13-2, reference is made to the Edwards Aquifer demand of 400,000 acre-feet per year. It is unclear as to the source of that reference or the applicability on this particular figure.

10. In light of the failure of the Applewhite referendum on August 13, 1994, all alternatives affecting Medina Lake which include any consideration of the Applewhite Reservoir need to be re-evaluated and appropriate modifications to those alternatives and conclusions made.

4. Option L-12 on page ES-30 contemplates that the use of a lower quality of water within the BMA irrigation system. There is no compensation proposed to landowners whose crop usage and/or yield may be reduced, if not restricted to the use of lower quality water. Specifically, the proposed use of treated effluent may reduce landowners ability to grow food crops for human consumption.

Volume II

1. In Section 3.3.1 (page 3-9) you cite BMA's current annual irrigation demand to be approximately 35,000 acre-feet per year. In fact, average annual demand over the last ten years has been approximately 39,000 acre-feet.

2. Section 3.3.3 addresses the possibility of exchanging reclaimed water for Medina Lake water. First, recognition should be given to the fact that farmers in the BMA irrigation system are not going to be readily amenable to such an exchange without substantial education and time to assimilate the viability of the idea. Moreover, the viability of the project has recently been placed in issue as a result of a letter from Myron Knudson, Region 6, EPA, to Sam Hamilton, State Administrator, U.S. Fish & Wildlife, regarding proposed amendments to San Antonio's NPDES discharge permit conditions which might restrict discharge from the San Antonio Wastewater Treatment Plant cited in Section 3.3.1 as potential sources of water for the proposed exchanged. This issue should be addressed in part of the Trans-Texas considerations.

3. In addition to wastewater from San Antonio, wastewater streams from other treatment plants in the vicinity of Medina Lake should be considered as potential sources for such an exchange. For example, City of Castroville has substantial wastewater that could be contributed directly into the canal system with nominal costs to transport the same from the treatment plant to the system. Another alternative which should be considered is the treatment of the wastewater effluent to a higher level and mixing it with the water in Medina Lake. Such an operation would not only enhance the availability of water from Medina Lake, but also provide a potentially higher firm yield from the Lake. Increased storage in the Lake would also facilitate recreational activities and possibly provide for maintenance of environmental situations including habitats.

4. At page 3-94, Figure 3.3-2, there is a map reflecting a new reservoir to be built near the IH-35 bridge over Medina River for storage of treated effluent with a pump station to pump the effluent into the BMA system. It indicates that this option would facilitate the availability of 66,000 acre-feet per year from Medina Lake. Query: Would a parallel delivery system be constructed to separate the Medina Lake water from the effluent, or

08-22-94-4

Aug.22,1994

TO: Policy Management Committee

SUBJECT: Review of Goals

Mr Raabe and Members of the Committee ,

Living in a semi-arid region requires particular attention to evaporation and other natural conditions. I believe conservation is extrely important, if not the first step in any water plan for this West Central Study Area.

Recharge of the aquifer from surface runoff is also very important ; and those areas in the recharge area should be looked at by a specialist in Karst type topography. I believe that some very worthwile projects have been presented to various water authorities and they should be given more emphasis, or higher priority than the proposed large reservoirs in the south.

Many false assumptions have been made a part of the study by the Consultants. Such assumptions as SE 1477 should be removed from any further study. This is a democracy in which we elect our representatives to the Edwards Underground Water District.

This region strongly believes in local control and that includes the authority to make rules to protect the aquifer. We would like to see more delegation of authority from the Texas Natural Resource Conservation Commission.

The opponents of the 2050 water plan and the proposed Applewhite reservoir won a victory this last Saturday. We would like all citizens to know that we forgive/ forgive the proponents and wish to work in cooperation with all towards a new water plan, a plan which will be a true consensus of our region.

Sincerely,

Tom Culbertson

Tom Culbertson, Hydrologist
Regional C.A.&.Water Assn.

11. As indicated earlier, as the only existing surface water reservoir in the region, the value and potential use of Medina Lake should be a high priority consideration in every alternative solution to the region's water supply problems. Every acre-foot of water that can be diverted from Medina Lake and utilized for municipal/industrial purposes as a substitute for a similar quantity of water now pumped from the Edwards Aquifer will be a benefit to the region. This is true whether or not the water available in Medina Lake is firm or non-firm.

Thank you for the opportunity to provide these comments. Should you have any questions, or if I can provide further information, please feel free to contact me at the District's offices in Natalia. The telephone number is (210) 665-2132.

Sincerely,

BEXAR-MEDINA-ATASCOSA COUNTIES WCID NO. 1

ERM for John W. Ward, III, President
Board of Directors

JWW/acb

78-31.04-1

Fay Sinkin
125 St. Dennis
San Antonio, Texas 78209

Mr. Steven J. Raabe
SARA
100 E. Guenther
P. O. Box 830027
San Antonio, Texas 78283

Your project will have very little credibility with the public if your "experts" are unable to see the correlation between quantity and quality. With massive development about to take place on the recharge zone with its attendant cementing up of sink holes and caves (2,500 on 1604 alone), reducing the quantity of water recharging the aquifer and the additional cumulative effect of the pesticides, herbicides, gasolines, oils, and toxic wastes increasing the odds of pollution of the aquifer, it is no mystery as to why the entire assumptions of your study are being called into question.

I do hope phase I will not be completed without attention being given to the above. Waiting for Phase II will not suffice.

Fay Sinkin

Fax Note 7671 Date 8/25 pages 1

To Steve Raabe / Herb Grubb Company SARA / HDR Engineering Location Fax # Telephone # Comments

From Mike Personett Company TWDB Location Austin Fax # 463-9843 Telephone # 463-8061 Dept. Charge

Original Destruction ☐ Destroy ☐ Return ☐ Call for pickup

8105 8 DA 08-25-94

Brown & Root, Inc.

Post Office Box 3
Houston, TX 77001-0003

August 16, 1994

Mr. Mike Personett
Director, Local & Regional Assistance
Texas Water Development Board
P.O. Box 13231
Austin, Texas 78711-3231

RE: West Central Study Area Phase I Interim Report Review

Dear Mike:

The Southeast Area consultant team offers the following comments of the above referenced report for your consideration. In general, the report was very thorough. We were impressed with the level of detail provided and the number of water supply alternatives investigated. Two principal comments are offered.

First, West-Central evaluation of the Allens Creek Reservoir and Toledo Bend Reservoir alternatives was based on construction of new transmission pipelines. Current planning by the Southeast Area project team includes consideration of canal systems from the Sabine River to the Brazos River. All but the northernmost Southeast Area conveyance routes can be constructed with canals. Additionally, several of the routes can potentially utilize existing canal systems. Both of these considerations will significantly reduce the construction estimate provided in the West-Central study for Alternatives SB-10 and SBB-10.

Secondly, evaluation of contractual transfer (water wheeling) opportunities within the West-Central study area could also potentially reduce the estimated conveyance system construction costs. Contractual transfers reduce the need to provide conveyance systems (canals or pipelines) throughout the course of the entire route. For example, lower basin Brazos River water could possibly be supplied to lower Colorado River basin customers who own reliable water rights in the Highland Lakes. This "freed up" Highland Lakes water could then be conveyed to Canyon Lake or to Cibolo Creek where it could then be used to meet future Guadalupe or San Antonio River basin demands. The "freed-up" surface water could potentially serve existing Edwards Aquifer customers thereby providing a reduction in groundwater usage.

The Phase II study for the Southeast Area will provide recommendations concerning the configuration of the conveyance system between the Sabine and Brazos rivers. We suggest continued consideration of West-Central Alternatives SB-10 and SBB-10 until completion of Phase II of the Southeast Area.

AUG 1994 SARA

Sincerely,

Jeff Taylor
Project Manager

cc: Southeast Area PMC
n:\data\word\jr1341\phasetwo\admin\wcstudy

the planning process. The construction of multiple reservoirs or multiple diversions within a given watershed can result in significant alteration of downstream flows, changes in the character of existing aquatic habitat, and a reduction in freshwater inflows to estuaries.

pp. 3-8, 9

The proposed instream flow criteria (see Appendix C- Trans-Texas Environmental Criteria) for instream flows and freshwater inflows to bays and estuaries state that at any point in a river basin intercepted by the Trans-Texas Water Program, stream flows would be passed downstream in an amount up to 60% of the median monthly flows from March through September, and 40% of the median monthly flows from October through February. Stream flows above these monthly flow limits are to be considered available for other beneficial uses and inter-basin transfer. New reservoirs would be required to pass through normal inflows to bays and estuaries up to the mean monthly flow in May-June and September-October, while the minimum maintenance needs are satisfied with inflows up to the median monthly flow in remaining months of the year.

Water stored in any new reservoirs would provide instream flows that would be limited to average or mean monthly flows in April-June and August-October, and median stream flows in the remaining months of the year when reservoir levels exceed 60% of capacity. New reservoirs would only be required to provide up to median daily flows of the stream observed during the historical drought of record when these reservoirs are at less than 60% of capacity. Water stored in existing reservoirs would not be allocated to instream uses or bay and estuary uses and released downstream to make up for normal flows below the specified limits.

These proposed instream flow criteria should be re-examined. They are too generic in nature and may not provide sufficient flows that adequately mimic seasonal patterns for many aquatic species throughout the year. These flow criteria are partially based upon providing <u>minimum</u> flows utilizing averages and medians for long-term periods. Supplying only continuous, minimum flows will not only degrade the riverine environment over the long-term, but will also make the system more susceptible to potentially catastrophic events such as prolonged drought. Higher flows are important in moving sediments downstream and scouring deeper pools. Additionally, discounting the availability and usefulness of unallocated or un-used water stored in existing reservoirs to use for instream flows may be premature and potentially eliminate an important source of water.

Any new reservoir construction will have an effect on existing reservoirs and vice versa. Watersheds and water diversions or dams within them will have to be examined and managed as an integrated system in order to maximize the availability of water while

09-02-94-2

United States Department of the Interior

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611 E. Sixth Street
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SEP 0 1 1994

Stephen J. Raabe, Project Manager
Trans-Texas Water Program
San Antonio River Authority
P.O. Box 830027
San Antonio, TX 78283-0027

Dear Mr. Raabe:

This responds to your June 15, 1994, letter requesting comments on the **West Central Study Area Phase 1 Report** (Report).

Specific Comments

Volume 1
Summary of Potential Water Supply Alternatives, p. ES-25

"Natural recharge" is defined to include the use of an injection well. We recommend that references to injection well be struck from the definition.

Environmental Issues, p. ES-27

We believe it is premature to state that "None of the alternatives considered appears to have adverse impacts so pronounced that the alternative can be eliminated at this time" since a detailed environmental analysis has not been performed on most individual alternatives or on aggregations of alternatives. This statement should be removed or re-written to reflect the additional information that is needed. Specifically, the effects on aquatic and riparian organisms due to alterations of stream flows, changes in water quality and quantity, and cumulative effects to instream flows and bay and estuary inflows caused by multiple alternative projects being implemented within a watershed need to be addressed.

Volume 2
3.0.1 Environmental Overview
p.3-7.

The Report only addresses individual water supply alternatives and states that multiple combinations of alternatives will be the subject of future phases of the Trans-Texas Water Program. Since the adoption of multiple individual project alternatives are likely to be required to meet the water needs being investigated as part of the Trans-Texas Water Program, we believe that the cumulative impacts to aquatic natural resources need to be evaluated early in

p. 3-39

The text mentions that there is currently no practicable way of mitigating consequences of converting flowing stream habitat into a lentic environment. We disagree with this statement. Mitigation is often considered as a hierarchical process of first avoiding, then minimizing, and finally off-setting remaining adverse impacts to natural resources. Mitigation is preferably done on-site, but may also be considered off-site, depending upon the resources involved and on-site suitability. Mitigation is also preferably accomplished by replacing similar, or in-kind habitat values. In the case of converting a lotic to a lentic environment, the only available mitigative measure may be upstream, downstream, or off-site mitigation. Examples of potential mitigative measures include, but are not limited to: reducing or eliminating adverse impacts to existing instream habitats such as minimizing sediment loads of contributing tributaries through soil conservation measures; establishing site-specific, state administered water quality standards for point and non-point pollution; eliminating unnecessary dams in other parts of the river; securing water rights to maintain critical low flows for selected aquatic organisms; altering dam discharges to provide downstream flows that are more reflective of historical flows; eliminating barriers to fish passage; stabilizing streambanks to maintain channel integrity; plus many others. We recommend that these and similar types of mitigative measures be incorporated in the discussions of alternative development and selection. If mitigation for an alternative is determined to be impracticable, then the relative practicality of the alternative should reflect this. Any alternatives resulting in adverse impacts to fish and wildlife resources for which mitigation is not being recommended should be thoroughly qualified.

p. 3-41

For new reservoirs under the Trans-Texas environmental criteria, bay and estuary inflow requirements are assumed to be met if the instream flow requirements are met. As previously stated, we believe that the Trans-Texas environmental criteria need to be revised. There has been no analysis yet as to how multiple alternatives within a given watershed may cumulatively affect stream flows and bay and estuary flows.

p. 3-42

The text states that it will be exceedingly difficult to obtain definitive risk assessments for any proposed aquifer recharge using treated wastewater and that potential effects will be evaluated in detail in future phases of the Trans-Texas program. Any proposed alternative involving the use of treated wastewater should include a detailed discussion of any safeguards that would be necessary to appropriately reduce the risk of aquifer contamination.

minimizing downstream adverse effects. Relying solely on percentages of mean and median flows without understanding the particular flow characteristics (timing and duration) of flows within individual river segments will not provide an adequate means of addressing the water needs of downstream fish and wildlife and other users.

p. 3-11.

The first full paragraph discusses the need to mitigate significant adverse impacts from any alternative implemented. Mitigation would include avoiding the impacts and minimizing the impact. We recommend that in the process of formulating an alternative, adverse impacts should be recognized, avoided, and then remaining impacts be minimized. Mitigative measures should become part of the alternative as was done for the Dilworth Reservoir alternative. Addressing adverse impacts of an already formulated alternative significantly reduces the options available for avoiding or minimizing impacts. The benefits and costs of mitigative measures should also be considered up-front when evaluating a range of alternatives.

p. 3-18

Stating that "San Marcos springs have the greatest flow dependability and environmental stability of any spring system in the southwestern United States" may be somewhat misleading. Although San Marcos springs has not been known to go dry, spring flows do vary seasonally and in response to precipitation and water withdrawal from the aquifer. Increasing levels of aquifer withdrawal are increasing the probability that San Marcos spring flows will be significantly reduced at times or even halted. In terms of "environmental stability", the most stable feature of the springs is likely the temperature of water emanating from the spring orifice. However, upon examining the entire spring system, including recharge and instream conditions, the quality of water within San Marcos springs is highly susceptible to environmental perturbations such as chemical contamination. As already stated, the quantity of water being discharged from the springs is also being increasingly affected by water withdrawals. While it may be true that San Marcos springs is among the most stable and dependable springs in terms of flow and ambient conditions, many other southwestern United States springs are highly susceptible to human and naturally induced alterations in spring flows. The spring may be more stable than others, but the reader should not be mislead to thinking that the spring is "environmentally stable" or not susceptible to being adversely affected in terms of flow, temperature, or chemical composition.

p. 3-44

In the discussion of potential inter-basin transfer of non-native species associated with inter-basin water pipelines, the application of biocides is mentioned as a means of eliminating the risk of organism transfer. Obviously, any biocides used in this manner would potentially be transferred into the receiving waters and affect non-target, native species, including some that are federally-listed. An evaluation of the use of biocides should be included in any discussions of inter-basin water transfers.

p. 3-44

This section ties mitigation to permit application processes. Close coordination with fish and wildlife agencies should be encouraged in the formulation of alternatives. Mitigative measures should be included as alternative components. By addressing mitigation measures as early as possible, a broader range of mitigation options is available and permit application processing for environmental impacts can usually be streamlined.

3.4.1 Reclaimed Water to the Edwards Aquifer
p. 3-107

There are several uncertainties regarding the injection of purified wastewater directly into the aquifer. The primary uncertainties involve the exact underground flow paths of the injected water and the storage capacity of the aquifer available from this technique for a given injection site. Concerns arise over the potential of aquifer contamination due to malfunctions in the water purification process or delivery system.

An additional alternative dealing with the storage and use of reclaimed water should be investigated. If the wastewater to be injected is treated to standards that reflect the properties of existing fresh water in the aquifer that is being withdrawn for drinking, this treated water would meet or likely exceed safe drinking water standards. Therefore, an additional alternative to consider would be to pipe treated wastewater directly to the municipal drinking water supply for final processing. The use of this recycled water would reduce the amount of water that would be needed to be pumped from the aquifer. A decrease in the withdrawal of Edwards water over time could provide similar water banking as that which also includes direct injection. The reduction in withdrawal throughout the year would allow more water to be stored and be available in the aquifer during traditionally lower water periods through existing recharge mechanisms.

3.9 Natural Recharge - Type 2 Projects
3.9.3 Environmental Issues, p. 3-179

The extent of intermittently flooded karst zones that would be affected hydrologically by the proposed Type 2 structures is stated as being unknown, as is the extent to which these zones are inhabited, and how hydrologic changes might affect resident communities. Type 2 recharge sites in Travis and Williamson Counties have potential for caves containing endangered species. A petition to list 9 karst invertebrates in Bexar County has been received by the U.S. Fish and Wildlife Service. Potential effects from Type 2 projects to federally-listed and candidate species need to be explored further and thoroughly evaluated prior to alternative selection.

3.10 Springflow Augmentation
3.10.1 A Description of Springflow Augmentation Study of Comal and San Marcos Springs, p. 3-186

This section uses quotations from an existing draft Comal and San Marcos Springs springflow augmentation study which is being reviewed. One quote states that augmentation is feasible from geological, biological, and hydrological perspectives under certain conditions. Based upon our review of the original draft document, we do not believe this statement is adequately supported by existing supplied data. The augmentation alternatives include both underground and above-ground proposals. Water quality and proper underground flows are of primary concern in maintaining the integrity and biologic suitability of the system for the underground and above-ground dependent residents. Direct injection can unnecessarily pose a risk of contamination of the entire system. There are also several uncertainties regarding the flow paths of well-injected water and it's relative contribution to spring flows. Because of the limited distribution of the federally-listed resident species, a single, short-lived event involving contamination of the aquifer or surface springs could extirpate several species. Above-ground augmentation involving the piping of water at or near spring orifices is unlikely to provide the necessary underground flows and chemical properties for which the subterranean species such as the Texas blind salamander are adapted. Piping of water may involve risks of both chemical and biological contamination.

3.10.2 Estimated Quantities of Augmentation Water Needed for Comal and San Marcos Springs, p. 3-191

The statement that "since no currently listed endangered species are dependent on the flow in the spring orifices at Comal and San Marcos springs, augmentation water could be delivered to Landa and Spring Lakes" is not accurate. The federally-listed Texas blind salamander is an aquifer dwelling species in the San Marcos area. This species frequently washes out of spring openings in Spring

Lake and is also sometimes found underwater near cave entrances that access the aquifer. One of the main habitat areas for the federally-listed San Marcos salamander (*Eurycea nana*) is rocky substrate around spring openings throughout Spring Lake. These areas may also be key reproduction sites. The Service believes that augmentation at or near the spring orifices would likely impact the habitat of these two species. Other species that may be impacted include some candidate invertebrate species that reside within the aquifer and/or in the Comal Spring runs. These species are dependent upon clean, clear water, and relatively constant water temperatures and spring flows.

3.14 Applewhite Reservoir
p. 3-235

The viability of the Applewhite Reservoir alternative (3.14)(S-14) should be re-addressed based upon the negative vote by San Antonio voters.

3.27 Dilworth Reservoir
3.27.3 Environmental Issues, p. 3-431

Approximately 1,530 acres of wetlands will be impacted by this reservoir. Although an estimated, combined cost for environmental studies and mitigation is provided in Table 3.27-1, there should be a discussion of how impacts to these wetlands would be mitigated.

Thank you for the opportunity to comment at this time. If you have any questions regarding this response, please call Richard Szlemp at (512) 482-5436.

Sincerely,

Jane S Grote

Acting Field Supervisor

09-30-94-1

TRANS-TEXAS WATER PROGRAM

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1.11-3.6-GC
1.11-3.6-TAC
1.11-3.6-PIC

September 30, 1994

TO: Policy Management Committee
Public Information Committee
Advisory Committee for Public and Technical Input

FROM: Steven J. Raabe, P.E., Project Manager
San Antonio River Authority
Office: (210) 227-1373
Fax: (210) 227-4323

SUBJECT: Trans Texas Water Program
West Central Study Area
Status Report on Phase 1-A Study

In May 1994, the West Central Study Area Policy Management Committee authorized Phase 1-A to study the City of San Antonio's 2050 Plan and the Canyon Lake/Mid Cities Plan. The City of San Antonio held an election on August 13, 1994 to reauthorize the Applewhite Project as a component of the 2050 Plan. The citizens of San Antonio voted not to reauthorize the Applewhite Project and those elements of the 2050 Plan were deleted from the Trans Texas Phase 1-A Study.

The Phase 1-A study includes modifying the surface water availability computer model so that it can calculate the potential yield of Canyon Lake under various hydrologic and water rights scenarios. The original scope of work was developed under the assumption that these calculations would be performed on a monthly timestep in the model. After work on the model modifications started, it became evident that the water availability needed to be calculated on a daily basis to properly account for instantaneous hydro power release requirements. The scope of work was adjusted to accomplish this additional computer modeling. The schedule for the Phase 1-A study was extended one month in order to accommodate the additional modeling work.

The Phase 1-A study draft report is scheduled to be completed by October 31, 1994 when it will be distributed to the Advisory Committee for review. We plan to schedule an Advisory Committee meeting in late November to discuss the report and receive comments and the Policy Management Committee will review the comments at a meeting in December.

If you have any questions, please contact me at (210) 227-1373.

SJR:rmc
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The Newsletter of the Highland Lakes Group

Water Matters

Volume 1, Number 5 October, 1994

Preparation for Trans-Texas: the Taking of Section 16.052

For the benefit of new readers, the Trans-Texas project is a state-wide program designed to provide water to the cities of San Antonio, Corpus Christi, and Houston. These cities are expected to have less water than they will need to support their economic growth at various times in the future.

The Trans-Texas Project is in the process of evaluating some 40 alternative means of providing water to San Antonio. These include new reservoirs, new water wells, water reuse, and conservation. Also included, and high on the priority list, are transfers of water from the Colorado basin.

Earlier editions of **Water *Matters*** have discussed the problems residents of the Highland Lakes counties find with inter-basin transfers from the Colorado River. These include the provision in the Texas Constitution which prohibits the use of state funds for water projects when there will be a need for that water in the donor basin within 50 years. Another is the fact that these cities have been lax in approving local water supply projects. Their half-hearted efforts at water conservation are best illustrated by the fact that water rates in each city are among the lowest in the state.

This article will look back at the year 1991, and examine a bill passed by the Texas Legislature that year. Since 1965, the Texas water code contained a provision (section 16.052) which prohibited the consideration of inter-basin transfers in state

(Continued next page)

Update on the Trans-Texas Project

Readers of **Water *Matters*** are aware that the Trans-Texas project is an effort to provide additional water for the cities of San Antonio, Corpus Christi, and Houston which are each expected to run short of water at various times in the future. The project is sponsored and funded by the Texas Water Development Board (TWDB), with some contributions from the cities and river authorities.

The study is organized geographically into regions and on a time scale into phases. Phase 1 is a preliminary evaluation of a wide range of alternative water sources, done by an engineering consulting firm. Each alternative is evaluated on the basis of the quantity of water available, the expected cost of the water, and the probable environmental impact. Phase 2 is intended to be a more detailed analysis of the best alternatives selected from Phase 1 by a management committee made up of representatives from each of

(Continued on page 5)

water plans.

Section 16.052

This section of the Texas Water Code, referring to the Texas Water Development Board, read, "The executive administrator shall not prepare or formulate a plan which contemplates or results in the removal of surface water from the river basin of origin if the water supply involved will be required for reasonably foreseeable water supply requirements within the river basin of origin during the next ensuing 50-year period, except on a temporary, interim basis."

Under this section of the state's water code, the Water Development Board (TWDB) was prohibited from even considering inter-basin transfers in their water planning unless there was no need for the water in the basin of origin.

"Burley's ditch" and the "50 year lockup"

In the mid-1960's, a predecessor program to Trans-Texas, called "Texas Basins Project," and nicknamed "Burley's ditch," proposed solving the state's water problems by massive transfers of water among Texas and Oklahoma river basins. Such discussions caused so much apprehension among Texas voters that the East Texas legislative delegation was able to pass several statutes which effectively stopped the talk about inter-basin transfers. These were statutes which **prohibited the use of state funds** for water projects which financed or "aided" any project which involved inter-basin transfers where the water was needed in the basin of origin within a 50 year time span (Water Code sect. 15.004). Another provision **stopped any planning** of water projects involving inter-basin transfers (Water Code section 16.052).

Finally, the Texas Constitution was amended (Art. III, Sect. 49d), also prohibiting the use of state money for inter-basin transfer projects.

These statutory and constitutional measures were called by their opponents the "50 year lockup." New pleas in the 1980's for additional water by growing cities in South Central Texas made the water planners at TWDB decide that the 50 year lockup had to go.

But had the political climate changed in favor of inter-basin transfers? Not necessarily. In order to avoid the public outcry and legislative opposition which had defeated "Burley's ditch," the state water planners decided to try some deception on those legislators whose constituents would stand to lose by a new program of inter-basin transfers.

Trojan horse - SB1059

During the months of April and May, when the Legislature is in session, bills are stacked up in committee, and bill sponsors are trying to make the deadline for floor votes before the end of the session. The sponsors of Senate Bill 1059 chose this most congested time of the 72nd legislative session to bring the bill before the two Natural Resource Committees.

S.B. 1059 appeared, on the surface, to be a bill intended to clean up a number of routine administrative matters at the Water Development Board. It contained 10 sections, including deletions of obsolete position titles, changes in definitions, and other routine administrative changes to the Water Code.

In section 10 of the bill, two sections of the Texas Water Code were repealed. One of these sections, 6.182, created several positions no longer used by TWDB, and

(Continued next page)

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its repeal was another routine administrative matter. The other, section 16.052, was the provision of the water code blocking the TWDB from the consideration of inter-basin transfers in their water plans.

Senate Bill 1059 was first heard by the Senate Natural Resources Committee. The bill was among more than a dozen bills heard by the committee on April 24, 1991 at their 2:00 p.m. meeting in the Lieutenant Governor's committee room.

The bill's sponsor, Senator Sims, relinquished the chair and was recognized to explain the bill. Senator Sims said, "The bill clarifies the role of the Texas Water Development Board in administering its financial assistance programs. That's basically what it does."

The Chair recognized three resource witnesses from the TWDB; Suzanne Swartz, Legal Counsel; Tommy Knowles, Assistant Director; and Jack Fickessen, Operations Manager.

Fickessen explained the purpose of Senate Bill 1059. "This bill tries to bring the water code more in line with where the Water Development Board is today."

So the bill was intended to bring state law in line with agency thinking. We were always under the impression that the legislature passed laws that set state policy, which was then executed by the agencies. Apparently we had this turned around.

Fickessen continues: "When the Board and Commission split apart in 1985, several provisions were left in the code which are no longer being utilized by the Board, or were put in the water code as a result of that splitup. We are trying to correct those changes.

The second thing is that this bill will allow the Board to expand its financial programs - primarily from legislative oversight, probably on our part, to allow the bond insurance program to be utilized by private non-profit or supply corporations utilizing the Board's programs similar to the other financial programs they are able to access."

Although we are not experts in bureaucratic doublespeak, it appears that Mr. Fickessen neglected to inform the committee that his bill, in addition to its numerous routine administrative changes, contained the most important policy change in the Texas Water Code in several decades.

Fickessen satisfied one senator who wondered if the bill would delay the implementation of the colonias project, and the testimony on S.B. 1059 ended. The committee voted unanimously to report the bill favorably to the full Senate.

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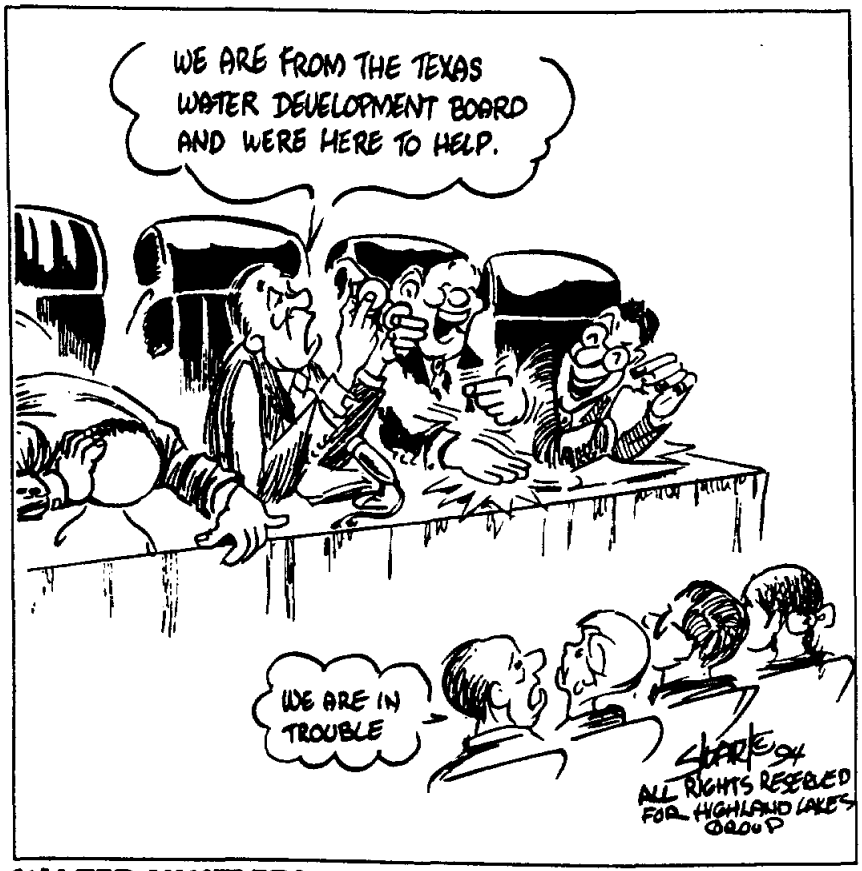


WATER HUSTLERS

Preparations (Cont.)

The next step was for the bill to be considered by the full Senate. Senator Sims arranged for S.B. 1059 to be included on the "local calendar" of the Senate. Bills assigned to the local calendar are normally those which apply to only a single city, county or hospital district, and which the full Senate does not need to concern itself with.

Although repeal of the ban on inter-basin water planning was anything but a local matter, S.B. 1059 was placed on the local calendar, and passed by the Senate on May 3rd with only two Senators present.

The House Considers S.B. 1059

Senate Bill 1059 was accepted unanimously by the House Natural Resources Committee without testimony, questions, or comments from any member, on May 14th, 1991. It was passed unanimously by the House on May 20th. The bill was signed into law on May 23rd, removing the only obstacle to the Water Development Board's plans for state-wide water transfers.

How did it happen?

How is it possible that the most important and most controversial change in Texas water law in 30 years could go through both houses of the Legislature, and both Natural Resource committees without a single dissenting vote, without debate, without questions from legislators, without any public input, and without testimony from other than the sponsoring agency? The answer is for the insiders to know and for the rest of us to wonder about.

No one involved wants to talk about S.B. 1059. Individual legislators fell into two categories. A small number apparently knew what was in the bill and chose to keep the information secret from their colleagues. Most of the legislators apparently did not know what was in the bill and voted for something they did not understand, and which may have been damaging to their constituents. In either case, they are understandably reluctant to discuss the matter.

The best guess is that a small group of insiders in each house worked with the TWDB staff to arrange the subterfuge, while most of those legislators voting for the bill in committee and on the floor did not know that it contained the repeal of the ban on inter-basin transfer planning.

Passage vs. repeal

There is a dramatic difference between the situation in 1965 when Section 16.052 was passed by the legislature and the repeal of the law in 1991. In 1965, there was a great deal of publicity and public debate about the Texas Basins Project--in 1991, no publicity. In the sixties, there was a heated debate in the legislature over the issue - in 1991, no debate. When the bill was passed in 1965, 97% of the Senators and 79% of state Representatives *favored* the ban on inter-basin transfers in state water planning; in 1991, the vote was unanimous *against* the ban on inter-basin transfers. But we will never know how the vote would have gone if the issue had been openly debated instead of being hidden and passed surreptitiously.

Conclusions

One has to admire the skill with which the TWDB staff manipulated the legislature in repealing section 16.052. It was so easy, in fact, that it is likely that they will try in the next session of the legislature to remove the other statutory and constitutional provisions which are hostile to inter-basin water transfers.

We hope that our elected representatives will be alert for another move by TWDB to repeal section **15.004 of the water code** and **article 3, Sect. 49-d of the Texas Constitution**. These two measures prohibit the use of state funds for inter-basin transfer projects unless the water is not needed in the donor basin for the next fifty years.

In corresponding and speaking with your elected representatives in the Legislature, you might consider

(Continued next page)

Preparations (Cont.)

mentioning the importance to you of these two parts of the Texas water law.

A second conclusion which may be drawn from the way in which the repeal of section 16.052 was handled is that the repeal effort would probably have failed if it had not been treated as "stealth" legislation. If a majority of legislators in 1991 favored inter-basin transfers, then the repeal of section 16.052 could have, and very likely would have been treated as a normal piece of legislation, capable of surviving public scrutiny, legislative questioning and debate. ❐

Update on Trans-Texas

(Continued from page 1)

the state, regional, and local agencies involved.

Corpus Christi

The Corpus Christi region is well ahead of the other regions of Trans-Texas. C.C. has completed Phase 1 which had some 16 alternatives, and "boiled them down" to 22 alternatives for Phase 2. There seemed to be no incentive to eliminate any of the alternatives from consideration; and, in fact, more were added for detailed study in Phase 2. State funding is apparently no problem for Trans-Texas, and without that constraint, there was no reason to "boil down" the scope of the project for Phase 2.

The Corpus Christi region is considering such new water supply alternatives as conservation, wastewater reuse, new reservoirs, desalinization, and inter-basin transfers.

The alternative in the Corpus Christi region, which will affect the Highland Lakes, is the proposed pipeline from Corpus Christi via Lake Texana which would transport water from the Colorado River south of Garwood, Texas to Corpus Christi. The City of Corpus Christi already has a contract with Garwood Irrigation Company for the purchase of 35,000 acre-ft. of Garwood's senior water right which is surplus to Garwood's needs as a rice irrigator.

Corpus Christi just received a grant and low interest loan from the TWDB totaling some $812,000 to pay for the consulting work to be done in Phase 2. The City of Corpus Christi is having some difficulty raising the money to buy the Garwood water, however, and this will be the subject of a future article in **Water *Matters.***

San Antonio

In the San Antonio region, the Phase 1 report examined some 40 alternative water sources for the city, including three involving inter-basin transfers from the Colorado basin. These include a pipeline from Lake Travis down I-35 to San Antonio, and a pipeline from Columbus to San Antonio, originating at either a new on-channel reservoir, or a new off-channel reservoir. A fourth alternative proposed by the Edwards Underground Water District was a new reservoir at Mason, TX on the Llano River. This alternative has been dropped because neither the EUWD nor its Trans-Texas partners chose to fund the study of a Mason reservoir.

So far as we know, this is the only alternative which has been dropped from consideration in the Trans-Texas project from among the hundreds of alternatives being considered.

The management committee from the S.A. region will consider the information learned from the consulting report from Phase 1 and make some decision this fall about the scope of work to be done in Phase 2.

Unfortunately, the Colorado River alternatives appear from the preliminary economics to be among the least expensive ways for San Antonio to augment its water supply.

Meanwhile, in August, San Antonio voted to reject the mayor's "2050 Water Plan," which included the proposed Applewhite Reservoir. Like Corpus Christi, the San Antonio city administration is suffering from a credibility gap with the local voters on water initiatives involving tax increases.

(Continued next page)

Trans-Texas (Continued)

Houston

The Houston region is considering the results of its Phase 1 consulting report and will be choosing which alternatives from that report to study in depth in Phase 2. There seems to be some question as to whether the surplus water in extreme east Texas, which was to be available for transfer elsewhere in Texas, really exists.

Austin

A Phase 1 report for the City of Austin has been completed, looking at possible transfers of water from the Brazos River and the purchase of LCRA stored water rights from Lake Travis. Also being considered is the purchase of unutilized irrigation water rights downstream and the possible purchase of the rights to water now being used for an annual second rice crop. The City of Austin is in the best shape by far of the four cities in the study in terms of its future water supply. There is some reason to believe that Austin was included in the Trans-Texas project less because of any pending water shortage than for political reasons. As a program participant, the City of Austin is pacified, receiving some consulting help about its water alternatives at state expense.

Except for being a participant, the City of Austin could otherwise be expected to react negatively to water initiatives from other basins which threatened its own water supply and the welfare of the Highland Lakes.

Representatives from the Highland Lakes Group are members of the "Technical Advisory Committees" for each region having any alternatives which involve the Colorado basin. ❐

Need a program?

If your organization needs a program about a subject of vital interest to this area, why not invite a speaker from the Highland Lakes Group?

Call the HLG speakers bureau:

Jack Saunders
512/261-6336

Highland Lakes Group
711 Mariner
Austin, TX 78734-4342

November 28, 1994

Highland Lakes Group
711 Mariner
Austin, TX 78734-4342

Dear Sirs:

I am a member of the PROTECT LAKE BUCHANAN AND INKS LAKE ASSOCIATION, IN Buchanan Dam, Texas. I have some recommendations for helping San Antonio Water situation.

L. Build a series of check dams along Salado and Cibilo Creeks and drill wells to resupply the aquifer.

2. Plug off or cap all of the artesian wells in the area.

3. Use Mitchell Lake for irrigation.

4. Cut out the use of water for lawns and car washes.

5. There's no need to have potable water in system. Use bottled water in homes.

6. Re-cycle all water possible. We have wasted too much water in in the past.

Thank you,

Olen E. Miller

OLEN E. MILLER
P O Box 102
Buchanan Dam, TX 78609

TRANS-TEXAS WATER PROGRAM

SAN ANTONIO RIVER AUTHORITY 100 EAST GUENTHER STREET P.O. BOX 830027 SAN ANTONIO TEXAS 78283-0027

1.11-3.6-TAC

Local/Regional Participants

Austin

Bexar Metropolitan Water District

Brazos River Authority

Corpus Christi

Edwards Underground Water District

Guadalupe-Blanco River Authority

Houston

Lavaca-Navidad River Authority

Lower Colorado River Authority

Nueces River Authority

Sabine River Authority

San Antonio River Authority

San Antonio Water System

San Jacinto River Authority

State Agencies

Texas Water Development Board

Texas Natural Resource Conservation Commission

Texas Parks and Wildlife Department

December 14, 1994

TO: **Advisory Committee for Public and Technical Input**

FROM: **Steven J. Raabe, P.E., Project Manager**
San Antonio River Authority
Office: (210) 227-1373
Fax: (210) 227-4323

SUBJECT: **Trans Texas Water Program**
West Central Study Area
Phase 1-A Interim Report

The Phase 1-A Interim Report is in printing and will be available for distribution soon. Those committee members who received the Phase 1 Interim Report will automatically receive a copy of the Phase 1-A Interim Report. If other committee members would like to receive copies of either report, please contact me at the above address or phone number.

A meeting of the Advisory Committee for Public and Technical Input and the deadline for submitting comments will be scheduled when the report is issued.

Please contact me if you have questions.

SJR:rmc

cc: **Policy Management Committee**
Public Information Committee

P:\RMC\WPDATA\TRANSTEX\LTRS

TRANS 0-4
01-30-95-3

Coleman Rowland
711 Mariner
Austin, TX 78734-4342

January 26, 1995

Steven Raabe, Project Manager
San Antonio River Authority
P.O. Box 830027
San Antonio, TX 78283-0027

Dear Steve:

One of the chambers of commerce in the Buchanan Dam area asked me this week if they could get a copy of the HDR report showing the various alternatives being considered in the West Central Study Area of Trans-Texas. I guess that would be the Phase 1 interim report, vol. 1, dated May, 1994. If there are no more copies available, I could let them copy mine. The person requesting the report is:

Peggy Proctor
Poppy's Point Waterfront Resort
Rt. 1, Box 264
Buchanan Dam, TX 78609

If you have a copy, please send it direct to Ms. Proctor. Otherwise, let me know, and I will copy one for her.

On another matter, I am curious as to the rationale for dropping Applewhite from consideration in Trans-Texas. If all it takes is a negative referendum to have an alternative dropped, maybe we should place the San Antonio water pipeline on the ballot for this spring up here.

Regards,

Cole Rowland

1.11-3.8 TAC

TRANS TEXAS WATER PROGRAM
WEST CENTRAL STUDY AREA
ADVISORY COMMITTEE FOR PUBLIC AND TECHNICAL INPUT
PHASE 1-A INTERIM REPORT

SUBMITTED BY: RON ATNIP 103 BAMBRIDGE SA TX 78223 DATE JUN '95

COMMENTS:

- PROPOSES A SALTWATER DESALINIZATION PLANT IN CORPUS CHRISTI AREA
- RUN A TRANSMISSION LINE CARRYING "SWEET" WATER TO SAN ANTONIO
- PUT INTO EFFECT A $\frac{1}{2}$ CENT SALES TAX IN THE COUNTIES THE TRANSMISSION LINE EXTENDS THROUGH TO HELP PAY FOR COSTS, IN EXCHANGE FOR A PORTION OF THE WATER
- SAN ANTONIO FUND A $250,000 STUDY TO INVESTIGATE FEASIBILITY
- IF FEASIBLE, HIRE A CONSTRUCTION COMPANY EXPERIENCED IN HEAVY CONSTRUCTION, LIKE H B ZACHARY CO., TO BUILD PROJECT
- "ENDLESS SUPPLY OF WATER TO SAN ANTONIO AND AREAS TO THE SOUTH
- MR ATNIP IS IN THE DRYWALL CONSTRUCTION BUSINESS, AND HAS NOTHING TO GAIN OR VESTED INTEREST IN THE PROJECT, JUST CONCERNED FOR A RELIABLE SOURCE OF WATER FOR SAN ANTONIO

PLEASE ATTACH ADDITIONAL SHEETS IF NECESSARY.

PLEASE RETURN TO:

STEVEN J. RAABE, P.E.
SAN ANTONIO RIVER AUTHORITY
P.O. BOX 830027
SAN ANTONIO, TEXAS 78283-0027
(210) 227-1373
FAX: (210) 227-4939

TRANS-TEXAS WATER PROGRAM

SAN ANTONIO RIVER AUTHORITY 100 EAST GUENTHER STREET P.O. BOX 830027 SAN ANTONIO TEXAS 78283-0027

1.11-3.6-GC
1.11-3.6-PIC
1.11-3.6-TAC

January 5, 1995

TO: Policy Management Committee
Public Information Committee
Advisory Committee for Public and Technical Input

FROM: Steven J. Raabe, P.E., Project Manager
San Antonio River Authority
Office: (210) 227-1373
Fax: (210) 227-4323

SUBJECT: Trans Texas Water Program
West Central Study Area
Phase 1-A Interim Report

There will be an Advisory Committee meeting on February 10, 1995 at 2:00 p.m. at the San Antonio Water System Training Room located at 1001 East Market Street, San Antonio, Texas to discuss the West Central Study Area Phase 1-A Interim Report. If you have comments, you can turn them in at the Advisory Committee meeting or mail them to me by February 17, 1995.

There will be a West Central Study Area Policy Management Committee meeting to discuss the comments received on the Phase 1 Interim Report on February 24, 1995 at 9:30 a.m. at the San Antonio River Authority Boardroom located at 100 East Guenther Street, San Antonio, Texas.

If you have any questions, please contact me.

SJR:rmc

Enclosure

P:\RMC\WPDATA\TRANSTEX\LTRS

ocal/Regional Participants
City of Austin
Bexar-Medina-Atascosa WCID #1
exar Metropolitan Water District
Brazos River Authority
rushy Creek Municipal Utility District
anyon Lake Water Supply Corporation
City of Cedar Park
ity of Corpus Christi
.dwards Underground Water District
City of Georgetown
Guadalupe-Blanco River Authority
City of Houston
City of Hutto
Ionah Special Utility District
Lavaca-Navidad River Authority
City of Leander
.ower Colorado River Authority
Lower Neches Valley Authority
Manville Water Supply Corporation
Nueces River Authority
City of Pflugerville
City of Round Rock
Sabine River Authority
San Antonio River Authority
San Antonio Water System
San Jacinto River Authority
Williamson County

State Participants
Texas Water Development Board
Texas Natural Resource Conservation Commission
Texas Parks and Wildlife Department
Coastal Coordination Council

Federal Participants
U.S. Army Corps of Engineers
U.S. Bureau of Reclamation

Printed on Recycled Paper

1.11-3.6 TAC

TRANS TEXAS WATER PROGRAM
WEST CENTRAL STUDY AREA

ADVISORY COMMITTEE FOR PUBLIC AND TECHNICAL INPUT

February 10, 1995, 2:00 P.M.

AGENDA

I.	INTRODUCTORY REMARKS	Steven J. Raabe San Antonio River Authority
II.	UPCOMING EVENTS	Steven J. Raabe San Antonio River Authority
III.	CANYON LAKE/MID CITIES PLANNING AREA	Herb Grubb, PhD. HDR Engineering, Inc.
IV.	CANYON LAKE YIELD/WATER RIGHTS TRANSFER ANALYSIS	Sam Vaugh HDR Engineering, Inc.
V.	WATER SUPPLY ALTERNATIVES AND COSTING	Herb Grubb, PhD. HDR Engineering, Inc.
VI.	OPEN DISCUSSION	
VII.	CLOSING REMARKS	Steven J. Raabe San Antonio River Authority

1.11-3.6 TAC

TRANS TEXAS WATER PROGRAM
WEST CENTRAL STUDY AREA

ADVISORY COMMITTEE FOR PUBLIC AND TECHNICAL INPUT

FRIDAY, FEBRUARY 10, 1995

NAME	ORGANIZATION	ADDRESS	PHONE NO.	FAX. NO.
Greg Rothe	for EUWD	Box 668	426 5696	426 8666
Joe Cadwell	City of Austin	P.O. Box 1088	512 322-2965	322-2842
TOM BRADETON	SJWS		446-7419	446-7570
Thomas D. Hill	GBRA	P.O Box 271	379-5822	
Herb Grubb	HDR			
JERRY JAMES	CITY OF VICTORIA	BOX 1758 Victoria	572-2749	
Norma Postel	101 ARCADIA PL.	SATX 78209	828-3834	
Nick Wehe	EAWD	P.O. 15830 SA	222-2214	222-9872
L.D. Steadman	SAMfg Assn	7073 San Pedro	340-2216	340-5751
W.H. Mullins	Player Mgt	570 Broadway	828-5521	828-1277
Doug Miller	NBU	P.O. Box 311508 NBTX 78131	606-2000	8282
WARREN R FORD	SUNBEAM PROP. & ENVI SVCS.	226 NORTHCLIFFE SA 78209		
Bob Vaya	Protect Lake Travis	10801 Rush	266-2500	
COLE ROWLAND	CITY OF LAKEWAY	711 MARINER AUSTIN 78734		
Carol & Kirk Patterson		410 Larkwood	824-3407	824-0915

1.11-3.6 TAC

TRANS TEXAS WATER PROGRAM
WEST CENTRAL STUDY AREA

ADVISORY COMMITTEE FOR PUBLIC AND TECHNICAL INPUT

FRIDAY, FEBRUARY 10, 1995

NAME	ORGANIZATION	ADDRESS	PHONE NO.	FAX. NO.
[illegible]	Houston Lighting & Power	P.O.Box 1700 Houston 77251	(713) 945-8214	
Jim T. Hester	Evergreen U.W.C.D.	Box 155 Jourdanton		
Tom Culbertson	Reg. Clear. & Water	511 Westwood SA 78212		
Butch Bloodworth	TWDB	1700 N. Congress Austin	(512) 936-0880	(512) 936-0889
Catherine [illegible]	LWV-TX	7616 Royal Place Dallas 75230	(214) 368-7839	
Chip Fly	Uvalde Co. UWCD	P.O. Box 1419 Uvalde 78802	210-278-8242	278-1904
Bill West	GBRA	Seguin Tx	210-379-5822	
Con Mims	NRA	POBx349 Uvalde, 78802	210-278-6810	210-278-202[illegible]
Robert Wagner	NRA	Crystal City, TX 78839		
Parke Christenberry	Garwood Irr Co	Box 428 Garwood TX 77442	409-758-3221	409 758-33[illegible]
Stephen Densmore	TWDB	1700 N. Congress	9360556	
Judi Austen	HQ AETC/CEVE	266 F St. West Randolph AFB 78150-4321	652-2774	
Bruce A. Moulton	TNRCC	PO BX 13087 Austin 78711	512/239/4809	512/239-480[illegible]
Dennis Crowley	TWDB	1700 N. Congress, Austin 78711		
Brooke Gallman	Bu/Rec	300 E 8th St. Austin, Tx 78745		

1.11-3.6 TAC

TRANS TEXAS WATER PROGRAM
WEST CENTRAL STUDY AREA

ADVISORY COMMITTEE FOR PUBLIC AND TECHNICAL INPUT

FRIDAY, FEBRUARY 10, 1995

NAME	ORGANIZATION	ADDRESS	PHONE NO.	FAX. NO.
Liana Buckner	Medina Co UWCD		426-3162	
Hank Brummett	6400 El Verde Leon Valley		~~824-7401~~ 684-1391	
Sam Vaught	HDR	Austin, TX	512-912-5142	
ARTHUR E. POSSEL	101 ARCADIA PL. SA, TX 78209		828-3834	
KEVIN MAYES	TPWD	PO Box 1685	San Marcos TX	5127546844 353-3484
FRED PFEIFFER	SARA	PO Box 830027	San Antonio Tx 78283-0027	210 2271373
Steve Ramsey	SARA	"	"	"
Bill Johnson	CH2M Hill	45 NE Loop 410 #14	San Antonio	377-3081
Lalia L Nye	Channel 4 KMOL	1031 NAVATO	226-4444	
Jorge SAENZ	" "	"	"	

02-14-95-1

TO: MR. STEVE RAABE, PROJECT MANAGER
SAN ANTONIO RIVER AUTHORITY
100 EAST GUENTHER STREET
P.O. BOX 830027
SAN ANTONIO, TEXAS 78238-0027

FEBRUARY 13,1995

FROM: R.L. WRIGHT
WRIGHT CONSULTING
3904 JOHN STOCKBAUER
VICTORIA, TEXAS 77904

RE: COMMENTS ON T-TWP WEST CENTRAL STUDY AREA PHASE 1-A INTERIM REPORT

ATTACHED ARE MY COMMENTS ON THE REFERENCED REPORT. I WOULD ALSO LIKE TO POINT OUT THAT I ENDORSE THOSE COMMENTS SUBMITTED BY MR. BILL WEST FOR GBRA. I DO NOT HAVE AVAILABLE ALL OF THE DATA THAT WOULD BE REQUIRED TO CHECK GBRA'S CONCLUSIONS IN DETAIL, BUT THE END RESULTS CAN BE SUPPORTED BASED ON OTHER REFERENCES AND EXPERIENCE.

R. L. Wright

R.L. WRIGHT
2/13/95

FILE: T-TWP7

COMMENTS ON THE T-TWP
PHASE I VOLUME 3
BY R.L.WRIGHT*
FEBRUARY 10,1995

THE EFFORT TO BEST UTILIZE THE WATER RESOURCES OF THE STATE OF TEXAS IS AN OBVIOUS GOAL OF THE TRANS-TEXAS WATER PLAN. PHASE I VOLUME 3 IN IT'S DRAFT FORM DATED NOVEMBER,1994 IS A CONTINUATION OF THIS OBJECTIVE. A SIGNIFICANT PART OF THIS REPORT DEALS WITH WATER IDENTIFIED AS THOSE PERMITS ASSOCIATED WITH GBRA AND OTHERS LOCATED BELOW THE CONFLUENCE OF THE GAUDALUPE AND SAN ANTONIO RIVERS. I REPRESENT "AND OTHERS" (UNION CARBIDE CORPORATION) AND WOULD LIKE TO MAKE A BRIEF AND COOPERATIVE STATEMENT ON THIS SUBJECT.

UNION CARBIDE HAS A LONG HISTORY IN THIS STATE OF WORKING HARD TO BE A GOOD NEIGHBOR AND HAS RECOGNIZED THAT WATER RESOURCES ARE LIMITED. WE HAVE BEEN ACTIVE IN STATE AND LOCAL EFFORTS IN PLANNING FOR THE FUTURE AS OUR COMPANY GROWS AND AS OTHER WATER REQUIREMENTS DEVELOP. UNION CARBIDE AND GBRA HAVE WORKED TOGETHER TO BE SURE THAT WATER ALLOCATED TO US BY THE STATE PERMITTING PROCESS HAVE BEEN USED JUDICIOUSLY. WE PLAN TO CONTINUE THIS POLICY.

CO-OWNERSHIP OF THESE PERMITS REQUIRED SIGNIFICANT INVESTMENT ON THE PART OF UNION CARBIDE AT THE TIME OF OBTAINING THE RIGHTS. SIGNIFICANT INVESTMENT HAS BEEN REQUIRED ON THE PART OF THIS COMPANY FOR MAINTENANCE OF THESE RIGHTS OVER THE YEARS. UNION CARBIDE PLANS TO CONTINUE TO GROW. WE SUPPORT THE CONCEPT OF SHARING "EXCESS" PERMITTED WATER IF USED FOR EQUAL OR HIGHER QUALITY ASSIGNMENT. WE ALSO FEEL THAT WE MUST BE AND WANT TO BE INVOLVED IN THE DETAILED PLANNING FOR ASSIGNMENT OF ANY PART OF THESE PERMITS TO OTHERS.

***UNION CARBIDE CORPORATION**
SEADRIFT PLANT

1.11-3.6 TAC

TRANS TEXAS WATER PROGRAM
WEST CENTRAL STUDY AREA
ADVISORY COMMITTEE FOR PUBLIC AND TECHNICAL INPUT
PHASE 1-A INTERIM REPORT

SUBMITTED BY: TOM GULLERSON, HYDROLOGIST **DATE** Feb.10,1995

COMMENTS: 1. The Trans-Texas Water group does not support San Antonio's reported master plan. This is contrary to the report by Tom Bower of the Express-News Staff, in an article dated May 25,1994 .

2. The citizens of San Antonio rejected a proposed surface water plan, known as Applewhite; they probably would reject the Lake Dunlap ,Alternative G-27, shown on Figure 3.40-1 for the same reasons. The alternative G-26 ,near Gonzales, would be similarly wasteful of water and taxpayer's money.

3. More hydrologically and economically sound proposals utilizing the recharge capabilities of the aquifer have been overlooked.

4. The Edwards Underground Water District has numerous recharge recommendations which seem more desirable.

PLEASE ATTACH ADDITIONAL SHEETS IF NECESSARY.

PLEASE RETURN TO:

STEVEN J. RAABE, P.E.
SAN ANTONIO RIVER AUTHORITY
P.O. BOX 830027
SAN ANTONIO, TEXAS 78283-0027
(210) 227-1373
FAX: (210) 227-4323

5. The projections to the year 2050 with the degree of accuracy calculated by HDR are very improbable..

Tom Gullerson

THE REPORT BY TOM BOWER WHICH IS ENCLOSED, IS MISLEADING !

The so-called master plan was just a list of ideas; and several aspects of this list of alternatives were discussed and some were severely critized.

The Trans-Texas Water Program will receive any ideas, but it does not have the authority to support a city master plan.

Tom C

San Antonio Express-News Wednesday, [illegible] 1984 This page is a

Trans-Texas Water group supports city master [illegible]

By Tom Bower
Express-News Staff Writer

The city's proposed $321 million master water plan received a vote of backing Tuesday from planners overseeing the Trans-Texas Water Program.

Under the city plan, continued reliance on the Edwards aquifer for tap water would be reduced with the development of alternative water supplies, including the completion of the abandoned Applewhite reservoir and a series of water trades.

The Trans-Texas program is a long-range effort by the Texas Water Development Board and numerous other state and local agencies to evaluate existing and potential water supplies across South Texas.

Trans-Texas feasibility studies are centering in three areas: Southeast Texas, the Corpus Christi area and the Austin-San Antonio-Victoria corridor, also referred to as the west-central study area.

Members of the management committee overseeing the west central studies met Tuesday at the headquarters for the San Antonio River Authority and agreed to include the city's master plan proposals in the Trans-Texas effort.

Panel members also agreed to investigate two other alternatives.

One proposal to buy out all hydroelectric water rights in the lower Guadalupe River and thereby increase the amount of water that can be withdrawn from the river.

This proposal was suggested by Guadalupe-Blanco River Authority General Manager Bill West as a quicker and [illegible] up more water [illegible] for San Antonio [illegible] Sierra Club [illegible] week to take [illegible] Applewhite proposals.

The proposal [illegible] water pipeline to be constructed from the Guadalupe River at Gonzales to supply San Antonio.

The other proposal suggested by the Edwards Underground Water District, is to build a reservoir on the Llano River near Mason to provide an undetermined amount of water directly for city consumption or for recharging the Edwards aquifer.

Investigation of the four water supply alternatives is estimated to add at least $130,000 [illegible] price tag for the first phase of feasibility studies.

Comment:

Mr. Gerald Rolf submitted comments summarized below:

1. The PMC has endorsed the City of San Antonio's 2050 Plan. (in the Ex. Now

2. Requested deletion of the Cibolo Reservoir site near Stockdale in favor of the Upper Cibolo Site north of IH 35 in Bexar County.

3. Disagreed with the designation of Dam #7 on the Guadalupe River upstream of Canyon Lake as a minor reservoir. It should be considered on the same basis as other potential reservoir sites.

4. Stated that it was irresponsible that the Clopton Crossing Reservoir was not considered in the Phase 1 report.

Suggested Action:

Clarifications in response to Mr. Rolf's comments:

1. The PMC voted to evaluate the 2050 Plan using the Trans Texas environmental, economic and technical criteria. The PMC has taken no position in favor or against the plan.

2. The Upper Cibolo site in Bexar County is included in Alternative L-18 as proposed and studied by the Edwards Underground Water District. The nature and extent of future studies of the Cibolo site near Stockdale will be determined in the development of the Phase 2 scope of work.

3. Dam #7 was designated as a minor reservoir project because of the impact that Canyon Lake has on the availability of water in the Guadalupe Basin upstream of Canyon Lake. However, the nature and extent of future studies of Dam #7 will be determined in the development of the Phase 2 scope of work.

4. Clopton Crossing dam site is included in Alternative L-17 as proposed and studied by the Edwards Underground Water District.

Comment:

Mr. Tom Culbertson submitted some general comments concerning conservation and other issues.

Suggested Action:

These comments are noted and accepted for the record.

THE UPPER CIBOLO CREEK
RESERVOIR PROJECT

101 ARCADIA PL. #507 SAN ANTONIO, TEXAS 78209 (210) 828-3834

February 13, 1995

Steven J. Raabe, P.E.
San Antonio River Authority
P.O. Box 830027
San Antonio, Texas 78283-0027

Dear Mr. Raabe:

Enclosed herewith is a copy of my comments related to the West-Central Study Area of the Trans-Texas Water Program. For your convenience if duplicates are made, an identical first page is also enclosed which will reproduce with greater clarity.

Sincerely yours,

Arthur E. Postel

ccs:

Joe Aceves, P.E.
President of SAWS

Gene L. Ames, III
Geologist

Kenneth Armbrister
State Senator

Rebecca Quintanilla Cedillo
Vice President of SAWS

Frank J. Corte, Jr.
State Representative

Tom Culbertson
Hydrologist

Ruben Espronceda
Thelma Neighborhood Assoc.

Herb Grubb, PhD.
HDR Engineering, Inc.

Hans R. F. Helland
Geologist

Sterlin Holmesly
E-N Editorial Director

Rick Illgner
General Manager, EUWD

Ron E. Lewis
State Representative

Robert A. Nicol, P.E.
Malcolm Pirnie, Inc.

Stanley L. Perkins, Jr.
Geologist

Fred N. Pfeiffer
General Manager, SARA

Gary L. Powell, Chief
Environmental Section, TWDB

Paul L. Rettman
Hydro-geologist

Ciro D. Rodriguez
State Representative

ccs (Cont.):

E. Gerald Rolf
Geologist

Robert J. Scott
Geologist

Carlos F. Truan
State Senator

O.J. Valdez
Malcolm Pirnie, Inc.

Sam Vaugh
HDR Engineering, Inc.

George Veni
Hydro-geologist

Nelson Wolff, Mayor
City of San Antonio

1.11-3.6 TAC

TRANS TEXAS WATER PROGRAM
WEST CENTRAL STUDY AREA
ADVISORY COMMITTEE FOR PUBLIC AND TECHNICAL INPUT
PHASE 1-A INTERIM REPORT

SUBMITTED BY: Arthur E. Postel **DATE** 2/14/95

COMMENTS: CANYON LAKE & CIBOLO CREEK: Conjunctive action between Canyon Lake and Cibolo Creek has the potential to meet the water requirements of all the parties at interest.

THE UPPER CIBOLO CREEK RESERVOIR: An excellent dam site on Cibolo Creek at coordinates N 29° 38'42" and W 98° 20'49" could impound water up to 150,000 AF. At this capacity its average depth would be 44 feet. Only 5 existing reservoirs in Texas have a greater average depth to minimize evaporation. To distinguish this proposed reservoir from one on Cibolo Creek in Wilson County, it has been designated the Upper Cibolo Creek Reservoir (UCCR).

SOURCES OF WATER FOR TERMINAL STORAGE: The drainage area of the UCCR is 258 square miles. While significant, it is not large enough for a reservoir that could fully utilize the potential of this site. Because of its topography and proximity to San Antonio, the UCCR site is the best location for terminal storage of water imports into Bexar County. Transfer of flood water and available conservation storage from Canyon Lake to the headwaters

PLEASE ATTACH ADDITIONAL SHEETS IF NECESSARY.

PLEASE RETURN TO:

STEVEN J. RAABE, P.E.
SAN ANTONIO RIVER AUTHORITY
P.O. BOX 830027
SAN ANTONIO, TEXAS 78283-0027
(210) 227-1373
FAX: (210) 227-4323

of Dripping Springs Creek would require but 6½ miles of pipe. From there it would flow into Lewis Creek and into Cibolo Creek and the UCCR. A small reservoir on the Blanco River at an excellent site upstream from Clopton Crossing would avoid housing in the area and require but 2½ miles of pipe to transfer its firm yield to the headwaters of Jacobs Creek which flows into Canyon Lake. Additional water from Canyon Lake could be incrementally provided from other proposals such as Dam #7 on the Guadalupe River and a reservoir on the Llano River near Mason which combined would eventually reach out to an extensive drainage area of some 4,750 square miles. These additional sources of water from Canyon Lake would be developed as needed; and, given the vagaries of nature, even during drought, the chances of gathering rainfall would be greatly enhanced from an ever more extensive and relatively pristine area.

SPRINGFLOW PRESERVATION BY AQUIFER RECHARGE AT CIBOLO: Both the character of this area and the miles of tumbling over the stream beds leading to the UCCR will render a natural purity to its water. Such purity is requisite for recharge.

The water impounded on the downthrown block of Bat Cave fault, which crosses Cibolo Creek, will be on the recharge zone of the Edwards Aquifer. Recharge can be direct and controlled at a point just "upstream" in the aquifer from the springs where correspondence with Comal Springs can be determined by 3-D seismic imaging; and, if found insufficient, can be established by drilling to the aquifer from the Cibolo Creek bed. At this point the aquifer narrows; and, with significant head behind the pure hill

country water in the reservoir, the aquifer will tend to mound, its hydraulic gradient will steepen toward the springs, level toward San Antonio permitting greater withdrawal of water, and hold in check the bad water line near the springs by the pressure and purity of the recharge water. This scenario is based on the properties of water and its hydrology, and there is no study of the aquifer formation in the critical area of Cibolo Creek and Comal Springs by which it could be refuted.

NATURAL BRIDGE CAVERNS: In 1989, consulting geologist Robert J. Scott considered the relationship between Natural Bridge Caverns and Cibolo Creek. His report showed that an impoundment on the creek bed above Bat Cave fault would be on the impermeable upper Glen Rose formation in which the caverns are formed. The creek bed is at 900 feet MSL at its closest point to the caverns, but their historical high water mark is 860. If infiltration from the creek could occur, water in the caverns would have been far above 860. His stratigraphic cross-section from the creek through the caverns to the dam site showed that local rains form a "perched" water table in the caverns on the upthrown block of Bat Cave fault. Water released to the downthrown block could not rise to the caverns because of the aquifer's lateral permeability. His report is , of course, available for detailed study.

TELEMETRY: As shown above, rainfall from a wide area north of San Antonio can be made available for terminal storage in the UCCR where it can recharge the aquifer to preserve springflow and enable the City to withdraw greater amounts of water from its

historic source. To coordinate the various elements of rainfall location and amount, reservoir levels, pipe line and pumping capacities, water demand, and springflow levels; telemeters would be installed to relay these data to a central system of servocontrols which would transmit the proper signals to the electrically operated pumps for their appropriate response and to the underwater valves for their releases to the aquifer. The San Antonio Water System (SAWS) would monitor the operation as the focal point of San Antonio's alternative water supply.

FINANCE: The $75 million cost estimate of the UCCR at full size development is derived from the U.S. Army Corps of Engineers cost estimate for Clopton Crossing Lake reduced to that of a comparable-sized reservoir and escalated to current price levels by Corps indices. Ancillary facilities, including the Blanco River diversion, could reasonably keep the total cost to within $110 million.

The UCCR proposal would enable SAWS to meet its water demands from the aquifer without a new delivery system which is estimated to cost an additional $87-91 million for other surface water proposals. Compared to these, SAWS is far more likely to finance the UCCR system from its new and current rate structure without a rate increase because aquifer water is so valuable to the San Antonio Water System.

CONCLUSION: Over the past six years, the UCCR proposal has been presented to the City Council of the City of San Antonio, the San Antonio Water System, the Edwards Underground Water Dis-

trict, the U.S. Army Corps of Engineers, the San Antonio River Authority, the 2050 Water Resources Committee, the Environmental Section of the Texas Water Development Board, the Center for Research in Water Resources of the University of Texas at Austin, HDR Engineering in Austin, the San Antonio Express-News, and other San Antonio papers. No word on the proposal has been published, and learned studies have either confused the UCCR with a proposed Cibolo Creek reservoir in Wilson County or with 7 proposed small structures on Cibolo Creek which were examined for recharge in an uncompleted draft study by Espey, Huston & Associates.

The near conjunction of Comal Springs, Cibolo Creek, and Canyon Lake lends itself to the optimum development of the Edwards Aquifer to meet the water requirements of all the parties at interest and at the least cost. Furthermore, as a premise to the following recommendation, it should be clearly understood that the federal courts have not ordered pumping limitations from the Edwards Aquifer, Sierra Club v. Babbitt, 995 F.2d 571 (5th Cir.). Consequently, the Upper Cibolo Creek Reservoir proposal should be critically examined and physically tested and the results published before other steps are taken.

Arthur E. Postel
Retired Professional Civil Engineer
And Municipal Bond Specialist

101 Arcadia Place
San Antonio, Texas 78209-5857
(210) 828-3834
FAX: (210) 822-1140

A. Kaake

GBRA

GUADALUPE-BLANCO RIVER AUTHORITY

February 13, 1995

Fred Pfeiffer, General Manager
San Antonio River Authority
and Administrator, West Central Study Area
Trans Texas Water Program
P.O. Box 830027
San Antonio, TX 78283

Gentlemen:

The Guadalupe-Blanco River Authority has reviewed Phase 1 Interim Report, Volume 3 dated November 1994 for the West Central Study Area and offer the following comments:

Comment 1
In Sections 3.40, 3.41 and 3.42, firm available water from the Guadalupe River Basin was determined based on the assumption that water would be withdrawn from the Edwards Aquifer at a constant rate of 368,000 acft/yr throughout the period of record. This level of withdrawals does not protect Comal or San Marcos springflows at all times as ordered by the Court. At this level of withdrawal, both springs would cease flowing during a repeat of the drought of record. Comal Springs would have no flow for several years.

We request in Phase II the development of a withdrawal management plan which provides protection at all times to both the Comal and San Marcos springflows, so that springflows never drop lower than the minimum levels ordered by the Court. All surface water modeling should be based on the anticipated springflows resulting from this management plant.

Comment 2
The surface water modeling performed for this report (Phase 1A) utilized estimated springflows based on the TWDB GW-SIM groundwater model.

The groundwater model has a tendency to underestimate springflows, especially at lower springflow levels, and especially at the San Marcos Springs. The results of the model may therefore significantly underestimate the flows available for diversion at Gonzales during a repeat of the drought of record.

We request that prior to Phase II, efforts are undertaken to better calibrate the GW-SIM model. Without realistic springflow it will be difficult to select the appropriate alternative. In addition to calibration, effort should also be initiated to obtain better recharge and pumpage data. The EUWD has made some progress recently in this area but much more is needed. With the present level of accuracy of the input data, springflow estimates are marginal at best and correspondingly this makes the accuracy of the surface water analysis less than desirable.

Comment 3

Sections 3.40 and 3.41 conclude that there is 10% difference in the amount of firm water available at the Dunlap diversion versus the Gonzales diversion. See Table 3.40-2 and Table 3.41-2. This purported difference is mainly due to the way the model handles channel losses, which overall may be on the order of 10%. It is not at all appropriate to assume a proportionate channel loss for all run-of-river water and all stored water that flows through the reach between Dunlap and Gonzales. It is highly likely that the loss is not linear - in other words, low river flows probably lose a much higher percentage than higher flows. Some of the run-of-river water physically available at Dunlap must be allowed to continue to Gonzales to maintain minimum instream flows and to honor water rights (other than hydro) in the reach between Dunlap and Gonzales, and then some of that water must be allowed to pass Gonzales for instream flow and bay and estuary purposes and to honor rights downstream of Gonzales. Additionally, substantial amounts of stored water will have to be released from Canyon Reservoir during dry conditions and delivered to diversion points downstream of Gonzales. Based on reasonable, non-linear loss assumptions, virtually all or most of the channel losses in this reach should be assigned to the water that must be allowed to flow in this reach anyway. Accordingly, the incremental losses assumed for water diverted at Gonzales should be substantially less than 10%.

We request, in Phase II, a reevaluation of channel loss assumptions.

Comment 4

Early in the planning process for Phase 1-A, it was agreed to model the basin with the subordination of certain major hydroelectric rights and once-through cooling water rights along the Guadalupe. Subordination of these rights allows greater flexibility from the standpoint of maximizing water

availability. We assume that the owners of these rights will be compensated as part of the subordination process. GBRA has agreed to consider the subordination of its hydropower rights. We are not aware of how other owners stand on this issue but we are confident that the others will also expect some type of compensation.

Comment 5

In Sections 3.40 and 3.41, consideration was given to the transfer of the 20,000 acft/yr run-of-the-river diversion rights and the 6,000 acft/yr of Canyon yield, both of which provide make-up water for cooling purposes at CP&L's Coleto Creek power plant. This scenario examined the possibility of mitigating the potential shortfalls in cooling water needs by a firm commitment to supply equivalent amounts of wastewater return flows from the City of San Antonio. It should be noted that an effective Edwards regulatory system and various state and federal permits or permit amendments will be needed to make such a trade work. GBRA and, to GBRA's knowledge, CP&L have not yet been presented with or evaluated any comprehensive and complete plan for such a transfer.

Comment 6

GBRA believes that the minimum instream flow, and bay and estuary inflow assumptions used thus far are too high. The actual requirements that will be imposed are likely to be much lower. A requirement that minimum flow conditions must be reconsidered periodically (e.g., every 20, 30 or 40 years) may encourage quick consensus on more reasonable initial conditions. Using more reasonable assumptions for the initial conditions may show other alternatives to be more attractive, by showing more water available on a firm basis at lower unit costs. Use of more realistic assumptions could also result in reordering the alternatives in terms of comparative yields and/or costs per acre-foot.

We request that the assumed minimum instream flow and bay and estuary inflow requirements be revised in Phase II to more accurately reflect the requirements that are likely to be acceptable today to applicable state and federal agencies. We would be pleased to assist you in developing reasonable assumptions for the Guadalupe River Basin.

Comment 7

The surface water modeling with the exception of Canyon yield calculations does not include any wastewater return flows from the City of San Antonio. It was agreed this would produce a conservative view of the available water within the Guadalupe Basin. For reconnaissance level planning such as that

performed in Phase I and IA, GBRA believes this approach is appropriate. For more refined analysis of Phase II this is not a realistic approach considering in-stream flow and bay and estuary requirements.

Comment 8

GBRA is of the opinion that the SAWS regional management plan is not the most effective approach to protecting the Edwards Aquifer and Comal and San Marcos springflows. The SAWS regional management plan attempts to levelize withdrawals from the Aquifer throughout the year by diverting surface water to meet the peaks which occur mainly in the summer months. However, during low rainfall periods, the summer months provide little excess run-of-river flows, thereby requiring most of the surface water to come from storage during those times. It would appear that a plan which maximizes diversions of available run-of-river surface flows at all times throughout the year would provide the most benefit for the Edwards Aquifer. Such a plan would also conserve valuable stored water supplies to the extent possible, so that more stored water will be available for everyone during severe droughts.

Comment 9

GBRA agreed to the study of transferring 40,000 acft/yr of GBRA Calhoun Canal Division rights upstream to Gonzales and, possibly, to Dunlap. HDR modeled these possible transfers with and without Trans-Texas environmental criteria due to differences of opinion among the participants on the correct approach. It is GBRA's opinion that the upstream movement of diversion points for existing water rights should not be subjected to any environmental screening criteria for minimum bay and estuary requirements. Additionally, the extent to which instream flow requirements might be applied to new upstream points for existing rights should be carefully evaluated, based on the facts and circumstances of each proposed amendment. We would be pleased to assist you in such evaluations for alternatives in the Guadalupe River Basin.

Also note, transfer of Calhoun Canal System water rights will require some type of compensation.

Comment 10

Section 3.40 and 3.41 examined firm availability utilizing a combination of Canyon conservation storage, CP&L Coleto Creek transfer, and GBRA Calhoun Canal System rights transfer. Additional analysis was performed by HDR including combining unappropriated waters at Dunlap and San Marcos. The results are found Appendix H under Tables H-1 and H-2. These results should be in the main body of the report. The results show a substantial amount of water can be made available at Gonzales, especially if

more realistic environmental criteria are applied to the unappropriated water.

Comment 11

It should be noted that only a portion of the remaining Canyon yield can be used for out-of-basin use. The analysis performed in Phase 1A assumed full utilization of the remaining yield (whatever it turns out to be) outside the basin. This scenario was run for information purposes only. Full utilization of the remaining yield outside the basin is not an option, because a substantial portion of the remaining yield is needed to satisfy projected increases in demands in the basin.

Sincerely,

W.E. West, Jr.
General Manager

DAVID A. TODD
709 EAST MONROE STREET
AUSTIN, TEXAS 78704-3131
512-442-3130

17 February 1995

Statewide Policy Management Committee
Trans-Texas Water Program
San Antonio River Authority
100 East Guenther Street
San Antonio, Texas 78283-0027

To the Committee Members:

I won't be able to attend the Policy Management Committee meeting on February 24 when you are slated to discuss the West Central Study Scope of Work. Since I won't be able to personally bring up some of my concerns about the proposed Study, I'd appreciate it if you would consider these written remarks and enter them in the record.

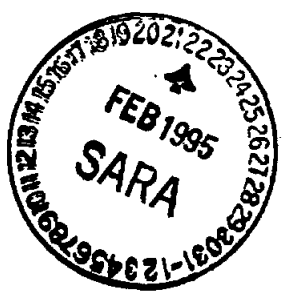
My basic difference with the Study's proposed Scope of Work is that there seems to be no in-depth consideration of the potential for aggressive reductions in water demand. My understanding is that many of the opportunities for water conservation are available with existing, off-the-shelf, cost-effective measures. Yet I hear that the water demand projections that are driving many of the supply options within the Scope of Work include very modest conservation-related demand reductions. I would think that it would be of the greatest importance to assure that the demand figures were the very lowest possible before embarking on expensive and controversial plans for expanding required supplies. These demand-related questions will certainly be asked when the final Trans Texas proposals are issued, and it would be good to be prepared.

In sum, I would urge that the Policy Management Committee include as Item 1, to be completed before all other study parts, a review of all conservation options. This review should look at the water savings possible, their acre-foot cost (in a format that would allow easy comparison with supply options' construction and O&M expense), the timing for their implementation, the cost-share or rebate possibilities for public financing of private conservation work, and any conservation aspects that may be peculiar to a particular segment of demand (such as municipal, agricultural, and industrial).

Thank you for considering my views. I look forward to hearing what your positions are on these issues.

Sincerely,

David Todd
Member, Advisory Committee on Public and Technical Input



[redacted]

EDWARDS UNDERGROUND
WATER DISTRICT

2.5-2.3-6.5-1

February 21, 1995

Mr. Steve Raabe
Project Manager
San Antonio River Authority
P.O. Box 830027
San Antonio, Texas 78283-0027

Subject: Phase I Interim Report - Volume 3
West Central Study Area, Trans Texas Water Program

Dear Mr. Raabe:

Please accept the following comments from our review of the subject report.

Canyon Lake Mid-Cities Area

1. Any alternatives proposed for examination in Phase II that propose moving water from west to east such as the Canyon Lake to Kyle/Buda area should be seriously questioned as running counter to the general concept of east to west movement of water embodied in the Trans Texas Water Program. The area in question may be better served from the Colorado River.

2. We note that 8740 acre-feet of Canyon Lake firm yield assigned to Canyon Regional Water Authority is not presently under contract and could be counted as uncommitted firm yield.

3. We concur in the expectations of the report that industrial demand projections for the Lower Guadalupe Basin will be lower than those presently offered by TWDB.

1615 N. ST. MARYS - P.O. BOX 15830
SAN ANTONIO TEXAS 78212-9030
210-222-2204
FAX 222-9869

Guadalupe River Water Transfers

1. We note that channel losses erode the firm yield of Canyon Lake as it is delivered downstream indicating that Canyon Lake firm yield should be diverted at Lake Dunlap, not sent downstream to Gonzales and returned to the North Water Treatment Plant. Run of river flows may be diverted at Gonzales, taking advantage of the larger drainage area in conjunction with Canyon Lake firm yield taken at Lake Dunlap.

2. The water rights proposed for transfer from the Lower Guadalupe River to the lake Dunlap and Gonzales diversion points are valued at $49.00 per acre-foot in the cost estimate. The consultant indicated that these rights were priced so because the lower basin rights are almost firm and Canyon Lake water is priced at $56.00 per acre-foot. The 40,000 a-f is part of 172,500 a-f of rights. Is it the first part or the last part? If it is the last part it may not be as firm as the rest and may be overpriced in this analysis.

SAW Reclaimed Water Transfer

1. The analysis indicates that Coleto Creek will not be made whole with the substitution of SAWS wastewater return flows. This problem, unless solved, will be an impediment to this alternative.

2. The financial analysis of this alternative should include a payment by CP&L for the SAWS wastewater supply at least in the amount of the current payment for Canyon lake firm yield after the problem noted in 1. above is solved.

3. SAWS wastewater return flows not used for rescue in San Antonio for Braunig, Calavaras and Coleto cooling reservoirs and reaching the confluence of the Guadalupe and San Antonio rivers were not counted in this analysis as being available to meet water rights below the confluence. This understates the availability of water at the Lake Dunlap and Gonzales diversion points, through probably not appreciably during the worst droughts years.

If any of these comments need clarification or further explanation prior to being included in the record of comments on Volume 3, please call us.

Sincerely,

Rick Illgner
General Manager

RI/mec
cc: Greg Rothe
ri020

TRANS 057
02-27-95 -3

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Ecological Services Field Office
10711 Burnet Road, Suite 200
Hartland Bank Bldg.
Austin, Texas 78758

FEB 24 1995

Steven J. Raabe, Project Manager
San Antonio River Authority
P.O. Box 830027
San Antonio, Texas 78283-0027

Dear Mr. Raabe:

This letter provides comments on the Trans-Texas Water Program, West-Central Study Area, Phase 1, Interim Report, Volume 3.

General Comments

Volume 3 of the above referenced Interim Report states that site specific investigations, publicly raised environmental concerns, and detailed assessments of systems operations and multiple project combinations will be the subject of future Trans-Texas Water Program phases. We believe these issues should be addressed at the earliest possible time. When these issues are addressed, we recommend that "draft" reports be made available to the public and governmental resource agencies such that any comments provided may be incorporated into the "final" documents.

Additionally, while Volume 3 states that multiple project combinations will be the subject of future water program phases, the G-27 and G-28 alternatives in Volume 3 consider combined quantities of water from several different sources. For combined projects such as these, the environmental impacts section needs to concede the cumulative and inter-related impacts associated with using multiple water sources.

The U.S. Fish and Wildlife Service's (Service) 12-month finding determined that the petition to federally-list the Cagle's map turtle (*Graptemys caglei*) was warranted, but precluded by listing actions of higher priority and because threats to the species were not imminent (Fed. Reg. 58(13):5701). The Cagle's map turtle is endemic to the Guadalupe river system and is currently found only in segments of the Guadalupe and San Marcos Rivers. While all of the potential projects identified in Volume 3 have listed the Cagle's map turtle as being within the project areas, no analysis of effects has been provided. While the Cagle's map turtle is still only a candidate for federal listing, the decision to proceed with the proposed listing of the Cagle's map turtle may occur within the planning and/or construction time period for proposed Trans-Texas Water Program projects. We recommend that Trans-Texas project proposals specifically evaluate potential impacts to this species since it may be listed within the foreseeable future.

Specific Comments

Section 3.40, p. 3-630
Under this alternative (G-27), streamflow alterations in the Guadalupe River below Canyon Dam are stated as resulting in an overall reduction in carrying capacity. However, the text goes on to state that the minimum streamflows "are expected to be adequate for at least minimal maintenance of the biological community in this reach, since flows during the critical summer period would be least affected." A similar statement is made for alternative G-28 on p. 3-651. In general, we do not recommend basing, long-term, biological management decisions on minimal maintenance conditions. Maintaining minimal conditions does not provide much of a buffer against potential unpredictable variations that may result in dips below these conditions. Small environmental condition perturbations to a population of organisms that is "minimally" maintained can be catastrophic to the organisms ability to maintain a stable, healthy population.

p. 3-631
Reference is made to the need for instream flow studies to be conducted in river reaches below Canyon Dam and Lake Dunlap. We recommend that all project alternatives that may result in alternations in streamflow volumes should be evaluated with the aid of instream flow studies. As previously stated in our September 1, 1994, letter commenting on Volumes 1 and 2 of the Phase 1 report for this study area, we recommend that the proposed Trans-Texas Environmental Criteria for Instream Flows should be re-examined. They are too generic in nature and may not provide sufficient flows that adequately mimic seasonal patterns for many aquatic species throughout the year. These flow criteria are partially based upon providing minimum flows utilizing averages and medians for long-term periods. Supplying only continuous, minimum flows will not only degrade the riverine environment over the long-term, but will also make the system more susceptible to potentially catastrophic events such as prolonged drought. Higher flows are important in moving sediments downstream and scouring deeper pools. Additionally, discounting the availability and usefulness of unallocated or un-used water stored in existing reservoirs to use for instream flows may be premature and potentially eliminate an important source of water.

Section 3.41, p. 3-645
The text discusses the available firm yield from alternative G-28 with and without the application of the Trans-Texas instream flow criteria and provides a summary in Table 3.41-2. The purpose for this comparison is unclear, but implies that the Trans-Texas instream flow criteria (which we have already stated as likely not supplying sufficient flows throughout the year) may be selectively ignored in cases where significant firm yields could be extracted. We recommend that a clarification be made of these discussions.

We appreciate the opportunity to provide comments at this time and we look forward to continued coordination in the evaluation of Trans-Texas Water Program alternatives. If you have any questions regarding this response, or if we can be of any further assistance, please contact Richard Szlemp at the above address or by phone at (512) 490-0057.

Sincerely,

Jan - B Grote

for Field Supervisor

AMENDED SCOPE OF WORK
TRANS-TEXAS WATER PROGRAM
WEST CENTRAL STUDY AREA

January 10, 1995

This Scope of Work has been prepared to address additional tasks to be completed as parts of the Trans-Texas Water Program West Central Study Area Phase 1 analyses presently underway.

	Budget
ITEM 1 - STORAGE AND DIVERSION OF UNAPPROPRIATED WATER UPSTREAM OF CANYON LAKE (G-29)	$11,100

a. Consider storage in and diversion from the proposed Guadalupe Dam No. 7 sited on the Guadalupe River upstream of Spring Branch.
b. Modify the Guadalupe - San Antonio River Basin Model (GSA Model) to facilitate computation of water availability upstream of Canyon Lake.
c. Compute unappropriated water potentially available from the Guadalupe River near Spring Branch and Comfort on a monthly timestep subject to senior water rights using the GSA Model. Solve for the firm yield and evaluate average availability under two overdraft diversion rates for Guadalupe Dam No. 7 subject to applicable Trans-Texas Environmental Criteria using only unappropriated water.
d. Assume Edwards Aquifer pumpage/springflow scenarios of 200,000 acft/yr and 400,000 acft/yr and full subordination of all downstream hydropower rights.

ITEM 2 - PURCHASE OF CANYON LAKE WATER FOR UPSTREAM DIVERSION (G-30)	$12,200

a. Consider each of two alternative diversion points on the Guadalupe River, one near Comfort and the other near Spring Branch.
b. Modify the GSA Model to facilitate computation of water availability upstream of Canyon Lake independent of impacts on storage in Canyon Lake.
c. Compute water potentially available (unappropriated and purchased) and impacts on the uncommitted firm yield of Canyon Lake for a range of diversion rates subject to senior water rights, applicable Trans-Texas Environmental Criteria, and average daily/monthly availability percentage.

d. Assume Edwards Aquifer pumpage/springflow scenarios of 200,000 acft/yr and 400,000 acft/yr and full subordination of all hydropower rights downstream of Canyon Dam.

ITEM 3 - CANYON LAKE STORAGE REALLOCATION (G-31) **$8,900**

a. Consider direct diversion from Canyon Lake.
b. Compute the uncommitted firm yield of Canyon Lake for a range of potential reallocations of flood storage to conservation storage subject to senior water rights.
c. Assume Edwards Aquifer pumpage/springflow scenarios of 200,000 acft/yr and 400,000 acft/yr and full subordination of all hydropower rights downstream of Canyon Dam.
d. Design flood(s), dam safety issues, and increased flood hazard potential downstream of Canyon Lake will not be evaluated in this phase.

ITEM 4 - DIVERSION OF CANYON LAKE FLOOD STORAGE FROM CANYON LAKE (G-32) **$12,200**

a. Modify the GSA Model to facilitate monthly simulation of flood storage management in Canyon Lake including diversions for recharge enhancement, specified release rates for evacuation of flood control storage, and stage-discharge relationship for outlet works.
b. Compute water potentially available for a range of diversion rates and a range of release rates for evacuation of flood control storage.
c. Assume Edwards Aquifer pumpage/springflow scenarios of 200,000 acft/yr and 400,000 acft/yr and full subordination of all hydropower rights downstream of Canyon Dam.
d. Design flood(s), dam safety issues, and increased flood hazard potential downstream of Canyon Lake will not be evaluated in this phase.

ITEM 5 - WATER AVAILABLE BELOW COMAL AND SAN MARCOS SPRINGS (G-33) **$12,100**

a. Consider alternative diversions from the Guadalupe River at Lake Dunlap and the San Marcos River below the Blanco River.
b. Sponsor(s) to request a simulation from the Texas Water Development Board Edwards Aquifer Model assuming calendar year 1989 pumpage for the entire 1934-89 historical period.

c. Quantify water available for existing rights (aggregated by stream reach) and compute uncommitted Canyon Lake firm yield under the 1989, 400,000 acft/yr, and 200,000 acft/yr pumpage scenarios.

d. Compute water potentially available for diversion from the Guadalupe River at Lake Dunlap and the San Marcos River below the Blanco River under existing upstream and downstream rights and unappropriated flow, assuming surface water diversion at 1989 levels, considering each of the 1989, 400,000 acft/yr, and 200,000 acft/yr pumpage scenarios using the GSA Model.

e. Assume surface water use and return flows throughout the Guadalupe - San Antonio River Basin to be at 1989 levels.

f. Assume that current contractual obligations from Canyon Lake will be delivered. Assume subordination of Guadalupe River hydropower rights to 0 cfs at Lake Dunlap and diversion of uncommitted Canyon Lake firm yield from Lake Dunlap.

ITEM 6 - ENGINEERING AND COSTING — $17,600

a. Upon partial completion of Items 1 through 5, sponsor(s) will select three specific alternatives for reconnaissance level engineering and costing analyses consistent with those for other water supply alternatives previously evaluated in Phase 1. Possible discharge locations for diversions from the upper Guadalupe River or Canyon Lake may include Medina Lake and/or northern Bexar County. Possible discharge locations for diversions from Canyon Lake or Lake Dunlap may include Cibolo Creek and/or northern Bexar County.

b. Diversion facilities, pump station, pipeline, booster station(s), etc. will be sized and costed for one diversion rate and one pipeline route for each specific alternative selected.

c. Estimate potential recharge enhancement associated with the three selected alternatives for reconnaissance level engineering and costing analyses.

ITEM 7 - ENVIRONMENTAL EVALUATION — $6,000

a. Upon partial completion of Items 1 through 5, sponsor(s) will select three specific alternatives for a reconnaissance level fatal flaw evaluation of potential environmental effects consistent with those for other water supply alternatives previously evaluated in Phase 1. Specific alternatives are

assumed to be the same as those selected for Engineering and Costing under Item 6.

b. Potential environmental impacts associated with structural improvements, typical lake levels, and changes in flow regime between the point of diversion and the Saltwater Barrier will be evaluated for each specific alternative selected.

c. Water quality considerations will not be addressed in detail in this phase.

ITEM 8 - REPORT, COORDINATION, AND MEETINGS $19,600

a. Consultant will prepare a supplemental report summarizing the water supply alternatives evaluated in a format consistent with that in the Phase 1 interim report.

b. Up to eight draft copies of the supplemental report will be submitted by the consultant for review by the sponsor(s) within about four months of receipt of notice to proceed. Up to 33 final copies of the supplemental report (25 bound and eight unbound camera-ready originals) will be transmitted to the sponsor(s) by the consultant within one month of receipt of sponsor(s) comments on the draft supplemental report.

c. As a part of performing this Scope of Work, consultant will participate in up to: 1) Three project management/coordination meetings; 2) Two Policy Management Committee meetings; and 3) One Technical Advisory Committee meeting. Participation in any additional meetings requested by the sponsor(s) will be considered Additional Services in accordance with our Agreement for Professional Services. Consultant will assist the sponsor(s) in preparing technical materials for use in the above meetings.

TOTAL $99,700

AMENDED SCOPE OF WORK
TRANS-TEXAS WATER PROGRAM
WEST CENTRAL STUDY AREA

January 26, 1995

This Scope of Work has been prepared at the request of sponsors participating in the Trans-Texas Water Program West Central Study Area.

ITEM 1: **TWO-DAY SEMINAR TO DISCUSS RIVER BASIN MODELS DEVELOPED BY HDR FOR NUECES AND GUADALUPE-SAN ANTONIO RIVERS.**

HDR staff will lead a two-day seminar generally in accordance with the attached agenda to explain various aspects of HDR's River Basin Models used in the Trans-Texas studies. Each participant will receive a stapled handout of materials which will contain information regarding specific aspects of the Model. During the seminar, HDR staff will explain the topics and answer participants questions. The handout will contain useful information and brief explanations of important points.

In order to have adequate time to prepare for the seminar, HDR staff requests that sponsors provide a minimum of 15 working days notice to HDR prior to seminar. Participation in any follow-up meetings requested by the sponsor(s) will be considered Additional Services in accordance with our Agreement for Professional Services.

TOTAL **$8,000.00**

TRANS-TEXAS WATER PROGRAM
WEST CENTRAL STUDY AREA

SCOPE OF WORK
April 3, 1995

This Scope of Work has been prepared to address additional tasks to be completed as parts of Trans-Texas Water Program West Central Study Area Phase 1 analyses presently underway. Studies proposed in this Scope of Work focus on evaluations of two potential projects: Cibolo Reservoir near Stockdale, Texas and Upper Cibolo Creek Reservoir near Bracken, Texas.

PART ONE - CIBOLO RESERVOIR WITH IMPORTED WATER (S-15D)

The objective of Part One is to evaluate the proposed Cibolo Reservoir near Stockdale, Texas considering inflows from Cibolo Creek and importation of water from potential sources outside of the Cibolo Creek watershed.

ITEM 1.1 - WATER POTENTIALLY AVAILABLE FOR IMPORTATION — $9,000

a. Quantify unappropriated water potentially available for diversion from the San Antonio River near Floresville, Texas using the Guadalupe - San Antonio River Basin Model (GSA Model).
b. Quantify unappropriated water potentially available for diversion from one location (near Gonzales or Cuero) on the Guadalupe River using the GSA Model.
c. Quantify unappropriated water potentially available for diversion at the Saltwater Barrier near Tivoli, Texas using the GSA Model. Assume this diversion is an alternative to potential diversions identified under Items 1.1a and 1.1b.
d. Quantify unappropriated water potentially available for diversion from one location on the Colorado River near Garwood, Texas using simulation results made available from the Lower Colorado River Authority Daily Allocation Program.
e. Assumptions pertinent to quantification of unappropriated water potentially available from sources within the Guadalupe - San Antonio River Basin include:

1. Subordination of hydropower rights to 0 cfs at Lake Dunlap.

2. Diversion of presently uncommitted firm yield of Canyon Lake from Lake Dunlap.
3. Inclusion of existing diversion rights at authorized amounts.
4. Inclusion of return flows at amounts reported for 1988.
5. Use of Trans-Texas Environmental Criteria applicable at the time the work is performed.
6. Fixed annual Edwards Aquifer pumpage of 400.000 acft/yr.

f. Assumptions pertinent to quantification of unappropriated water potentially available from the Colorado River Basin include:
   1. Inclusion of existing diversion rights at authorized amounts.
   2. Inclusion of return flows at amounts used for Colorado River alternatives examined in Phase 1.
   3. Consideration of applicable environmental criteria.

ITEM 1.2 - WATER SUPPLY ANALYSES **$4,000**

a. Simulate Cibolo Reservoir contents fluctuations considering runoff from the Cibolo Creek watershed, imported water available from the San Antonio, Guadalupe, and Colorado Rivers, evaporation, and delivery of water to the South Water Treatment Plant.
b. Compute the firm yield of Cibolo Reservoir subject to Trans-Texas Environmental Criteria for New Reservoirs.

ITEM 1.3 - ENGINEERING AND COSTING **$11,000**

a. Size and cost diversion facilities, pump station, pipeline, booster station(s), etc. for importation of water from the San Antonio River near Floresville, Texas to Cibolo Reservoir.
b. Size and cost diversion facilities, pump station, pipeline, booster station(s), etc. for importation of water from one location (near Gonzales or Cuero) on the Guadalupe River to Cibolo Reservoir.
c. Size and cost diversion facilities, pump station, pipeline, booster station(s), etc. for importation of water from the Saltwater Barrier near Tivoli, Texas to Cibolo Reservoir.

d. Size and cost diversion facilities, pump station, pipeline, booster station(s), etc. for importation of water from the Colorado River near Garwood, Texas to Cibolo Reservoir.
e. Engineering and costing analyses will be performed at a reconnaissance level consistent with those for other water supply alternatives previously evaluated in Phase 1.
f. Engineering and costing analyses for Cibolo Reservoir previously developed in Phase 1 will be used in this work, however, size and cost for diversion facilities, pump station, pipeline, booster station(s), etc. for delivery of water from Cibolo Reservoir to the South Water Treatment Plant will be revised to account for additional firm yield.

ITEM 1.4 - ENVIRONMENTAL EVALUATION — $8,000

a. Evaluate potential environmental impacts associated with structural improvements, typical lake levels, and changes in flow regime below the points of diversion or impoundment.
b. Environmental evaluation will be performed at a reconnaissance (fatal flaw) level consistent with that for other water supply alternatives previously evaluated in Phase 1.
c. Environmental evaluation components for Cibolo Reservoir previously developed in Phase 1 will be used in this work and expanded to address additional facilities necessary for importation of water.

ITEM 1.5 - REPORT, COORDINATION, AND MEETINGS — $8,000

a. Consultant will prepare a supplemental report section summarizing this water supply alternative in a format consistent with that in Volumes 2 and 3 of the Phase 1 Interim Report. It is assumed that this supplemental report section will become a portion of Volume 4 of the Phase 1 Interim Report.
b. Up to eight draft copies of Volume 4 of the Phase 1 Interim Report will be submitted by the consultant for review by the sponsor(s) within about six months of receipt of notice to proceed. Up to 33 final copies of Volume 4 of the Phase 1 Interim Report (25 bound and eight unbound camera-ready originals) will be transmitted to the sponsor(s) by the consultant within one month of receipt of sponsor(s) comments on the draft report.
c. As a part of performing this Scope of Work, consultant will participate in up to: 1) Three project management/coordination

meetings; 2) Two Policy Management Committee meetings; and 3) One Technical Advisory Committee meeting. It is assumed that all meetings with the exception of one project management/coordination meeting will be held concurrently with other meetings identified in Part Two of this Scope of Work and in the January 10, 1995 Scope of Work for study of Edwards Aquifer recharge enhancement alternatives in the Upper Guadalupe River Basin. Participation in any additional meetings requested by the sponsor(s) will be considered Additional Services in accordance with our Agreement for Professional Services. Consultant will assist the sponsor(s) in preparing technical materials for use in the above meetings.

TOTAL **$40,000**

PART TWO - UPPER CIBOLO CREEK RESERVOIR (S-17)

The objective of Part Two is to evaluate the cost of Upper Cibolo Creek Reservoir near Bracken, Texas which has been proposed as a means of sustaining Comal springflow and Edwards Aquifer pumpage during drought.

ITEM 2.1 - ENGINEERING AND COSTING $21,000

a. Cost dam and appurtenant works for Upper Cibolo Creek Reservoir assuming conservation storage capacity of about 150,000 acre-feet below elevation 950 feet-msl. Limited analyses of flood hydrology and hydraulics will be performed to select appropriate dam type and spillway configuration.
b. In consultation with hydrogeologists and a general contractor experienced in dam construction and grouting, develop an estimate of cost to seal appropriate portions of the bed of Upper Cibolo Creek Reservoir to minimize leakage or uncontrolled recharge of the Edwards Aquifer. A field reconnaissance of the reservoir area will be performed as a part of this task.
c. Evaluate potential environmental impacts and mitigation costs associated with long-term impoundment in Upper Cibolo Creek Reservoir focusing on habitat within the reservoir pool and changes in infiltration characteristics to the Edwards Aquifer.
d. Engineering, environmental, and costing analyses will be performed at a reconnaissance level consistent with those for other water supply alternatives previously evaluated in Phase 1.

ITEM 2.2 - REPORT, COORDINATION, AND MEETINGS $4,000

a. Consultant will prepare a supplemental report section summarizing this water supply alternative focusing on the engineering, environmental, and cost aspects of project development. It is assumed that this supplemental report section will become a portion of Volume 4 of the Phase 1 Interim Report.
b. Up to eight draft copies of Volume 4 of the Phase 1 Interim Report will be submitted by the consultant for review by the sponsor(s) within about six months of receipt of notice to proceed. Up to 33 final copies of Volume 4 of the Phase 1 Interim Report (25 bound and eight unbound camera-ready originals) will be transmitted to the sponsor(s) by the consultant within one month of receipt of sponsor(s) comments on the draft report.
c. As a part of performing this Scope of Work, consultant will participate in up to: 1) Three project management/coordination meetings; 2) Two Policy Management Committee meetings; and 3) One Technical Advisory Committee meeting. It is assumed that all meetings with the exception of one project management/coordination meeting will be held concurrently with other meetings identified in Part One of this Scope of Work and in the January 10, 1995 Scope of Work for study of Edwards Aquifer recharge enhancement alternatives in the Upper Guadalupe River Basin. Participation in any additional meetings requested by the sponsor(s) will be considered Additional Services in accordance with our Agreement for Professional Services. Consultant will assist the sponsor(s) in preparing technical materials for use in the above meetings.

TOTAL **$25,000**

BUDGET SUMMARY

Task	Budget
Part One - Cibolo Reservoir With Imported Water	$40,000
Part Two - Upper Cibolo Creek Reservoir	$25,000
TOTAL	$65,000

NATURAL BRIDGE CAVERNS

April 18, 1995

Fred Pfeiffer
San Antonio River Authority
P.O. Box 830027
San Antonio, TX 78283-0027

Dear Mr. Pfeiffer,

Enclosed is a copy of the letter we sent to Nancy Skinner, the National Natural Landmark Coordinator for the U.S. Department of the Interior. Natural Bridge Caverns was designated as a National Natural Landmark in 1971, and in 1967 the caverns were declared a Texas Historical Site. The caverns have been opened to the public for thirty-one years and have become a place for both the education and enjoyment of thousands of visitors each year.

The recent article in the San Antonio Express-News dated March 16, 1995 concerns us greatly with regards to the proposed Upper Cibolo Creek Reservoir. The enclosed letter clearly outlines the basis of our concerns regarding this proposed project. We feel that the negative impact such a project could have on Natural Bridge Caverns should be a primary focus of investigation and should be a major consideration in the Board's rejection of this proposal.

Sincerely,

Brian Vauter
Staff Geologist
Natural Bridge Caverns, Inc.

NATURAL BRIDGE CAVERNS

April 4, 1995

Nancy Skinner
National Park Service
P.O. Box 728
Santa Fe, NM 87504-0728

Dear Ms. Skinner,

We would like to bring to your attention the potential threat to Natural Bridge Caverns near New Braunfels, Texas. As you know, the cave is a National Natural Landmark and as such, it is important to report threats to the cave and its natural resources.

Our concern relates to a proposed dam project on the upper Cibolo Creek, which we feel would have a direct and detrimental impact on the caverns. The proposed dam would create an impoundment of water that has the potential to fill the cave with back waters that could drastically impact the natural system of the cave. This could result in devastating impacts on the cave's fauna, mineral deposition, hydrologic processes and its status as a National Natural Landmark.

Natural Bridge Caverns is located in one of the most important karst areas in the nation and certainly the most important in Texas. Karst is defined as a landform typified by sinkholes, caves, dry valleys, fluted rocks, enclosed depressions underground streamways and spring resurgences.

Over twenty percent of earth's surface is characterized as karst and in the U.S., over 22% of our drinking water comes from karst aquifers! Karstic aquifers and related landforms are created as rain water seeps down in, and between layers of, limestone. The rainwater when combined with carbon dioxide (from the atmosphere and from decaying plant matter) creates a weak solution of carbonic acid which dissolves the limestone to create these landforms, including caves, such as Natural Bridge Caverns.

It is vitally important that nothing is constructed that will interfere with this system, which both supplies drinking water and creates caves. The proposed sealing of the limestone fractures and porosites for the Cibolo Creek dam would effectively kill any cave system down stream of the proposed project. It is the very same fractures and porosites which allowed the infiltration of the karstic waters that formed the caverns.

The very important economic role of the cave as a tourist destination and educational tool would also be impacted or completely destroyed. At the present time Natural Bridge Caverns employs over 30 people, all dedicated to the protection and presentation of the great natural resources of the cave. Natural Bridge Caverns is located one mile from Cibolo Creek in Comal County. At the present time flood waters from the creek pose no threat to the cave system. While it is true that the cave does fill with water during seasonal and periodic rises in the waters of the Edwards Aquifer and/or the Glen Rose Aquifer, this rise and fall of the aquifers is a natural occurrence and apparently does little or no damage to the cavern and its ecosystem.

As you can see from the attached article from the March 16, 1995 issue of the San Antonio Express News, there is already concern that the proposed dam site could impact the well-known Bracken Bat Cave. Since Natural Bridge Caverns is only 1/2 mile from the Bracken Bat Cave, certainly any project that has the potential to impact Bracken could also impact the cavern.

We will continue to keep you posted as this project continues and ask that you support us in our attempt to protect Natural Bridge Caverns. If you have any questions or need additional information, you can contact Clara Heidemann, or Reggie or Joye Wuest at (210) 651-6101. If you are interested in touring the area to personally assess the potential threats please let us know.

Sincerely,

Reginald Wuest

Reginald Wuest
Vice President,
Natural Bridge Caverns

RW/jp
Enclosure: 1

KARL WURZ
820 FLORIDA

BEFORE PROCEEDING TO THE POINT OF CREATING IRREVERSABLE FINANCIAL LOSSES ATTACHED TO ANY NUMBER OF ALTERNATIVE PLANS BASED ON REDUCED RELIANCE ON THE EDWARDS AQUIFER I BELIEVE A FULL-STOP IS NECESSARY TO THOROUGHLY EXAMINE ANY ASPECT THAT HAS NOT BEEN PLACED ABOVE BOARD ON THE TABLE.

LETS PUT ALL 54 CARDS ON THE TABLE INCLUDING THE JOKERS.

MR. STEVEN RAABE JUST RECENTLY POINTED OUT TO THE S.A.R.A BOARD AND TO MYSELF THAT I AM A MEMBER OF THE COMMITTEE FOR PUBLIC AND TECHNICAL INPUT. NO REAL POWER HAS BEEN DELEGATED TO ME. AND NO SERIOUS CONSIDERATION, I BELIEVE, WILL BE GIVEN TO SUGGESTIONS I MAY PUT FORTH.

THE WORDS TOKENISM AND LIPSERVICE MAY PROBABLY BEST DESCRIBE THE LISTING OF MY NAME. THIS IS NOT A REQUEST TO DELIST ME.

OTHER MEMBERS ARE PAID AGENTS OF AGENCIES IN THE WATER BUSINESS. FOR THE RECORD, I AM NOT IN THE EMPLOY OF ANY SUCH AGENCY.

I ATTENDED THE MEETINGS OF THE 2050 WATER RESOURCES COMMITTEE WHICH ISSUED A MAY 1994 REPORT. IN THE ELECTION WHICH FAILED TO PASS I VOTED AGAINST THE PLAN AND HANDCARRIED LETTERS TO ENTITIES WITH CONSIDERABLE MEMBERSHIP ASKING THEM TO VOTE AGAINST THE PLAN.

THAT LETTER POINTED OUT THE MAJOR FLAWS OF THE 2050 PLAN. AND THAT THERE WOULD BE NO CONSTANT LEVEL IN THE APPLEWHITE LAKE FOR RECREATIONAL PURPOSES.

THE MAJOR FLAWS WERE: 1) THE TREATMENT PLANT WAS WOEFULLY INADEQUATE TO TREAT THE DOWNSTREAM TRADE WATER AND AQUIFER CONTAMINATION, 2) THERE WAS NO INFRASTRUCTURE FROM PLANT TO DISTRIBUTION SYSTEM, 3) NO PROVISION FOR COLLECTION FROM CONTAMINATED AQUIFER TO THE TREATMENT PLANT, 4) NO PIPELINES FROM WATER LENSES TO THE SAWS DISTRIBUTION SYSTEM, 5) MOST IMPORTANT THE APPLEWHITE RESERVOIR PERMIT IMPOUNDMENT WAS LIMITED TO LESS THAN 46,000 AC/FT.

EVEN IF SAWS HAD THAT AMOUNT AVAILABLE IN ANY ONE YEAR THE LEVEL WOULD HAVE HAD TO BE DRAWN DOWN TO ZERO ACRE FEET. CONTINUOUS CYCLES OF FILLING UP THE RESERVOIR WOULD HAVE TAKEN 2 TO 3 YEARS FOLLOWING EVERY RELEASE TO DOWN-STREAMERS. THATS HOW BAD THE 2050 PLAN WAS.

WHICH BRINGS ME BACK TO MY OPENING REMARK OF CREATING IRREVERSABLE FINANCIAL LOSSES ATTACHED TO ANY NUMBER OF ALTERNATIVE PLANS BASED ON REDUCED RELIANCE ON THE EDWARDS AQUIFER.

CANDIDATE FOR MAYOR BILL THORNTON VOTED FOR THE 2050 PLAN. RESPONDING TO AN EXPRNEWS QUESTIONNAIRE HE SAID QUOTE "AND BEGIN IMMEDIATELY THAT PROCESS TO IDENTIFY AND DEVELOP NEW SOURCES OF WATER." UNQUOTE, I BELIEVE THE TRANS-TEXAS PROGRAM IS THAT PROCESS GOING ON FOR MORE THAN A YEAR.

REPLYING AS TO ETHICS QUOTE "THE FIRST THING IS TO MAKE CERTAIN THAT THE PROCESS IS OPEN, IN FULL VIEW OF THE CITIZENS, AND IN THE FULL LIGHT OF DAY. ALL

PROPOSALS MUST BE COMPETITIVE, AND EVERYONE SHOULD BE ALLOWED TO BID. I ALSO BELIEVE THE OBJECTIVITY OBTAINED IN STAFF RECOMMENDATION IS IMPORTANT." UNQUOTE

THAT IS THE KIND OF SPIRIT I WOULD LIKE TOO SEE ADDRESSED IN WATER PLANNING. OPEN UP THE PROCESS.

THE PATTERSONS: KIRK AND CAROL HAVE MADE VARIOUS PRESENTATIONS AS TO THEIR PLANS. THE LATEST ONE, AND IN MY PRESENCE, CONTAINS WHAT THEY SAY IS THE TEXAS WATER DEVELOPMENT BOARD RESPONSE TO STATE REPRESENTATIVE CIRO RODRIGUEZ.

REFERENCE IS TO AQUIFER MODEL RUNS 1) PUMPAGE VS. SIMULATED MINIMUM SPRINGFLOW — PHASE 6 - 1947-1959 RECHARGE SEQUENCE 2) SIMULATED SAN MARCOS SPRING-FLOW ZERO PUMPAGE 1934-90 RECHARGE. AND THE EDWARDS AQUIFER PLAN BY THE FEDERAL MONITOR ON EMERGENCY WITHDRAWAL - TAKE AND JEOPARDY RUNS ON SPRINGFLOWS. 3) COMAL SPRINGS AND 4) SAN MARCOS SPRINGS.

THESE RUNS AND MODELS WITH WITH REPRESENTATIVES CIRO RODRIGUEZ REQUEST TO THE TWDB AND TWDB'S COMMUNICATION TO MR. RODRIGUEZ, I THINK SHOULD BE MADE PART OF THE RECORD OF THE TRANS-TEXAS WATER PROGRAM PROCEEDINGS.

I URGE THE PROFESSIONAL COMMENTARY OF COMPETENT QUALIFIED PERSONS, ENGINEERS WHATEVER WITH THAT OF THE POLICY MANAGEMENT COMMITTEE GO ON THE RECORD REGARDING THESE TWDB RUNS AND MODELS.

THIS IS NOT A STATEMENT OF SUPPORT FOR THE PATTERSONS PLAN. IT IS A CALL FOR FULL PUBLIC DISCLOSURE OF THE FACTS.

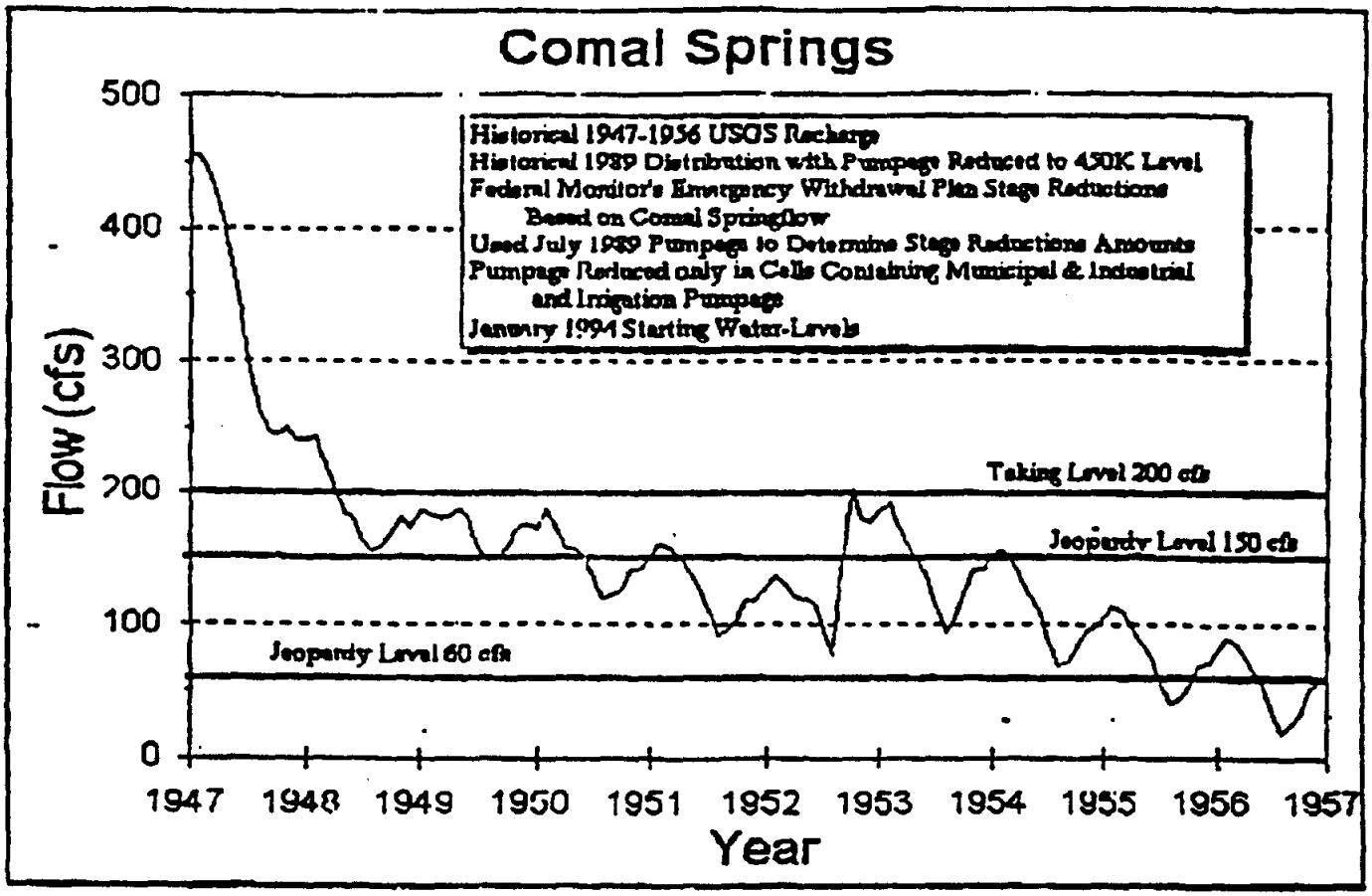
Our choices are:
1.to cut off aquifer and get alternate water, or
2. to add water to the aquifer.
We know a lot about the first choice. We know first that the cutoff doesn't work to protect the spring species as required in a recovery plan or in order to get a take permit. Cutting aquifer pumping to 350,000 af/y allows Comal Springs to go dry in drought for about 6 years, and San Marcos Springs to fall below jeopardy levels 60% of the time.

Cutting pumping according to the August 1, Emergency Recovery Plan of up to 40% of July pumping still allows both Springs to fall below jeopardy. Even cutting pumping to zero allows San Marcos Springs to fall below jeopardy. Page 65 states that "Permanent reliable storage in the Edwards Aquifer is only that below the elevation of San Marcos Springs 574 msl."

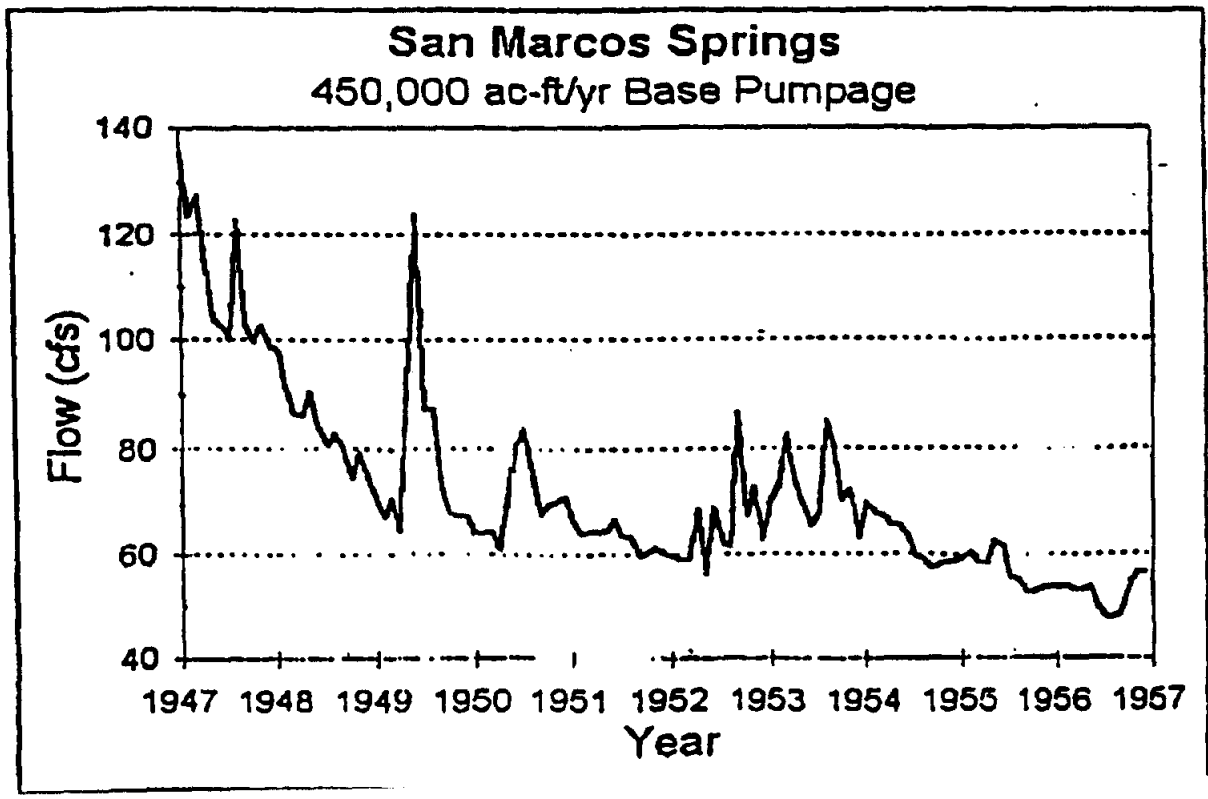
Transferring water from irrigation can't work when zero pumping is allowed, and, as made clear in Uvalde, even in relatively good times, the storage function of the aquifer makes immediate transfer of irrigation water to municipalities ineffective to protect springflow.

The costs of such a program are very high. Cutting aquifer pumping to 350,000 regionally and supplying alternative water from surface, reuse, and conservation was calculated in a 1986 study to cost $261 million per year. Cutting pumping to 400,000 was estimated to cost the region $355 million per year, or about $1500 per family per year.

No calculation has been made of what it would cost to cut pumping to 200,000 af'y or to zero. Such a plan would require the makeup of 540,000 af/y of water plus an estimated 250,000 af/y for projected 50 year growth. Where Would 790,000 af/y of firm yield come



The Texas Water Development Board recently ran the Federal Monitor's Emergency Withdrawal Plan for the Edwards Aquifer at the request of Representative Ciro Rodriguez. The plan makes reductions in pumpage when springflow at Comal Springs drops to various flow levels. The base pumping level for this plan was 450,000 ac-ft/yr. Representative Rodriquez requested July 1994 water-levels and pumpage, however this data was not available as of yet for the model.



"take &
"jeopard

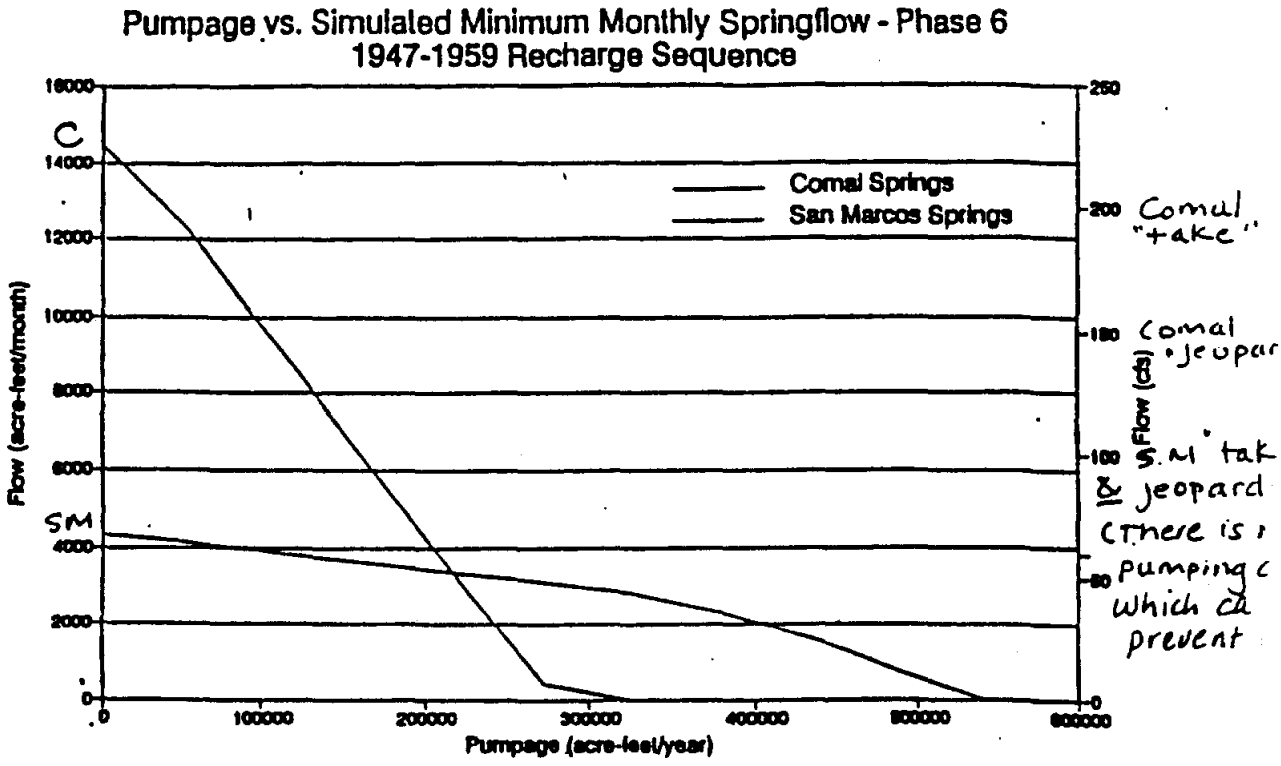
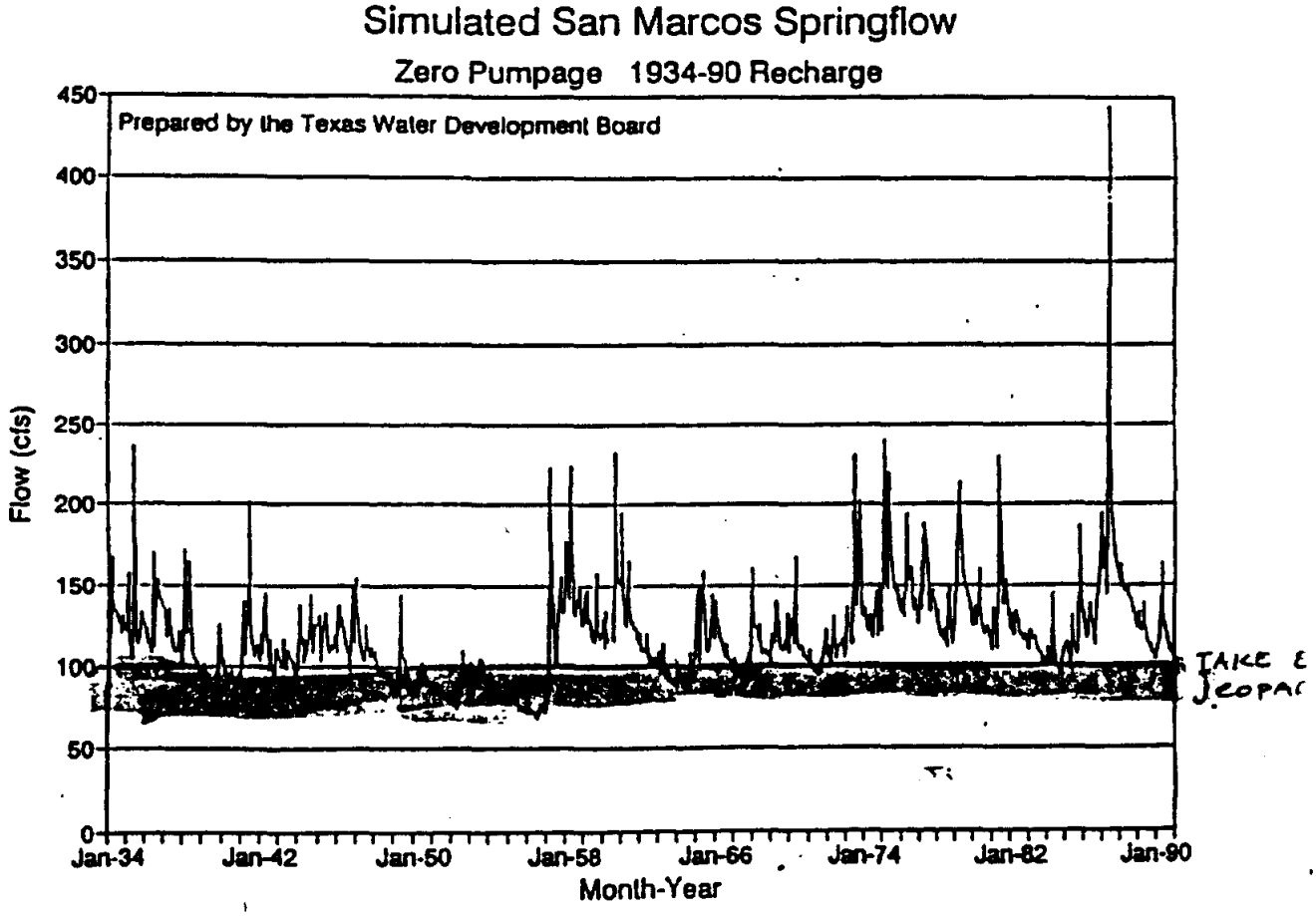

Pumpage vs. Simulated Minimum Monthly Springflow - Phase 6
1947-1959 Recharge Sequence
Comal Springs
San Marcos Springs
Flow (acre-feet/month)
Flow (cfs)
Pumpage (acre-feet/year)
C
SM
Comal "take"
Comal "jeopar
S.M "tak
& jeopard
CThere is
pumping c
which ca
prevent

Figure 18


Simulated San Marcos Springflow
Zero Pumpage 1934-90 Recharge
Prepared by the Texas Water Development Board
Flow (cfs)
Month-Year
TAKE &
JEOPAR

SOURCE:

PRESENTATION TO THE SENATE DELEGATION
TEXAS LEGISLATURE

REGARDING: SB 1477 AND MANAGEMENT
OF EDWARDS AQUIFER

MARCH 29, 1995

KIRK AND CAROL PATTERSON
410 LAKEWOOD DRIVE
SAN ANTONIO, TEXAS 78209
PHONE (210) 824-3407

Much of the evidence that the 2050 Plan won't do what it says it will do is in the plan itself. Other evidence exists in the Applewhite Permit and news-clips.

The Permit limits the impoundment, quote "and to impound therein not to exceed 45,528 acre-feet of water..." This guarantees the Applewhite Reservoirwill not offer the same recreational benefits of Calaveras Lake. It also guarantees SAWS will not have 60,000 acre-feet of water available for downstream trade.

See page 14 and Table 9 on page 43.

Condition Reuse	86,000
less reuse (CPS/Ind.)	-38,000
remainder	48,000
less local use	-25,000
remainder	23,000
Applewhite Res. Permit	+45,528
Apparently available	68,528
Back up! Back up! Impoundment not to exceed 45, 528 acre-feet	-23,000
Available only under average conditions.	45,528
less downstream trade.....	45,528
Water impounded behind dam after trade	-0-

Under drought conditions such as when Medina Lake nearly evaporated away only the sewage effluent,23,000AF, would be available.

By law the city is not permitted to impound any water over 45,528 AF. By law it has to prematurely release any excess. When the peak season arrives- the warmer and drier months and downstream industries need the 60,000 AF the city may have 45,528 AF to trade but not much more than that. Therefore the promise of a recreation lake is one big lie.

There are other major flaws in the plan. The capacity of the treatment plant could not in an emergency handle both the downstream water and aquifer contamination at the same time. There is no provision for pipelines to the treatment plant, from the aquifer. No provision for an infrastructure from the treatment plant to existing distribution lines. There is no guarantee of water lease deliverability because there are no pipelines from the leases to the SAWS system. Under their plan, I think, only direct pipelines guarantee delivered water to the SAWS system. As for the non-potable clause in the ordinance, it is an ordinance which could be amended in the future. All they have to do is take it to the voters again and have them under another created crisis vote for it. Thats the way it is and that is the way it will be.

Sincerely

Karl Wurz
820 Florida
San Antonio, Tex.
78210

505687

PERMIT TO
APPROPRIATE STATE WATER

APPLICATION NO. 4128 PERMIT NO. 3914 TYPE: Section 11.121

Permittee :	Water Works Board of Trustees of San Antonio	Address :	P. O. Box 2449 San Antonio Texas 78206
Received :	November 7, 1979	Filed :	May 11, 1981
Granted :	September 13, 1982	County :	Bexar
Watercourse:	Leon Creek, tributary of Medina River; and the Medina River, tributary of the San Antonio River, tributary of the Guadalupe River	Watershed:	San Antonio River Basin

WHEREAS, the Texas Water Commission finds that jurisdiction of the application is established; and

WHEREAS, a public hearing has been held and specific findings of fact and conclusions of law were adopted in the form of a Commission Order, as required by law;

NOW, THEREFORE, this permit to appropriate State water is issued to the Water Works Board of Trustees of San Antonio subject to the following terms and conditions:

1. IMPOUNDMENTS

(a) Permittee is authorized to construct and maintain an on-channel dam and reservoir, to be known as the Applewhite Reservoir, on the Medina River, tributary of the San Antonio River, tributary of the Guadalupe River, in the San Antonio River Basin, and to impound therein not to exceed 45,528 acre-feet of water at normal maximum operating elevation 536.0 feet above mean sea level. The Applewhite Reservoir Dam will be located in the Bruno M. Martinez Survey, Abstract No. 465; in the Bernardino Ruiz Survey, Abstract No. 611; and the Ignacio Perez Survey, Abstract No. 13, Bexar County, Texas. Station 41+00 on the centerline of the dam is S 67° 45' W, 1,650 feet from the NE corner of the said Martinez Survey, Abstract No. 465, Bexar County, Texas.

(b) Permittee is further authorized to construct and maintain an on-channel dam and reservoir, to be known as the Leon Creek Diversion Dam, on Leon Creek, tributary of the Medina River, tributary of the San Antonio River, tributary of the Guadalupe River, in the San Antonio River Basin, and to impound therein not to exceed 544 acre-feet of water at normal maximum operating elevation 536.0 feet above mean sea level. The dam will be located in the Fernando Rodriguez Survey, Abstract No. 15 and the Ignacio Perez Survey, Abstract No. 13, Bexar County, Texas. Midpoint of the dam at the stream is N 85° 06' E, 3,411 feet from USC & GS Triangulation Station Leon 2.

Both dams and reservoirs are to be located approximately 11 miles south of the City of San Antonio in Bexar County, Texas.

2. USE

Permittee is authorized to divert not to exceed 12,300 acre-feet of water per annum from the Leon Creek Diversion Dam

VOL. 3 PAGE 365

THE UPPER CIBOLO CREEK
RESERVOIR PROJECT

101 ARCADIA PL. #507 SAN ANTONIO, TEXAS 78209 (210) 828-3834

May 9, 1995

Fred N. Pfeiffer, General Manager
San Antonio River Authority
P.O. Box 830027
San Antonio, TX 78283-0027

Dear Fred: In re: UCCR Scope of Work

My remarks at the May 5th meeting of the PMC for the Trans-Texas Water Program, West Central Study Area related to the Scope of Work dated February 26, 1995 for the Upper Cibolo Creek Reservoir "as a means of sustaining Comal springflow and Edwards Aquifer pumpage during drought", and to a subsequent reduced scope of work dated March 10th that confined the study to the feasibility of sealing the reservoir and to develop a cost estimate.

As I mentioned at the meeting, the ownership of Natural Bridge Caverns will not accept a mere paper evaluation of sealing feasibility. In their view, this must be demonstrated. Consequently, my remarks at the meeting tried to show that because the UCCR project lends itself to incremental development by starting with a diversion pump at Canyon Lake, the 6½ mile pipe line to Cibolo tributaries, and a small retarding dam on Cibolo Creek; water would then be available on demand to physically test the sealing of the creek bed and also correspondence between the creek bed and Comal Springs by drilling if necessary.

Thus it was my thought that the Scope of Work should be prioritized to reflect this necessary sequence of development rather than a preliminary evaluation of the ultimate UCCR construction. Significantly, even the initial development outlined above would have beneficial results with its controlled but limited aquifer recharge and probable augmentation of springflow.

Enclosed for your information is a UCCR derivative cost estimate of $72,000,000 that I made a year ago for the 2050 Committee. Indices included would revise this to a current estimate of $74 million.

Sincerely yours,

Arthur E. Postel

cc. w/enc: HDR Eng., Inc.

cc: Natural Bridge Caverns

C O S T E S T I M A T E

F O R T H E

U P P E R C I B O L O C R E E K R E S E R V O I R

S A N A N T O N I O, T E X A S

B Y

A R T H U R E. P O S T E L

Retired Professional Civil Engineer

UPPER CIBOLO CREEK RESERVOIR

DERIVATIVE COST ESTIMATE

The proposed Upper Cibolo Creek Reservoir in Bexar and Comal counties has been conceived as a water supply, terminal storage, aquifer recharge, and springflow preservation reservoir which will impound water imports for the San Antonio area.

At this conceptual stage of its development, the reservoir's cost estimate can best be made by derivation from a detailed cost estimate of a reservoir in similar terrain and in the same vicinity. Detailed cost estimates for such a reservoir are available in the General Design Memorandum for the proposed Clopton Crossing Lake issued by the United States Army Corps of Engineers in 1980. Copies of these estimates are attached.

Clopton Crossing Lake on the Blanco River in Hays and Comal counties was proposed for both flood control and water supply. Its latest cost estimates are at the 1978 price level. They include a single purpose, water supply only, cost estimate of $74,772,000 for a total capacity reservoir of 279,500 acre-feet (271,000 + 8,500 sediment storage). The application of cost indices used by the Corps bring this estimate up to $141,543,000 ($74,772,000 x 1.893, see attached) for the March 1994 price level.

Since Clopton Crossing Lake would be much larger than the Upper Cibolo Creek Reservoir, various ratios are available to reduce this estimate to that of a comparable-sized reservoir as follows:

Acre-feet storage capacity	$\frac{146,279}{279,500*}$	=	52.3%
Surface area at conservation pool (Acres)	$\frac{3,316}{6,060}$	=	54.7%
Surface area at spillway crest (Acres)	$\frac{3,772}{7,730}$	=	48.8%
Length of dam (Feet)	$\frac{3,625}{7,520}$	=	48.2%
Average			51.0%

Current estimated cost of the Upper Cibolo Creek Reservoir: $141,543,000 x 51% = $72,187,000

Cost per acre-foot of water stored: $\frac{\$72,187,000}{146,279}$ = $493

Differences in unit costs are, of course, inherent in the different locations of the two reservoirs. The General Design Memorandum of the Corps cites extensive real estate development at the reservoir site for Clopton Crossing Lake and the attendant higher land costs (p. 29), whereas the precipitous terrain in the Upper Cibolo Creek area has precluded any significant development in the canyon to be inundated. Although this canyon itself is presently inaccessible, unit transportation costs would be less for the Cibolo project because it is closer to a railroad, a major highway, and material processing plants for concrete, crushed stone, sand, and concrete pipe.

* Includes sediment storage for comparable figure to that available for the Upper Cibolo Creek Reservoir.

While these cost savings may be significant, they will be offset by other factors. Since the location, terrain, and unique attributes of the site lend themselves to recharge and springflow preservation, as well as a surface water supply for the City of San Antonio; any overburden in the basin should be removed to permit a better sealing of the Kainer formation below Bat Cave fault, and a system of controlled recharge valves should be installed to develop the potential with which this reservoir site is naturally endowed. These factors and the reservoir site's capacity to maintain water quality should justify the expenditure of any savings derived from location.

In sum, $72 million is a reasonable derivative cost estimate for constructing the Upper Cibolo Creek Reservoir at current price levels. Interest during construction and finance costs are not included in this estimate.

FACSIMILE TRANSMITTAL HEADER SHEET

COMMAND	NAME OFFICE SYMBOL	TELEPHONE NUMBER	AUTHORIZED RELEASER'S SIGNATURE
FROM: Richard Keene Army Corps of Eng	CESWF-ED-C	voice: (817) 334-2293 FAX334-4849	R. Keene

TO:			DATE-TIME	MONTH	YEAR
Art Postel	___-__-__	voice: (210) 828-3834 FAX___-____	17-4:15	3	9[illegible]

CLASSIFICATION	NO. PGS.	PRECEDENCE	REMARKS:
[redacted]	1Header+2		

Mr. Postel,

Please note that our Indeces only go Back to 1979. I Believe that if you use an Index of 1000 for 1978 you will be OKAY.

SPACE BELOW FOR COMMUNICATIONS CENTER USE ONLY

DA FORM 3918-R
1 AUG 72

(AR 105-31)

Record#	CALYEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	1979										1000	1000	999
2	1980	999	1005	1011	1018	1033	1048	1062	1076	1090	1104	1114	1123
3	1981	1133	1134	1136	1137	1150	1162	1175	1181	1186	1182	1198	1203
4	1982	1209	1211	1212	1214	1227	1241	1254	1264	1273	1283	1287	1291
5	1983	1295	1295	1297	1298	1307	1317	1326	1333	1340	1346	1351	1356
6	1984	1361	1364	1366	1369	1374	1378	1383	1388	1392	1397	1401	1406
7	1985	1410	1413	1415	1418	1423	1429	1433	1438	1442	1447	1451	1455
8	1986	1458	1460	1462	1465	1470	1475	1479	1483	1487	1492	1496	1500
9	1987	1504	1506	1508	1511	1516	1521	1525	1530	1535	1540	1544	1548
10	1988	1553	1556	1559	1562	1567	1572	1578	1583	1588	1594	1599	1604
11	1989	1610	1613	1616	1620	1627	1634	1640	1646	1652	1659	1665	1671
12	1990	1676	1679	1682	1686	1693	1700	1706	1713	1720	1727	1732	1736
13	1991	1740	1743	1746	1748	1754	1759	1764	1770	1776	1781	1785	1789
14	1992	1792	1794	1796	1798	1803	1808	1812	1817	1821	1825	1829	1833
15	1993	1837	1839	1842	1845	1850	1855	1860	1865	1870	1874	1879	1883
16	1994	1887	1890	1893	1895	1900	1905	1910	1915	1920	1925	1930	1935
17	1995	1939	1942	1945	1947	1953	1959	1964	1970	1976	1981	1986	1991
18	1996	1995	1998	2001	2004	2010	2016	2021	2027	2033	2038	2044	2049
19	1997	2053	2057	2060	2063	2069	2075	2081	2087	2093	2099	2105	2110
20	1998	2115	2119	2122	2125	2133	2139	2143	2150	2156	2162	2168	2174
21	1999	2179	2182	2185	2188	2195	2202	2208	2215	2221	2227	2233	2239
22	2000												
23	2001												

TRI-SERVICE MILITARY CONSTRUCTION PROGRAM (MCP) INDEX

CALENDAR YEAR	*1992	*1993	1994	1995	1996	1997	1998	199
JANUARY	1792	1837	1887	1939	1995	2053	2115	217
FEBRUARY	1794	1839	1890	1942	1998	2057	2119	2182
MARCH	1796	1842	1893	1945	2001	2060	2122	218
APRIL	1798	1845	1895	1947	2004	2063	2125	218
MAY	1803	1850	1900	1953	2010	2069	2133	2195
JUNE	1808	1855	1905	1959	2016	2075	2139	220
JULY	1812	1860	1910	1964	2021	2081	2143	2208
AUGUST	1817	1865	1915	1970	2027	2087	2150	221
SEPTEMBER	1821	1870	1920	1976	2033	2093	2156	2221
OCTOBER	1825	1874	1925	1981	2038	2099	2162	2227
NOVEMBER	1829	1879	1930	1986	2044	2105	2168	223
DECEMBER	1833	1883	1935	1991	2049	2110	2174	2239

Example: (For 10 Month Construction Period)

Submittal Date	- 1 Sept 92	1821	
Bid Opening Date	- 1 Apr 93		
Contract Award Date	- 1 May 93		-- 13 Months
Midpoint of Construction	- 1 Oct 93	1874	

Cost Growth Factor = 1874 / 1821 = 1.0291 Use 1.03

Use 3.0 % Per Fiscal Year For Projection Beyond FY 2000

* Historical

TABLE 1
PERTINENT DATA
(Source: HD 92-364 dated 25 September 1972)

LOCATION. The Clopton Crossing damsite is located at river mile 32.5 on the Blanco River. The lake would lie in Hays and Comal Counties, Texas.

PROJECT PURPOSES. Flood control, water conservation, and recreation and fish and wildlife.

DRAINAGE AREA	307 square miles
SPILLWAY DESIGN FLOOD	
Peak Inflow	414,900 cfs
Volume	353,000 acre-feet
Volume	21.56 inches
Peak Outflow	196,400 cfs

RESERVOIR	Elevation (feet msl)	Area (acres)	Capacity (acre-ft)	Capacity (inch)
Top of dam	1023.0	—	—	—
Maximum design water surface	1017.5	9,600	573,000	35.0
Top of flood control pool and spillway crest	998.0	7,730	404,000	24.67
Top of conservation pool	980.5	6,060	283,400	17.31
Sediment storage, total	998.0	—	9,200	0.56
Sediment storage, conservation pool	980.5	—	8,500	0.52

STORAGE SUMMARY

Flood Control	119,900 acre-feet
Water Conservation	274,900 acre-feet
Sediment	9,200 acre-feet
Total	404,000 acre-feet

DAM

Type	Earth and rock fill
Length	7,520 feet
Height above streambed	200.0 feet
Crown width	30 feet
Side slopes:	
Upstream	1 on 3.5
Downstream	1 on 3.0

TABLE 5
COST ESTIMATES FOR DUAL AND SINGLE PURPOSE PROJECTS
(October 1978 price level, 6-7/8% interest)

	FLOOD CONTROL AND WATER SUPPLY	FLOOD CONTROL ONLY	WATER SUPPLY ONLY
PERTINENT DATA			
Top of Dam Elevation, feet	1023.0	973.0	1005.0
Top of Flood Control Pool Elevation, feet	998.0	947.0	—
Top of Conservation Pool Elevation, feet	980.5	—	980.0
Storage capacity (spillway crest less sediment), acre-feet	394,800	114,000	271,000
PROJECT FIRST COST			
01 Lands and Damages	$ 32,540,000	$16,467,000	$24,424,000
02 Relocations	3,128,000	1,000,000	1,989,000
03 Reservoirs	647,000	—	642,000
04 Dams	50,770,000	29,905,000	39,158,000
Embankment	(42,201,000)	(7,633,000)	(30,072,000)
Spillway	(3,569,000)	(17,532,000)	(4,488,000)
Outlet Works	(5,000,000)	(4,740,000)	(4,598,000)
08 Access Roads	40,000	40,000	40,000
18 Cultural Resource Preservation	568,000	271,000	449,000
19 Buildings, Grounds, and Facilities	645,000	645,000	645,000
20 Permanent Operating Equipment	369,000	87,000	369,000
30 Engineering and Design	4,774,000	3,195,000	3,896,000
31 Supervision and Administration	4,044,000	2,524,000	3,160,000
Total Project First Cost	$97,525,000	$54,134,000	$74,772,000
INVESTMENT COST			
Interest During Construction	13,410,000	7,443,000	10,281,000
Investment Cost	$110,935,000	$61,577,000	$85,053,000
ANNUAL CHARGES			
Annual Investment	7,637,000	4,239,000	5,855,000
Operation, Maintenance, and Replacement	195,000	111,000	138,000
Total Annual Cost	$7,832,000	$4,350,000	$5,993,000

U P P E R C I B O L O C R E E K

WATER SUPPLY, RECHARGE AND TERMINAL STORAGE RESERVOIR

PRELIMINARY DATA

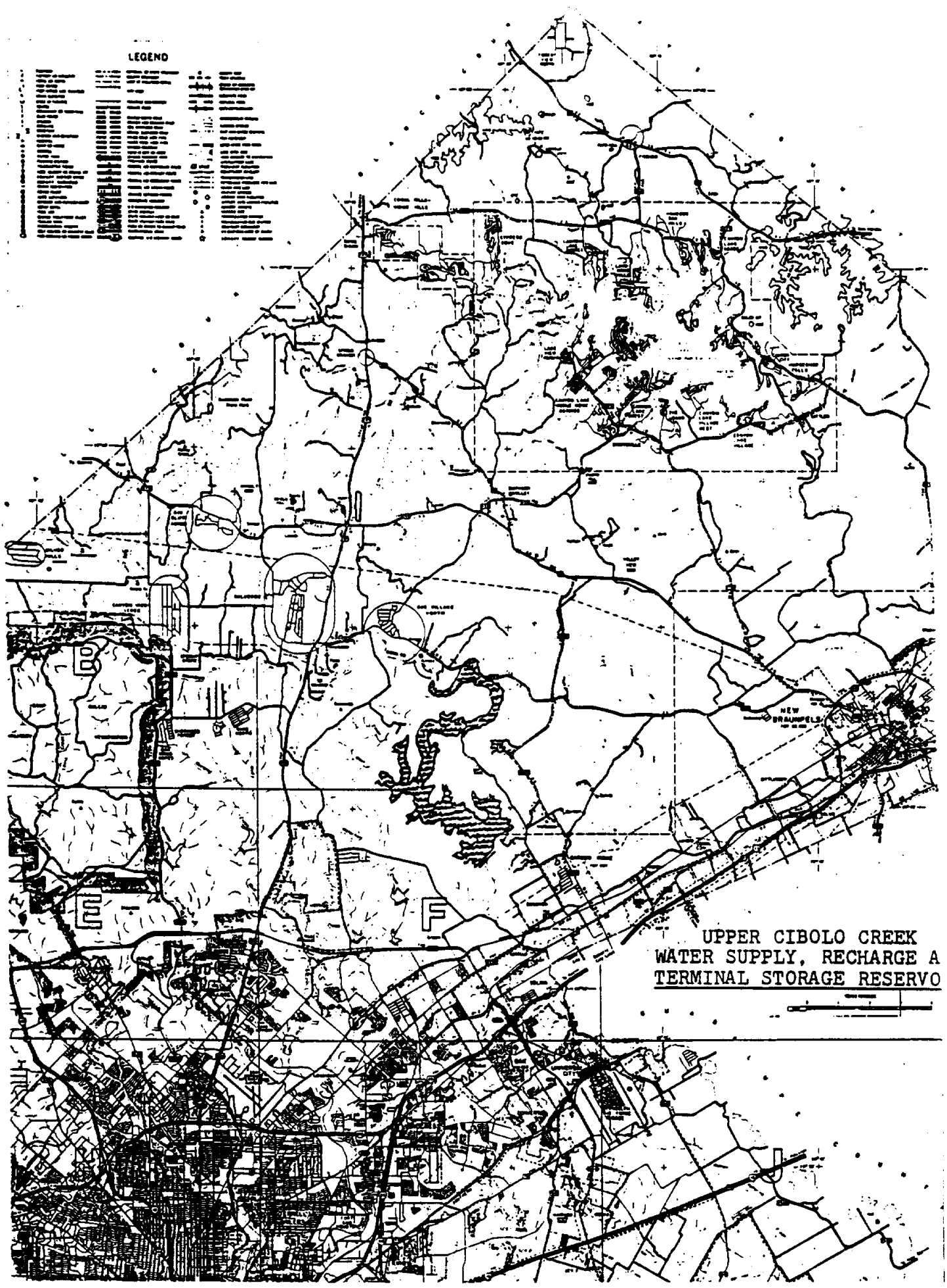
Coordinates of Dam at Creek	N 29° 38' 42" W 98° 20' 49"
Bearing of Dam	N 48° 30' E
Length of Dam	3,625 Ft
Elevation at Top of Dam	960
Elevation at Top of Pool	950
Maximum Height of Dam	160 Ft
Capacity of Reservoir at 950 Elevation	146,279 Acre-Feet
Area of Reservoir Pool at 950 Elevation	3,316 Acres
Average Depth	44 Ft
Drainage Area	258 Square Miles

APPENDIX A

U P P E R C I B O L O C R E E K
WATER SUPPLY, RECHARGE AND TERMINAL STORAGE RESERVOIR

A R E A - C A P A C I T Y T A B L E

ELEVATION	0	1	2	3	4	5	6	7	8	9
950 A - F	146,279	149,848	153,418	156,987	160,556	164,126	167,695	171,264	174,833	178,403
Acres	3,316	3,367	3,417	3,468	3,519	3,569	3,620	3,671	3,722	3,772
940 A - F	115,875	118,915	121,956	124,996	128,037	131,077	134,117	137,158	140,198	143,239
Acres	2,765	2,820	2,875	2,930	2,985	3,040	3,096	3,151	3,206	3,261
930 A - F	90,187	92,756	95,325	97,893	100,462	103,031	105,600	108,169	110,737	113,306
Acres	2,373	2,412	2,451	2,491	2,530	2,569	2,608	2,647	2,687	2,726
920 A - F	68,291	70,481	72,670	74,860	77,049	79,239	81,429	83,618	85,808	87,997
Acres	2,006	2,043	2,079	2,116	2,153	2,190	2,226	2,263	2,300	2,336
910 A - F	50,050	51,874	53,698	55,522	57,346	59,171	60,995	62,819	64,643	66,467
Acres	1,642	1,678	1,715	1,751	1,788	1,824	1,860	1,897	1,933	1,970
900 A - F	35,560	37,009	38,458	39,907	41,356	42,805	44,254	45,703	47,152	48,601
Acres	1,256	1,295	1,333	1,372	1,410	1,449	1,488	1,526	1,565	1,603
890 A - F	24,674	25,763	26,851	27,940	29,028	30,117	31,206	32,294	33,383	34,471
Acres	921	955	988	1,022	1,055	1,089	1,122	1,156	1,189	1,223
880 A - F	16,685	17,484	18,283	19,082	19,881	20,680	21,478	22,277	23,076	23,875
Acres	677	701	726	750	775	799	823	848	872	897
870 A - F	11,074	11,635	12,196	12,757	13,318	13,880	14,441	15,002	15,563	16,124
Acres	445	468	491	515	538	561	584	607	631	654
860 A - F	7,144	7,537	7,930	8,323	8,716	9,109	9,502	9,895	10,288	10,681
Acres	341	351	362	372	383	393	403	414	424	435
850 A - F	4,274	4,561	4,848	5,135	5,422	5,709	5,996	6,283	6,570	6,857
Acres	233	244	255	265	276	287	298	309	319	330
840 A - F	2,341	2,534	2,728	2,921	3,114	3,308	3,501	3,694	3,887	4,081
Acres	153	161	169	177	185	193	201	209	217	225
830 A - F	1,124	1,246	1,367	1,489	1,611	1,733	1,854	1,976	2,098	2,219
Acres	90	96	103	109	115	122	128	134	140	147
820 A - F	422	492	562	633	703	773	843	913	984	1,054
Acres	51	55	59	63	67	71	74	78	82	86
810 A - F	87	121	154	188	221	255	288	322	355	389
Acres	17	21	24	27	31	34	37	41	44	48
800 A - F	0	9	17	26	35	44	52	61	70	78
Acres	1	3	4	6	7	9	11	12	14	15


LEGEND
B
E
F
NEW BRAUNFELS
UPPER CIBOLO CREEK
WATER SUPPLY, RECHARGE A
TERMINAL STORAGE RESERVO

Trans Tex
05-11-95-3

Patsy Light
Friends for Conservation of
The San Antonio River Valley
West of Goliad
300 Argyle
San Antonio, Texas 78209
May 9, 1995

Mr. Steve Rabe
Trans-Texas Water Program
San Antonio River Authority
P. O. Box 830027
San Antonio, Texas 78283-0027

Dear Steve:

Dr. Grubb of H.D.R. Engineering has suggested that I inform the Trans-Texas Water Program that it appears that the cost estimates for a reservoir which might be constructed on the San Antonio River at Goliad do not include the cost of purchasing both new and old producing and non-producing mineral interests which are in the projected site.

There is new (1995) production in the area that would be inundated. Generally speaking, production from the deeper horizons, which are definitely present, have a long life and enormous reserves.

Additionally, a 3-D seismic program encompassing 50 square miles has recently been completed. This state-of-the-art seismic technique will inevitably lead to additional long-life production in the area.

I'm sure that if a Goliad reservoir should become an option for water supplementation for any area in the Trans-Texas Programs, this mineral assessment will be completed.

I have been informed that the figures are being amended for the R & M project near Corpus Christi for the same reason.

Thank you very much.

Sincerely,

Patsy Light

Patsy Light
Friends for Conservation of the San Antonio River Valley West of Goliad

PL:sa

cc. Dr. Herb Grubb
H.D.R. Engineering
3000 S. IH 35
Austin, Texas 78704

Mr. James Dodson
Regional Water Director
P. O. Box 9277
Corpus Christi, Texas 78469-9277

Ms. Carole Britton
Texas Water Development Board
P. O. Box 13231
Austin, Texas 78711-3231

Dr. Tommy Knowles
Texas Water Development Board
P. O. Box 13231
Austin, Texas 78711-3231

Mr. Tony Bagwell
Texas Water Development Board
P. O. Box 13231
Austin, Texas 78711-3231

06-23-95-1

2118 36th St. NW
Canton, OH 44709
June 20, 1995

Steven J. Raabe, P.E.
Chief, Engineering Division
San Antonio River Authority
P.O. Box 830027
San Antonio, TX 78283-0027

Dear Steve: In re: UCCR Scope of Work

Thanks for sending a copy of the Letter of Intent dated April 19, 1995 between the various water agencies which letter has as its purpose the supply of water to Bexar County from the Guadalupe River Basin. As reflected by your Letter of Transmittal dated May 26th, this was at my request.

You will recall our conversation in SARA's office on May 25th at which I made this request and also your expressed intent to reply to my letter of May 9, 1995 related to prioritizing the Scope of Work for the $25,000 study of the Upper Cibolo Creek Reservoir proposal which SARA is financing. Since the UCCR proposal has the potential to meet the water requirements of all parties at interest at the least cost, you can readily understand the importance of having the focus of this initial study on those elements of the project that enhance regional recharge as the best way to preserve springflow at Comal and San Marcos Springs.

The favor of your reply will be very much appreciated.

Yours very truly,

Arthur E. Postel

TRANS-TEXAS WATER PROGRAM

SAN ANTONIO RIVER AUTHORITY 100 EAST GUENTHER STREET P.O. BOX 830027 SAN ANTONIO TEXAS 78283-0027

1.11-3.6 TAC

July 13, 1995

TO: **Advisory Committee for Public and Technical Input**

FROM: **Steven J. Raabe, P.E.**

SUBJECT: **Trans-Texas Water Program - West Central Study Area Status Report**

Supplemental Phase 1 studies are presently underway which will analyze the availability of water upstream of Canyon Reservoir which could be used to recharge the Edwards Aquifer. Several potential diversion and recharge locations are being evaluated and the analysis is scheduled to be completed by September 1995. This information will be sent to you for comments when it is available.

Supplemental Phase 1 studies of the proposed Upper Cibolo Creek Reservoir near Bracken and the proposed Cibolo Creek Reservoir near Stockdale are also underway. The studies are funded by a loan from the Texas Water Development Board. The proposed Upper Cibolo Creek Reservoir is being considered as a result of input by the Advisory Committee For Public and Technical Input. The firm yield of the proposed Cibolo Reservoir near Stockdale was previously estimated using its contributing drainage area. Its firm yield will be estimated using water imported from adjacent river basins. The analysis of these proposed alternatives is scheduled to be completed by October 1995 and the results will be sent to you for comments when they are available.

The PMC recognizes the need to make decisions and recommendations about the water supply needs and potential water supply alternatives evaluated in Phase 1 in a manner which involves a high degree of public participation/stakeholder involvement. The goal is to design a process which will achieve stakeholder's acceptance of the results of the Phase 2 technical study and the alternatives selected for implementation.

Therefore, the West Central PMC is in the process of hiring a consultant to assist in developing an enhanced public participation/stakeholder involvement process. Proposals are being solicited from qualified firms with the necessary expertise. Proposals are due August 11, 1995. A copy of the proposal is enclosed for your information.

A meeting of the Advisory Committee for Public and Technical Input will be scheduled when results are available from the Phase 1 supplemental study.

For more information please contact me at 210/227-1373.

Enclosure
P:\RMC\WPDATA\TRANSTEX\TAC.MMO

Local/Regional Participants

City of Austin
Bexar Metropolitan Water District
Brazos River Authority
City of Corpus Christi
Edwards Underground Water District
Guadalupe-Blanco River Authority
City of Houston
Lavaca-Navidad River Authority
Lower Colorado River Authority
Lower Neches Valley Authority
Nueces River Authority
Sabine River Authority
San Antonio River Authority
San Antonio Water System
San Jacinto River Authority

State Participants

Texas Water Development Board
Texas Natural Resource Conservation Commission
Texas Parks and Wildlife Department
Coastal Coordination Council

Federal Participants

U.S. Army Corps of Engineers
U.S. Bureau of Reclamation

07-17-95-1

DAVID A. TODD
709 EAST MONROE STREET
AUSTIN, TEXAS 78704-3131
512-442-3130

14 July 1995

Steven J. Raabe, P.E.
Trans-Texas Water Program
San Antonio River Authority
100 East Guenther Street
San Antonio, Texas 78283-0027

Dear Mr. Raabe:

Thank you for sending me a copy of the RFP for enhanced public participation in Trans-Texas. I think it's a great idea to expand the public's involvement in water supply planning. I support whatever procedural changes can be made to ensure that the wide variety of stakeholders are heard.

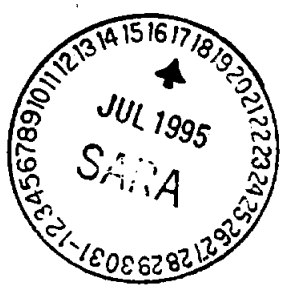
However, I would urge you and the West Central PMC to consider more substantive ways of ensuring public satisfaction with the Water Program. While participation is always welcome, the final construction proposals that come out of the whole process will be the real key to public acceptance. I'd hope that the PMC would look hard at ways that San Antonio can meet its water demand through and within supplies in its own water basin. It seems to me that much of the public opposition to the various editions of the Water Plan has centered on its proposals to shift the burdens of living in a dry central Texas climate to citizens that live in wetter parts of the state. This reshuffling of the state's water does not seem fair, nor does it seem like a lasting solution to inefficient use of water. With that in mind, I think that the River Authority and PMC would get much greater public approval for their Plan if they looked first and much harder at

1) water conservation, particularly through generally higher and more steeply graduated water pricing;
2) water trading from users with other sources and/or less value-added and/or less priority to those with no alternatives, more value-added, or more priority;
3) on-site rainwater harvesting, to instill in water customers a clearer idea of the limits on consumption, and to reduce runoff and non-point water pollution.

Thank you for considering my comments. I would like to hear your response and I'd appreciate it if you would pass my thoughts on to the PMC as well.

Sincerely,

David Todd



08-04-95-1

L7619(SW-PQS)

AUG -1 1995

Mr. Reginald Wuest
Vice President
Natural Bridge Caverns
26495 Natural Bridge Caverns Road
Natural Bridge Caverns, Texas 78266

Dear Mr. Wuest:

We have carefully reviewed the information that you and your staff geologist, Mr. Brian Vauter, have provided regarding a proposal for a water storage reservoir on Upper Cibolo Creek. It appears that the proposed Upper Cibolo Creek Reservoir (UCCR) could affect the natural processes which created and sustain Natural Bridge Caverns and South Cave. These natural karstic processes are the reason for the size, shape and decorations of the cave as well as for all associated fauna, including aquatic fauna. Interference with or alteration of these natural processes could significantly affect the entire cave system. Maintaining the integrity of the karstic systems of the area is therefore key to long-term preservation of Natural Bridge Caverns and maintaining its integrity as a national natural landmark.

In order to adequately evaluate potential effects on Natural Bridge Cavern, we will submit recommendations to the San Antonio River Authority for consideration in the study process. Our primary recommendation will be that a thorough analysis of the relationship between the cavern and the local aquifer be undertaken as soon as possible in order to identify any fatal flaws or the potential for significant resource impacts. We see a need for developing such baseline data for Natural Bridge Caverns instead of concentrating study efforts on a particular construction process or method, such as sealing the limestone at the proposed site near the cave.

We are concerned not only with the proposed location of the reservoir and with the siting of appurtenant facilities but also with the methods of construction and maintenance that will likely be used.

Methods of "sealing" the proposed reservoir are of specific concern. As you know, sealing a reservoir in a karst area can be very expensive as well as very difficult. Many times a successful seal is only accomplished by the injection of grout

under pressure into the underlying geologic formations. A seal of this type, known as a "grout curtain," could prevent the free flow of karstic groundwaters into or out of Natural Bridge Caverns and South Cave.

Many times people do not understand the relationships between caves and groundwater systems, and we appreciate your concern and understanding. We will assist you as much as possible in your endeavor to maintain the natural systems which have created and which sustain Natural Bridge Caverns, an irreplaceable national natural landmark.

Until such time as more information is available, we will operate under the premise that the UCCR proposal may well pose a threat to the integrity of Natural Bridge Caverns. We will therefore recommend that Natural Bridge Caverns be listed as a threatened site in the "Damaged and Threatened National Natural Landmarks" report we prepare annually for Congress.

We appreciate your interest in the National Natural Landmark Program. Please continue to share information on the UCCR proposal as it's being developed.

Sincerely,

(s) Joe Sovick

Stewardship and Partnership
Team Coordinator,
Southwest System Support Office

cc:
Mr. Fred N. Pfeiffer
General Manager
San Antonio River Authority
Post Office Box 830027
San Antonio, Texas 78283-0027

District Engineer
Fort Worth District
U.S. Army Corps of Engineers
Post Office Box 17300
Fort Worth, Texas 76102-0300

Mr. Bill Cox
Chief, Federal Assistance Section
Environmental Services Division
Environmental Protection Agency
1445 Ross Avenue
Dallas, Texas 75202-2733

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DEPARTMENT OF THE INTERIOR
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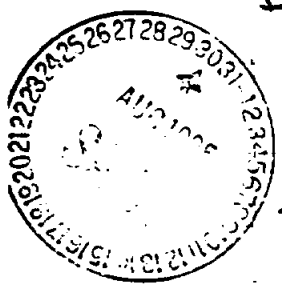
Mr. Fred N. Pfeiffer
General Manager
San Antonio River Authority
P. O. Box 830027
San Antonio, TX 78283-0027

Aug 30, 1995

Trans Ref
08-30-95-1

MR STEVEN RANGE
S.A.R.A.
S.A TEXAS

DEAR SIR:



RE: YOUR LETTER AUG 29, 1995
ITEMS TO BE DISCUSSED : NO 2.
2) CONSIDERATION OF LETTER OF INTENT CONCEPTUAL PLAN AS PART OF PHASE 2./ NOTIFICATION OF SUCH ITEM IS VERY BROAD. VOTE ON PLAN TO PROCEED: IS IT PREMATURE RELATIVE TO ITEM 1.) ?/ WHAT IS THE PRESENT CONCEPTUAL PLAN BEING CONSIDERED IN LETTER OF INTENT ?

I'll WONDERING IF MR. TOM CULBERTSON IS ASKING SIMILIAR QUESTIONS. NOT MEANING TO TAKE UP YOUR VALUABLE TIME WITH TRIVIAL INQUIRIES.

I AM
YOURS TRUELY
KARL WURZ
820 FLORIDA
SA TEXAS 78210

11-20-95-2

Nov.16,1995

Steven C. Raabe,P.E.
Chief, Eng. Division
San Antonio River Authority
P.O. Box 830027
San Antonio, TX 78283-0027

Dear Mr Raabe,

The Bulletin for this Fall on the West-Central Study Area was not appropriate considering Judge Pennington's ruling in Bondo.

I do not believe that we should be considering the transfer of 150,000 acre-feet of water on a temporary basis from the GBRA to SARA.

Proper coordination with other water institutions, such as the Edwards Underground Water District should be affected first.

What real qualifications does the firm of Robert Guirre possess; I never heard of him before. While I am for an enhanced public participation in our water plans, it would seem that you should have received the recommendations of your ADVISORS before acting on this with a budget of $50,000.

Let us really work together !

Sincerely,

Tom Culbertson

Tom Culbertson, Hydrologist
511 Westwood
SA,TX.,78212

TRANS-TEXAS WATER PROGRAM

SAN ANTONIO RIVER AUTHORITY 100 EAST GUENTHER STREET P.O. BOX 830027 SAN ANTONIO TEXAS 78283-0027

Local/Regional Participants

City of Austin
Bexar Metropolitan Water District
Brazos River Authority
City of Corpus Christi
Edwards Underground Water District
Guadalupe-Blanco River Authority
City of Houston
Lavaca-Navidad River Authority
Lower Colorado River Authority
Lower Neches Valley Authority
Nueces River Authority
Sabine River Authority
San Antonio River Authority
San Antonio Water System
San Jacinto River Authority

State Participants

Texas Water Development Board
Texas Natural Resource Conservation Commission
Texas Parks and Wildlife Department
Coastal Coordination Council

Federal Participants

Army Corps of Engineers
U.S. Bureau of Reclamation

1.11-3.6-TAC

January 31, 1996

TO: **Advisory Committee for Public and Technical Input**

FROM: **Steven J. Raabe, P.E., Project Manager**
San Antonio River Authority
Office: (210) 227-1373
Fax: (210) 227-4323

SUBJECT: **Trans Texas Water Program**
West Central Study Area
Phase 1-B Interim Report

The Phase 1-B Interim Report has been printed. Those committee members who received the Phase 1-A Interim Report will automatically receive a copy of the Phase 1-B Interim Report. If other committee members would like to receive copies of the Phase 1-B, please contact me at the above address or phone number.

A meeting of the Advisory Committee for Public and Technical Input will be held on Thursday, March 7, 1996 at 2:00 p.m. at the San Antonio Water System Training Room located at 1001 E. Market Street, San Antonio, Texas. HDR Engineering, Inc. will present the results of the study and be available for questions. The deadline for submitting comments is March 15, 1996.

Please contact me if you have questions.

SJR/msb

cc: **Policy Management Committee**
Public Information Committee

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1.113.6-TAC

TRANS TEXAS WATER PROGRAM
WEST CENTRAL STUDY AREA PHASE 1B REPORT

ADVISORY COMMITTEE FOR PUBLIC AND TECHNICAL INPUT

SUBMITTED BY: _____ **DATE:** _____

COMMENTS: _____

PLEASE ATTACH ADDITIONAL SHEETS IF NECESSARY.
PLEASE RETURN TO:

STEVEN J. RAABE, P.E.
SAN ANTONIO RIVER AUTHORITY
P.O. BOX 830027
SAN ANTONIO, TEXAS 78283-0027
(210) 227-1373
FAX (210) 227-4323

1.113.6-TAC

TRANS TEXAS WATER PROGRAM
WEST CENTRAL STUDY AREA PHASE 1B REPORT

ADVISORY COMMITTEE FOR PUBLIC AND TECHNICAL INPUT

SUBMITTED BY: Jay Lucia **DATE:** 2-12-96

COMMENTS: To reiterate: We cannot / should not proceed into Phase 2 feasibility studies or make decisions about which water supply alternatives deserves further studies without first determining what kind of water quality we can depend on in the Edwards Aquifer. If the water is defiled, if water treatment plants are necessary, if the recharge capability is impaired as THRCC is determined to be, if we no longer can count on drawing 500,000 acre ft from the Aquifer — all the answers to the above & more will have an effect upon our alternative decisions. Please answer the question of WHY the delay in 3.44.4-RG. 3/106 or WHY it is to be completed in subsequent phases —

PLEASE ATTACH ADDITIONAL SHEETS IF NECESSARY.
PLEASE RETURN TO:

STEVEN J. RAABE, P.E.
SAN ANTONIO RIVER AUTHORITY
P.O. BOX 830027
SAN ANTONIO, TEXAS 78283-0027
(210) 227-1373
FAX (210) 227-4323

03-04-96-1

Mar.2,1996

Mr Steven J. Raabe, P.E. Project Manager
Trans-Texas Water Program
San Antonio River Authority
100 East Guenther Street
P.O. Box 830027
San Antonio, Texas 78283-0027

Dear Mr Raabe,

I remember a date of Mar.15th in which suggestions were to be sent to your office. Please accept these notes until I can find the form letter you included in one of the other reports:

The idea that anyone or any government can project uses of water to the year 2050 is absurd. Let me call your attention to the fact that the San Antonio Water System , depite supporting the 2050 plan, was unable to make projections beyond the year 2020.

It is also well to consider the national political disputes going on between candidates for the Presidency of the United States. They don't seem to agree that any political party or scientific organization is able to predict needs even to the year 2001, which is only five years ahead.

The concept of moving water through pipelines across an artesian reservoir , the Edwards Aquifer, is foolish and a waste of money. The water can be added to the aquifer at a number of locations. The Uppper Cibolo Creek proposal is one; the Edwards Underground Water District has been investigating the enhancement of the aquifer by recharging the aquifer underlying the Blanco River, where large losses to the Edwards have been measured.

Please consider these two ideas, the planning time to something realistic, and the recharge of the aquifer to save the taxpayers money.

Sincerely, Tom Culbertson

Tom Culbertson, Hydrologist
511 Westwood
San Antonio, Texas 78212

Tel. 733-7474

1.11-3.6 TAC

TRANS TEXAS WATER PROGRAM
WEST CENTRAL STUDY AREA

ADVISORY COMMITTEE FOR PUBLIC AND TECHNICAL INPUT

March 7, 1996, 2:00 PM
San Antonio Water System Training Room

AGENDA

I.	WELCOME	Fred N. Pfeiffer San Antonio River Authority
II.	INTRODUCTORY REMARKS	Steven J. Raabe, P.E. San Antonio River Authority
III.	UPCOMING EVENTS	Steven J. Raabe, P.E. San Antonio River Authority
IV.	UPPER GUADALUPE RECHARGE	Sam Vaugh, P.E. HDR Engineering, Inc.
V.	CIBOLO RESERVOIR WITH IMPORTED WATER	Sam Vaugh, P.E. HDR Engineering, Inc.
VI.	UPPER CIBOLO CREEK RESERVOIR COST ANALYSIS	Rich Shoemaker, P.E. HDR Engineering, Inc.
VII.	SUMMARY OF PHASE 1-B	Ken Choffel, P.E. HDR Engineering, Inc.
VIII.	PUBLIC PARTICIPATION STAKEHOLDER INVOLVEMENT	Robert Aguirre Robert Aguirre Consultants, L.C.
IX.	PHASE 2 - LETTER OF INTENT STATUS REPORT	Steven J. Raabe, P.E. San Antonio River Authority
X.	OPEN DISCUSSION	
XI.	CLOSING REMARKS	Steven J. Raabe, P.E. San Antonio River Authority

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1.113.6-TAC

TRANS TEXAS WATER PROGRAM
WEST CENTRAL STUDY AREA PHASE 1B REPORT

ADVISORY COMMITTEE FOR PUBLIC AND TECHNICAL INPUT

SUBMITTED BY: _____ **DATE:** _____

COMMENTS: _____

PLEASE ATTACH ADDITIONAL SHEETS IF NECESSARY.
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STEVEN J. RAABE, P.E.
SAN ANTONIO RIVER AUTHORITY
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FAX (210) 227-4323

1.11-3.8-GC

TRANS-TEXAS WATER PROGRAM
WEST CENTRAL STUDY AREA

ADVISORY COMMITTEE FOR PUBLIC AND TECHNICAL INPUT

SAN ANTONIO WATER SYSTEM
BOARDROOM
THURSDAY, MARCH 7, 1996
2:00 P.M.

VISITORS SIGN-IN SHEET

NAME	ORGANIZATION	PHONE NUMBER
Bob Hall	UGRA	210 896 7478
Judi Austen	HQ AFETC/CEDE	210-652-2774
Robert Aguirre	Aguirre Consultants	299-1171
FRED N. PFEIFFER	SARA	227 1373
GARY GILLS	WILSON COUNTY NEWS	210-216-4519
J. McJones	BMA WCiW	2106652132
Luana Buckner	Medina Co GWD	426-3162
SAM VAUGHT	HDR	512-912-5142
Mingma Hammond	SAWS	704-7528
D Bradley	TWDB	512-463-7976
Thomas D. Hill	GBRA	210-379-5822
Ken Choate	HDR	512-912-5131
Jerry Needham	Express-News	210-351-7387
Jack Mahnken	Bexar Met	354-6500
WARREN R. FORD	SUNBELT ENVT. SVCS.	(210) 828 2457
Albert S. Gonzalez	MARGON, INC.	210-978-7607

1.11-3.8-GC

TRANS-TEXAS WATER PROGRAM
WEST CENTRAL STUDY AREA

ADVISORY COMMITTEE FOR PUBLIC AND TECHNICAL INPUT

SAN ANTONIO WATER SYSTEM
BOARDROOM
THURSDAY, MARCH 7, 1996
2:00 P.M.

VISITORS SIGN-IN SHEET

NAME	ORGANIZATION	PHONE NUMBER
Con Ming	Nueces River Auth.	210-278-6810
Cole Rowland	City of Lakeway	512-261-5922
ART POSTEL	UCCR Project	(210) 805-5083
Rich Shoemaker	HDR Engineering	(512) 912-5157
Cindy Loeffler	TPWD	(512) 912-7015
Carlos Lopez	Bureau of Reclamation	(512) 916 5641
Greg Rothe	EDWID	210 426 5696
Tom Culbertson	RLA&W P.O. Box 6293 78209	733-7472
MARK Sullivan	Sullivan Research	210) 822-2022
Irene Reyes	Bexar met	210-670-3108
Danielle Milam	SAWS	210 828 3960
JIM HANNAH	LAMCOS	510.4731
Phil Ross	HPA	229153
CAMERON CORNETT	SWMD	796 7260

Mar.7,1976

Mr Steven J. Raabe, Project Manager
Trans-Texas Water Program
S.A.R.A., 100 East Guenther, S.A. ,TX. 78283

Dear Mr Raabe,

Specifically, The Upper Cibolo Creek Reservoir proposed by Arthur L. Postel, is the most viable water supply which includes surface storage, aquifer recharge, and resulting increase in springflow.

The comments included in the H.D.R. report were not professionally prudent in this Phase I general discussion of alternatives.

The Edwards Underground Water District has made a legal effort to stop the waste of water reported at the so-called Fishfarm, which produces Edwards aquifer water. I believe they would be justified in opposing large shallow surface reservoirs such as proposed at Cuero and Lindenau.

The waste of water through evaporation in arid regions ~~is~~ is an important consideration in the options that are available to us in the West Central Study Area.

As a citizen, I oppose the waste of money as well as water on projects that are not economically sound; and I am specific in saying that the transfer of water by a pipeline over an artesian reservoir is a waste of the taxpayers money. Surface streams, such as the Blanco River lose water naturally over the recharge zone of the Edwards. And it is physically possible to increase that recharge through various technics within the bed of that river.

It is earnestly hoped that a postive program may be developed in the Trans-Texas Water Program ; but thus far it seems that we have seen too much -rhetoric.

Sincerely, Tom Culbertson

Tom Culbertson, Hydrologist
511 Westwood
San Antonio, Texas 78212

Trans Tex
03-07-96

Medina County
Underground Water
Conservation District

Preserve, Protect, Conserve

1613 Avenue K, Suite 105
Hondo, Texas 78861
(210) 426-3162 Fax (210) 426-5037

DATE: 3-7-96

TO: Steve Raabe
SARA

RE: Comments on TransTexas Water Program
West Central Study Area Phase 1; Vol. 4

Section 3.45/Alternative G-33: Total Water Availability
Assume pumping from aquifer of 400,000 af/yr even during drought conditions. Assumption appears to over estimate water availability (as enhanced spring flow) under drought conditions.

Implementation Issues listed on pages 3-761 & 3-781:
Statement implies these alternatives could not be implemented utilizing existing institutional arrangements. I disagree with statement and object to the "editorial" comment in a technical report.

Section 3.48/Alternative S-17:
Statement on page 3-788, "Tourism and federal military expenditures represent a significant contribution to the economy of the area." Since agribusiness has the 2nd largest economic impact on Bexar County (4.97 billion dollars annually) future reports, when describing the Bexar County economy should include agribusiness.

Steve-Sorry so late with comments. lb

SARA

MAR 0 6 1996

1.113.6-TAC

TRANS TEXAS WATER PROGRAM
WEST CENTRAL STUDY AREA PHASE 1B REPORT

ADVISORY COMMITTEE FOR PUBLIC AND TECHNICAL INPUT

SUBMITTED BY: Arthur E. Postel **DATE:** March 7, 1996

COMMENTS: CONCEPTUAL ERROR & INCONSISTENCY[1] ABASE THE UPPER CIBOLO CREEK RESERVOIR PROJECT AND MAY ADVANCE MORE COSTLY ALTERNATIVES.

BACKGROUND: The Upper Cibolo Creek Reservoir Project (UCCR) was proposed to meet the water requirements of all parties at interest by conjunctive action between Canyon Lake and Cibolo Creek. This was clearly shown in the written comments dated 2/12/95 [App. A] to the above named committee which led to the inclusion of "Cost Analyses" of UCCR in Volume 4[1] presently under consideration. This conjunctive action was also delineated in comments to the Advisory Committee on 2/10/95, to the T-TWP, West Central Study Area, Policy Management Committee (PMC) on 2/28/95 & 5/5/95, and in letters to SARA, the lead sponsor of the West Central Study, dated 3/9/95 [APP. B], 3/24/95 [App. D], 5/9/95 [App. E], 6/20/95 [App. F], and 8/14/95 [App. H]. Response received dated 7/31/95 [App. G].

Throughout these communications, it was shown that the UCCR

[1] HDR Engineering, Inc., TRANS-TEXAS WATER PROGRAM, West Central Study Area, Phase 1, Interim Report, Volume 4, January, 1996, pp. (3-783)-(3-801).

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FAX (210) 227-4323

was to be structured to provide the following (See Appendix C):

1. Water Supply,
2. Terminal Storage,
3. Aquifer Recharge, and
4. Spring Flow Preservation.

FIRM YIELD OF UCCR DERIVED FROM CONCEPTUAL ERRORS: "In order to provide a minimum, conventional estimate of the available yield of Upper Cibolo Creek Reservoir, the firm yield of the proposed 150,000 acft (sic) reservoir was computed utilizing only runoff originating in the Cibolo Creek watershed."[2] This concept of considering only "water supply" from the limited watershed of the UCCR fails the potential of its site (See above); and, by estimating the cost of water on this basis, a very high unit cost of water was shown.[3]

Furthermore, the amount of "runoff originating in the Cibolo Creek watershed"[2] was erroneously derived in that "streamflows for Cibolo Creek at Selma (ID #1850) were assumed to be representative of inflows to Upper Cibolo Creek Reservoir."[4] However, the gage at Selma, below the dam site, records less flow than the gage at Boerne (ID #1839), above the UCCR, because "Considerable flow of Cibolo Creek enters the Edwards and associated limestone in the Balcones Fault Zone, that crosses basin between this station (Selma) and the station near Boerne (station 08183900)."[5] In fact, the Cibolo Creek gage near Boerne is shown as having a 29 year average discharge of 19,630 AF/YR from only a 68.4 square mile watershed, and the one at Selma is shown as having a 45 year average discharge of only 11,010

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[2] Id., p. 3-786. [3] Id., p. 3-798. [4] Id., p. 3-787.

[5] U.S. Geological Survey, Water Resources Data, Texas, Water Year 1991, Volume 3, p. 352.

AF/YR from a 274 square mile watershed.[6] The average difference of 8,620 AF/YR is roughly that of the 8,700 AF/YR shown to be the firm yield of the UCCR[7] which is postulated as little more than that which "enters the Edwards and associated limestone".[5]

Not only is the firm yield shown to be less than its assumed inflows, but average UCCR inflows could have been realistically estimated from the 287 AF/YR (19,630/68.4) per square mile streamflow at the Boerne gage times the UCCR watershed of 260 square miles for an average inflow of 74,620 AF/YR (287 x 260). With the reservoir sealed as contemplated,[8] the application of the model "specifically written to simulate reservoir operations subject to the Trans-Texas Environmental Criteria"[9] would produce a firm yield in excess of 75,000 AF/YR.

The "total project cost is estimated to be $168,673,000. The resulting annualized project cost, including operation and maintenance, is $17,305,000"[10] Thus, annual cost of water for the above conventional estimate of available yield for the UCCR would be $230 per acre-foot instead of $1,989 per acre foot as shown.[10]

RECOGNIZED POTENTIAL OF UPPER CIBOLO CREEK RESERVOIR:

> "If Upper Cibolo Creek Reservoir were operated with the primary objective of sustaining flows from Comal Springs, its available yield would be realized in the form of sustained Edwards Aquifer pumpage during drought periods. If controlled recharge from the reservoir could, in fact, maintain discharge from Comal Springs

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[6] Id., pp. 351,352. [7] HDR, Vol. 4, pp. 3-787 & 3-801

[8] Id., pp. (3-798)-(3-800). [9] Id., p. 3-787. [10] Id., pp. (3-800)-(3-801).

> at a rate in excess of a specified jeopardy level, curtailment of aquifer pumpage under a drought management plan might be minimized, particularly in Uvalde, Medina, and Bexar Counties. Significant hydrogeological questions exist, however, as to how much of the water recharged at the reservoir would bypass Comal Springs and flow towards Hueco and San Marcos Springs (see Figure 3.48-1). Furthermore, it is possible that the hydraulic gradient of the aquifer could be reversed during drought causing water recharged at the reservoir to flow in the direction of concentrated municipal and industrial pumpage in the San Antonio metropolitan area. Long-term average recharge which occurs naturally along Cibolo Creek above the proposed dam site would be reduced significantly by sealing of the Kainer formation to impound the reservoir. The ability of current hydrogeologic computer models to simulate the complex physical processes involved sufficiently accurately to address these concerns is also in question at this time."[11]

Therein is recognized the site potential of the UCCR. The four expressed concerns can be sequentially addressed as follows:

1) Water recharged at the reservoir that might bypass Comal Springs can be minimized by first drilling to the aquifer from the Cibolo Creek bed to establish the point of correspondence for controlled recharge (See Apps. A, B, C, & E).

2) Reversal of the aquifer's hydraulic gradient during drought is highly unlikely because of the aquifer's broad expanse west of Cibolo Creek and narrow width east of the creek whereby any recharge would quickly level out to the west but steepen the gradient to the east because of the confined flow path.

3) Natural recharge along Cibolo Creek would of course be reduced by sealing, but this is by design so as to control recharge at this critical point for release as needed.

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[11] Id., p. 3-786.

4) Drilling to establish correspondence between the Cibolo Creek bed and the aquifer's flow path to Comal Springs would reduce the difficulty of any computer modeling that may be necessary to utilize the full potential of Cibolo Creek and its conjunctive action with Canyon Lake (See 1 above).

ENVIRONMENTAL ISSUES: Pages 3-787 through 3-793 of the UCCR Cost Analyses included in the Volume 4 Interim Report clearly show that isopods, spiders, harvestmen, cave crickets, cave beetles, ranid frogs, cricket frogs, and the Texas salamander, if they were listed on the Endangered Species List (although none "has been reported to occur on the project site") could prevent the use of Cibolo Creek for water supply, terminal storage, aquifer recharge, and springflow preservation on behalf of the public interest by the power that would then be given to these species by our government.

Although no listed species were observed in the proposed reservoir area, nor habitat for the listed golden-cheeked warbler and black-capped vireo, such habitat "<u>may exist</u>" or "<u>could be present</u> within the project area." Since no such speculative, environmental limitations were found in the other projects analyzed in Volume 4, this inconsistency tends to abase the UCCR project vis-à-vis the other alternatives.

INCREMENTAL DEVELOPMENT OF THE UCCR: Capital costs of $168,673,000, including reservoir seal and recharge facilities, are reasonable when it is recognized that this cost represents the ultimate size of the UCCR; whereas, this reach of Cibolo Creek lends itself to incremental development by starting with a diversion pump at Canyon Lake,

and a 6½ mile pipeline to a Cibolo Creek tributary [App. E]. The initial retarding dam on Cibolo Creek could be sealed to control recharge, sized in keeping with these transfers plus natural inflow, and avoid the limitations on transfer utilization for recharge that was noted on page 3-707 of Volume 4.

As additional water for recharge is needed, to supply springs and sustain San Antonio's pumping from the aquifer, the Blanco River Diversion to Canyon Lake could be built [App. A,C, & D] with its 1½ mile transfer line and supplemental transfer facilities paralleling those from Canyon Lake to the Cibolo Creek tributary.

CONCLUSION: Conjunctive action between Canyon Lake and the UCCR has the potential to meet the water requirements of all parties at interest, at the least cost to the San Antonio Water System, and with the least financial impact on the San Antonio and Bexar County water customer [See App. I].

However, conceptual analysis and structural refinements must be explored for this least cost solution to reach its potential. A synthesis of the UCCR analysis and that of Alternative G-32 (Diversion of Canyon Lake Flood Storage to Recharge Zone via Cibolo Creek) plus available Canyon Lake firm yield would advance this objective.

The next phase of the Trans-Texas Water Program can accomplish this purpose.

1.11-3.6 TAC

TRANS TEXAS WATER PROGRAM
WEST CENTRAL STUDY AREA
ADVISORY COMMITTEE FOR PUBLIC AND TECHNICAL INPUT
PHASE 1-A INTERIM REPORT

SUBMITTED BY: Arthur E. Postel **DATE** 2/12/95

COMMENTS: **CANYON LAKE & CIBOLO CREEK:** Conjunctive action between Canyon Lake and Cibolo Creek has the potential to meet the water requirements of all the parties at interest.

THE UPPER CIBOLO CREEK RESERVOIR: An excellent dam site on Cibolo Creek at coordinates N 29°38'42" and W 98°20'49" could impound water up to 150,000 AF. At this capacity its average depth would be 44 feet. Only 5 existing reservoirs in Texas have a greater average depth to minimize evaporation. To distinguish this proposed reservoir from one on Cibolo Creek in Wilson County, it has been designated the Upper Cibolo Creek Reservoir (UCCR).

SOURCES OF WATER FOR TERMINAL STORAGE: The drainage area of the UCCR is 258 square miles. While significant, it is not large enough for a reservoir that could fully utilize the potential of this site. Because of its topography and proximity to San Antonio, the UCCR site is the best location for terminal storage of water imports into Bexar County. Transfer of flood water and available conservation storage from Canyon Lake to the headwaters

PLEASE ATTACH ADDITIONAL SHEETS IF NECESSARY.

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FAX: (210) 227-4323

APPENDIX A

of Dripping Springs Creek would require but 6½ miles of pipe. From there it would flow into Lewis Creek and into Cibolo Creek and the Upper Cibolo Creek Reservoir.

Additional water from Canyon Lake could be incrementally provided from other sources. A small reservoir on the Blanco River at an excellent site upstream from Clopton Crossing would avoid housing in the area and require but 2½ miles of pipe to divert its firm yield from 300 square miles of drainage area to the headwaters of Jacobs Creek which flows into Canyon Lake. The proposed Dam #7 on the Guadalupe would develop additional firm yield from the river. These sources of water from Canyon Lake would be developed as needed; and, given the vagaries of nature, even during drought, the chances of gathering rainfall would be greatly enhanced from this more extensive and relatively pristine area.

SPRINGFLOW PRESERVATION BY AQUIFER RECHARGE AT CIBOLO: Both the character of this area and the miles of tumbling over the stream beds leading to the UCCR will render a natural purity to its water. Such purity is requisite for recharge.

The water impounded on the downthrown block of Bat Cave fault, which crosses Cibolo Creek, will be on the recharge zone of the Edwards Aquifer. Recharge can be direct and controlled at a point just "upstream" in the aquifer from the springs where correspondence with Comal Springs can be determined by 3-D seismic imaging; and, if found insufficient, can be established by drilling to the aquifer from the Cibolo Creek bed. At this point the aquifer narrows; and, with significant head behind the pure hill

country water in the reservoir, the aquifer will tend to mound, its hydraulic gradient will steepen toward the springs, level toward San Antonio permitting greater withdrawal of water, and hold in check the bad water line near the springs by the pressure and purity of the recharge water. This scenario is based on the properties of water and its hydrology, and there is no study of the aquifer formation in the critical area of Cibolo Creek and Comal Springs by which it could be refuted.

NATURAL BRIDGE CAVERNS: In 1989, consulting geologist Robert J. Scott considered the relationship between Natural Bridge Caverns and Cibolo Creek. His report showed that an impoundment on the creek bed above Bat Cave fault would be on the impermeable upper Glen Rose formation in which the caverns are formed. The creek bed is at 900 feet MSL at its closest point to the caverns, but their historical high water mark is 860. If infiltration from the creek could occur, water in the caverns would have been far above 860. His stratigraphic cross-section from the creek through the caverns to the dam site showed that local rains form a "perched" water table in the caverns on the upthrown block of Bat Cave fault. Water released to the downthrown block could not rise to the caverns because of the aquifer's lateral permeability. His report is , of course, available for detailed study.

TELEMETRY: As shown above, rainfall from a wide area north of San Antonio can be made available for terminal storage in the UCCR where it can recharge the aquifer to preserve springflow and enable the City to withdraw greater amounts of water from its

historic source. To coordinate the various elements of rainfall location and amount, reservoir levels, pipe line and pumping capacities, water demand, and springflow levels; telemeters would be installed to relay these data to a central system of servocontrols which would transmit the proper signals to the electrically operated pumps for their appropriate response and to the underwater valves for their releases to the aquifer. The San Antonio Water System (SAWS) would monitor the operation as the focal point of San Antonio's alternative water supply.

FINANCE: The $75 million cost estimate of the UCCR at full size development is derived from the U.S. Army Corps of Engineers cost estimate for Clopton Crossing Lake reduced to that of a comparable-sized reservoir and escalated to current price levels by Corps indices. Ancillary facilities, including the Blanco River diversion, could reasonably keep the total cost to within $110 million.

The UCCR proposal would enable SAWS to meet its water demands from the aquifer without a new delivery system which is estimated to cost an additional $87-91 million for other surface water proposals. Compared to these, SAWS is far more likely to finance the UCCR system from its new and current rate structure without a rate increase because aquifer water is so valuable to the San Antonio Water System.

CONCLUSION: Over the past six years, the UCCR proposal has been presented to the City Council of the City of San Antonio, the San Antonio Water System, the Edwards Underground Water Dis-

trict, the U.S. Army Corps of Engineers, the San Antonio River Authority, the 2050 Water Resources Committee, the Environmental Section of the Texas Water Development Board, the Center for Research in Water Resources of the University of Texas at Austin, HDR Engineering in Austin, the San Antonio Express-News, and other San Antonio papers. No word on the proposal has been published, and learned studies have either confused the UCCR with a proposed Cibolo Creek reservoir in Wilson County or with 7 proposed small structures on Cibolo Creek which were examined for recharge in an uncompleted draft study by Espey, Huston & Associates.

The near conjunction of Comal Springs, Cibolo Creek, and Canyon Lake lends itself to the optimum development of the Edwards Aquifer to meet the water requirements of all the parties at interest and at the least cost. Furthermore, as a premise to the following recommendation, it should be clearly understood that the federal courts have not ordered pumping limitations from the Edwards Aquifer, Sierra Club v. Babbitt, 995 F.2d 571 (5th Cir.). Consequently, the Upper Cibolo Creek Reservoir proposal should be critically examined and physically tested and the results published before other steps are taken.

Arthur E. Postel
Retired Professional Civil Engineer
And Municipal Bond Specialist

101 Arcadia Place
San Antonio, Texas 78209-5857
(210) 828-3834
FAX: (210) 822-1140

THE UPPER CIBOLO CREEK
RESERVOIR PROJECT

101 ARCADIA PL. #507 SAN ANTONIO, TEXAS 78209 (210) 828-3834

March 9, 1995

Herb Grubb, PhD.
HDR Engineering, Inc.
Suite 400
3000 South IH 35
Austin, TX 78704-6536

In re: Trans-Texas Water Program
UCCR Scope of Work

Dear Dr. Grubb:

For your information, a copy of the Geology of the Upper Cibolo Creek Reservoir Area is enclosed which has been reproduced in folio form rather than by comb binding. As a result, some page numbers are out of sequence, but without effect on the content.

Item 3d of the Scope of Work for the UCCR related to an appropriate spillway configuration brings to mind the swale in the ridge that extends from Bat Cave Road to the dam site which could be excavated for an emergency spillway.

Item 3e related to sealing appropriate portions of the creek bed by grouting brings to mind various techniques such as reinforced shotcrete with fibers of steel, polypropylene, latex, etc. to increase its tensile and compressive strength and reduce plastic shrinkage, and/or the application of a polymer material to accomplish sealing. The Forta Corporation of Grove City, PA has extensive experience with reinforcement of air-placed concrete. Furthermore, beds of dense, argillaceous limestone that is hydrogeologically known as the Regional Dense Member are exposed within and adjacent to the reservoir site. This material is known to hold water and consideration should be given to its utilization for sealing.

Appropriate as an addition under Item 4 would be section f to establish correspondence with Comal Springs by boring a pilot hole in the bed of Cibolo Creek for the introduction of trace elements and its subsequent enlargement to enhance recharge and maintain spring flow.

If I can be of further help, please advise.

Yours very truly,

Arthur E. Postel

cc: Steven J. Raabe.

APPENDIX B

THE UPPER CIBOLO CREEK RESERVOIR PROJECT

By Arthur E. Postel, Retired
Professional Civil Engineer and Municipal Bond Specialist

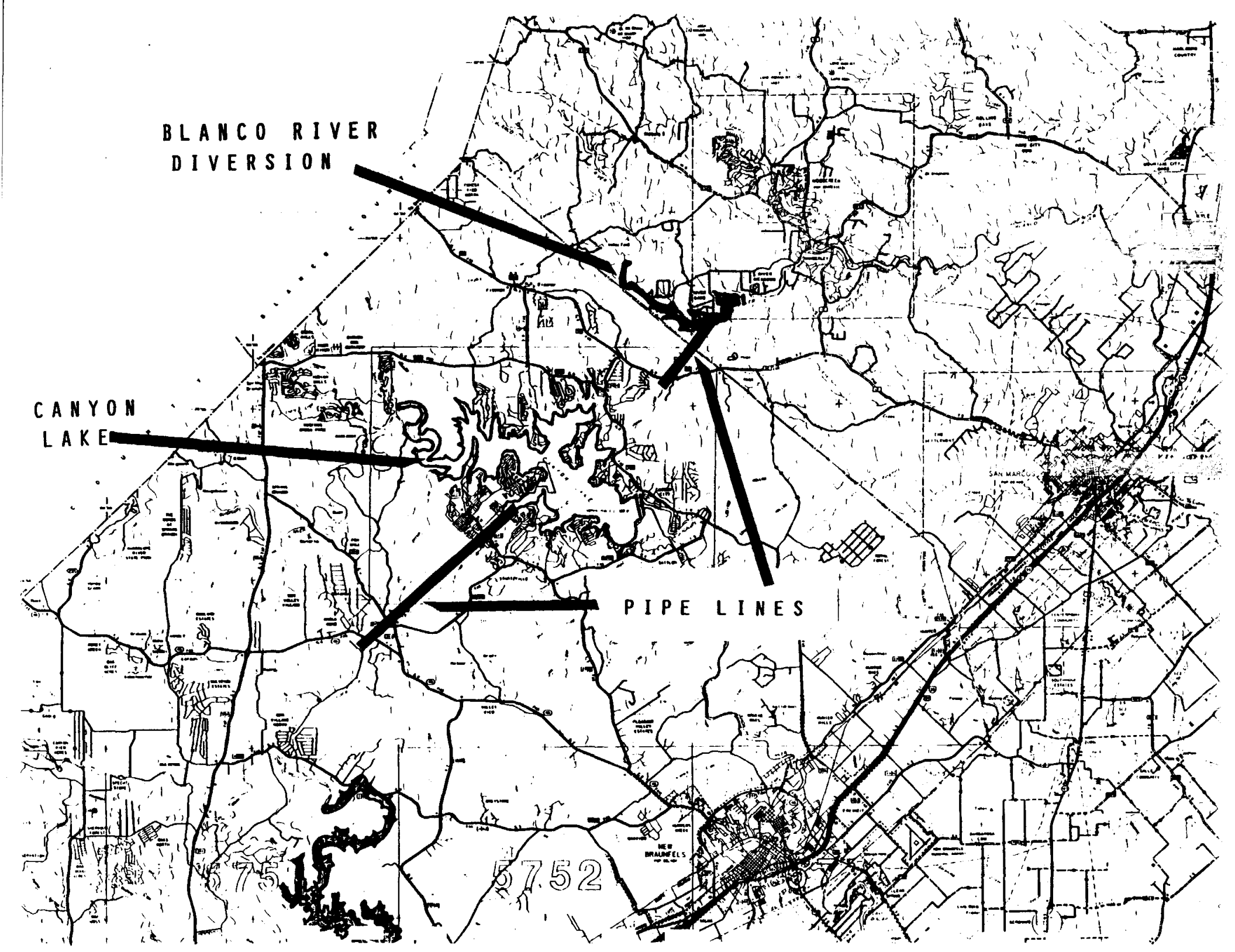
101 Arcadia Place #410 San Antonio, Texas 78209 (210) 805-8083

THE OBJECTIVE: Conjunctive action between Canyon Lake and Cibolo Creek to meet the water requirements of the Springs, the Irrigators, San Antonio, the I-35 Corridor, and downstream users.

THE UPPER CIBOLO CREEK RESERVOIR: An excellent dam site on Cibolo Creek north of Bracken could impound 146,279 acre-feet of water at 950 feet MSL. At this capacity its average depth would be 44 feet. Only 5 existing reservoirs in Texas have a greater average depth to minimize evaporation. To distinguish this proposed reservoir from one on Cibolo Creek in Wilson County, it is designated the Upper Cibolo Creek Reservoir (UCCR).

SOURCES OF WATER FOR TERMINAL STORAGE: The drainage area of the UCCR is 258 square miles. While significant, it is not large enough for a reservoir that could fully utilize the site's potential. Because of its topography and proximity to San Antonio, the UCCR site is the best location for terminal storage of water imports into Bexar County. Transfer of flood water and available firm yield from Canyon Lake on the Guadalupe River to the headwaters of tributary streams would require but 6½ miles of pipe.

Additional water from Canyon Lake could be provided from other sources. A small reservoir on the Blanco River at an excellent site upstream from Clopton Crossing would require but 2½ miles of pipe to divert its firm yield from 300 square miles of drainage area to a Canyon Lake tributary. The proposed Dam #7 on the Guadalupe would develop additional firm yield from the river. These sources of water from Canyon Lake would be developed as needed; and, given the capriciousness of nature, the chances and capacity to gather rainfall, even during drought, would be greatly enhanced from this more extensive and relatively pristine area.


BLANCO RIVER
DIVERSION
CANYON
LAKE
PIPE LINES
SAN MARCOS
NEW
BRAUNFELS
5752

UPPER CIBOLO CREEK RESERVOIR

LEGEND

FOR:

1. WATER SUPPLY,
2. TERMINAL STORAGE,
3. AQUIFER RECHARGE, AND
4. SPRING FLOW PRESERVATION.

(Over)

SPRING FLOW PRESERVATION BY AQUIFER RECHARGE AT CIBOLO: Both the character of this area and the miles of tumbling over the stream beds leading to the UCCR will render a natural purity to its water. Such purity is requisite for recharge.

Water impounded on the downthrown block of Bat Cave fault, which crosses Cibolo Creek, will be on the recharge zone of the Edwards Aquifer. Recharge can be direct and controlled at a point just "upstream" in the aquifer from the springs where correspondence with Comal Springs, if found insufficient, can be established by drilling to the aquifer from the Cibolo Creek bed. At this point the aquifer narrows; and, with significant head behind the pure hill country water in the reservoir, the aquifer will tend to mound, its hydraulic gradient steepen toward the springs, level toward San Antonio (enabling a greater withdrawal of water), and hold in check the bad water line near the springs by the pressure and purity of the recharge water.

NATURAL BRIDGE CAVERNS: In 1989, consulting geologist Robert J. Scott considered the relationship between the caverns and Cibolo Creek. He showed that an impoundment on the creek bed above Bat Cave fault would be within the impermeable upper Glen Rose formation in which the caverns are formed. The creek bed is at 900 feet MSL at its closest point to the caverns, but their historical high water mark is 860. If infiltration from the creek could occur, water in the caverns would have been above 860. His stratigraphic cross-section from the creek through the caverns to the dam site showed that local rains form a "perched" water table in the caverns on the upthrown block of Bat Cave fault. Water released to the downthrown block could not rise to the caverns because of the aquifer's lateral permeability.

AN OBSERVATION: The Blanco River Diversion, Canyon Lake, and the UCCR all bear directly N 30° E from the Bexar County Courthouse. It is as if nature had directed the solution to the water problems of the San Antonio area.

March 1995

THE UPPER CIBOLO CREEK
RESERVOIR PROJECT

101 ARCADIA PL. #507 SAN ANTONIO, TEXAS 78209 (210) 828-3834

March 24, 1995

Mr. Fred N. Pfeiffer, General Manager
San Antonio River Authority
P.O. Box 830027
San Antonio, TX 78283-0027

Dear Fred: In Re: Trans-Texas Water Program and
The Upper Cibolo Creek Reservoir

A diversion dam and reservoir on the Blanco River is proposed for an additional water supply to Canyon Lake and then to the subject reservoir.

Dam coordinates at the Blanco River of approximately N 29°58'05" and W 98°08'30" could utilize Pinoak Creek for drainage from a short emergency spillway.

An updated folder related to the Cibolo project is enclosed for your information.

Sincerely,

Art Postel

Arthur E. Postel

cc w/enc. Dr. Herb Grubb
HDR Engineering, Inc.

APPENDIX D

THE UPPER CIBOLO CREEK
RESERVOIR PROJECT

101 ARCADIA PL. #507 SAN ANTONIO, TEXAS 78209 (210) 828-3834

May 9, 1995

Fred N. Pfeiffer, General Manager
San Antonio River Authority
P.O. Box 830027
San Antonio, TX 78283-0027

Dear Fred: In re: UCCR Scope of Work

My remarks at the May 5th meeting of the PMC for the Trans-Texas Water Program, West Central Study Area related to the Scope of Work dated February 26, 1995 for the Upper Cibolo Creek Reservoir "as a means of sustaining Comal springflow and Edwards Aquifer pumpage during drought", and to a subsequent reduced scope of work dated March 10th that confined the study to the feasibility of sealing the reservoir and to develop a cost estimate.

As I mentioned at the meeting, the ownership of Natural Bridge Caverns will not accept a mere paper evaluation of sealing feasibility. In their view, this must be demonstrated. Consequently, my remarks at the meeting tried to show that because the UCCR project lends itself to incremental development by starting with a diversion pump at Canyon Lake, the 6½ mile pipe line to Cibolo tributaries, and a small retarding dam on Cibolo Creek; water would then be available on demand to physically test the sealing of the creek bed and also correspondence between the creek bed and Comal Springs by drilling if necessary.

Thus it was my thought that the Scope of Work should be prioritized to reflect this necessary sequence of development rather than a preliminary evaluation of the ultimate UCCR construction. Significantly, even the initial development outlined above would have beneficial results with its controlled but limited aquifer recharge and probable augmentation of springflow.

Enclosed for your information is a UCCR derivative cost estimate of $72,000,000 that I made a year ago for the 2050 Committee. Indices included would revise this to a current estimate of $74 million.

Sincerely yours,

Arthur E. Postel

cc. w/enc: HDR Eng., Inc.
cc: Natural Bridge Caverns

APPENDIX E

2118 36th St. NW
Canton, OH 44709
June 20, 1995

Steven J. Raabe, P.E.
Chief, Engineering Division
San Antonio River Authority
P.O. Box 830027
San Antonio, TX 78283-0027

Dear Steve: In re: UCCR Scope of Work

Thanks for sending a copy of the Letter of Intent dated April 19, 1995 between the various water agencies which letter has as its purpose the supply of water to Bexar County from the Guadalupe River Basin. As reflected by your Letter of Transmittal dated May 26th, this was at my request.

You will recall our conversation in SARA's office on May 25th at which I made this request and also your expressed intent to reply to my letter of May 9, 1995 related to prioritizing the Scope of Work for the $25,000 study of the Upper Cibolo Creek Reservoir proposal which SARA is financing. Since the UCCR proposal has the potential to meet the water requirements of all parties at interest at the least cost, you can readily understand the importance of having the focus of this initial study on those elements of the project that enhance regional recharge as the best way to preserve springflow at Comal and San Marcos Springs.

The favor of your reply will be very much appreciated.

Yours very truly,

Arthur E. Postel

APPENDIX F

TRANS-TEXAS WATER PROGRAM

SAN ANTONIO RIVER AUTHORITY 100 EAST GUENTHER STREET P.O. BOX 830027 SAN ANTONIO TEXAS 78283-0027

1.11-3.6 TAC

July 31, 1995

Mr. Arthur E. Postel
101 Arcadia PL. # 507
San Antonio, TX 78209

RE: Trans-Texas Water Program
West Central Study Area
Phase 1B - Upper Cibolo Creek Reservoir

Dear Mr. Postel:

Thank you for your recent letters to Mr. Fred N. Pfeiffer and myself providing clarification of your remarks at the May 9, 1995 Policy Management Committee meeting concerning the sequence of study items on the proposed Upper Cibolo Creek reservoir.

You have suggested immediate construction of a diversion pump at Canyon Lake, a 6.5 mile pipeline to a tributary of Cibolo Creek and a small retarding dam on Cibolo Creek to physically test the feasibility of sealing the proposed reservoir, its impact on Natural Bridge Caverns and whether the water recharged from the reservoir would actually accrue to Comal Springs. This type of pilot study would require a significant commitment of funds and should be undertaken only after the project is supported by conceptual screening analyses.

Over 150 different alternatives are being evaluated in the Phase 1 Trans-Texas study. Many of these alternatives have previously been studied by other federal, state and local agencies. These alternatives are being reconsidered using the same evaluation criteria being used for all new alternatives. Therefore, it is important to develop a project cost estimate for the proposed Upper Cibolo Creek reservoir using current and site specific criteria for equivalent comparison with other alternatives.

APPENDIX G

The amount of water the project would make available for supply to a water treatment plant or for recharge to supplement springflows has to be factored into the project cost as one indication of potential project feasibility. As part of the work sponsored by the Edwards Underground Water District, the Phase 1B scope of work already contains tasks to determine the amount of water which could be potentially available from the Guadalupe River and Canyon Lake for delivery to locations in north Bexar County to be used for recharge to the Edwards Aquifer or storage in a reservoir like Upper Cibolo Creek reservoir. The results of these tasks are expected to have additional application to the conceptual evaluation of the proposed Upper Cibolo Creek reservoir.

I hope this letter better informs you of the intended level of evaluation now funded for the proposed Upper Cibolo Creek reservoir. If you have any questions, please do not hesitate to contact me.

Sincerely;

STEVEN J. RAABE, P.E.
Project Manager

SJR:rmc

P:\RMC\WPDATA\TRANSTEX\POSTEL.LTR

THE UPPER CIBOLO CREEK
RESERVOIR PROJECT

101 ARCADIA PL. #507 SAN ANTONIO, TEXAS 78209 (210) 828-3834

August 14, 1995

Steven J. Raabe, P.E.,
Chief, Engineering Division,
San Antonio River Authority
P.O. Box 830027
San Antonio, TX 78283-0027

FAX: (210) 227-4323

Dear Steve: In re: UCCR Project, Scope of Work

Your July 31st reply to my letters of May 9th and June 20th was recently received. It provides a bridge to reach a mutual understanding and consensus on the sequence of study of the UCCR project which is necessary for a valid "comparison with other alternatives" using "site specific criteria".

My letters did not suggest "immediate construction of a diversion pump at Canyon Lake, a 6.5 mile pipeline to a tributary of Cibolo Creek and a small retarding dam on Cibolo Creek". You will note in my letter of May 9th that the construction of these facilities was suggested in the context of a development sequence. Since the 4/3/95 UCCR Scope of Work for $25,000 was reduced from the comprehensive 2/26/95 Scope of Work for $62,000, it was my suggestion that the priority of study should reflect this sequence of development.

Furthermore, the objective stated in each Scope of Work was to evaluate the UCCR project "as a means of sustaining Comal springflow and Edwards Aquifer pumping during drought". Therefore, diversions from Canyon Lake and recharge from Cibolo Creek to sustain springflow should have study priority, and the "greater annual Edwards Aquifer pumpage which might be sustained with the project operational"(2/26/95 Scope of Work, Item 2d) should likewise have study priority. Since this objective of the UCCR project is to sustain Edwards Aquifer pumpage without artificial limitations, a water treatment plant is unnecessary and need not be factored into the project cost as one of the "evaluation criteria being used for all new alternatives".

Given the economies inherent in the UCCR project, it was with some disappointment that its Scope of Work was reduced to make way for the study of the Cibolo Reservoir near Stockdale for which at least two studies have already been completed (Trans-Texas, Phase I and BuRec 1971). Perhaps you could forestall this work so as to complete the comprehensive study of the proposed

UCCR project with its potential of enabling the sustained use of the Edwards Aquifer with all of its natural attributes of water supply, treatment, distribution, and protection from evaporation.

It is noted that the Phase 1B Analysis of Water Availability in the upper Guadalupe River Basin and Canyon Lake is scheduled to be completed by September. Since you note its application to the UCCR project, it would be very much appreciated if you would send a copy to me.

Sincerely yours,

Arthur E. Postel

Arthur E. Postel
(216) 492-6218

ccs: Tom Culbertson
Gerald Rolf
Bob Scott

RUNAWAY GOVERNMENTS RUN WATER UPHILL TO MONEY BY ABUSING THE PUBLIC TRUST

The San Antonio 2050 Water Plan of 1994 included the Applewhite Reservoir. The Plan was defeated by the voters, but the City claims that only Applewhite was defeated.[1] Now the City has taken preliminary steps to construct elements of the 2050 Plan without the necessity of another election.

1) Since April, the San Antonio City Council has supported the joint actions of SAWS, SARA, GBRA, and others to develop a plan for the import of water into Bexar County in accord with their **Letter Of Intent.** This Letter quotes a 1994 Federal Court Order urging the City of San Antonio to cooperate with the Court Monitor, Joe G. Moore, Jr.,[1] and cites his proposal to have 75,000 acre-feet of treated water per year supplied initially and quickly from the Guadalupe River and 75,000 acre-feet per year from the Colorado River. Project costs to accomplish a comparable Guadalupe River-Bexar County segment of the Monitor's plan were estimated in a recent engineering study.

2) This 1994 study, sponsored by the Trans-Texas Water Program, shows costs of treating 78,600 acre-feet of water per year diverted from the Guadalupe River at Lake Dunlap for delivery in Bexar County and also the costs for 71,260 acre-feet per year diverted from a point near Gonzales (Colorado transfers?). This combined total water import is about that of the 150,000 acre-feet urged by the Court and proposed by its Monitor. Total annual costs for both are shown as $103,910,000 with combined total project

---

[1] The Court Monitor, Mr. Moore, was the first Executive Director of the Texas Water Development Board under whose leadership the Texas Water Plan was developed to transfer water from the Mississippi River to West Texas. The Plan was defeated as a $3½ Billion Constitutional Amendment in 1969, but the TWDB claimed that only its method of finance was defeated. Four years later, TWDB Resolution 73-6 cited findings of the Army Corps of Engineers, the Bureau of Reclamation, and the Mississippi River Commission showing costs of the Plan to be seven times greater than primary benefits. However, Congress never recognized anything beyond primary benefits, and the Plan required federal participation. Deceptively, voters had not been informed of this fact, but their innate wisdom prevailed.

APPENDIX I

cost of $629,820,000. Facilities to deliver Colorado River water to the Guadalupe River at Gonzales would be an additional cost.

3) **Legislative enactments within the past eight years** enable the City to issue and sell the bonds necessary to finance such huge sums without an election. Following are these changes in the law.

4) **Merely by having the word "subchapter" in § 17.284 of the Texas Water Code** changed by the Texas Legislature in 1987 to the word "chapter" and giving this section the number 17.188, the TWDB enabled itself to purchase revenue bonds issued by local political subdivisions to finance the construction of every type of water facility "without the necessity of an election" locally.

5) **Before 1993, § 17.124 of the Texas Water Code** required the TWDB to find that its applicants for bond purchases to finance the construction of water supply projects could not sell bonds in commercial channels at reasonable interest rates. This was known as the "hardship condition". Since San Antonio can sell its bonds commercially, this condition did not apply, so the TWDB could not buy the City's bonds. However, the "hardship condition" for such bonds, or those of the City's water suppliers, was eliminated by H.B. 1269. This bill was initiated by the TWDB, passed on the Local And Consent Calendar in the House, and the Local And Uncontested Calendar in the Senate of the 73rd Texas Legislature in 1993.

6) **Now that the TWDB can purchase water supply revenue bonds of San Antonio**, these bonds can be sold to the TWDB; and, thereby, the bonds can be authorized and issued without the necessity of a local election notwithstanding any "general or special law or charter provision to the contrary" (V.T.C.A., Water Code § 17.188).

7) **Bonds sold to the TWDB can generate two more bond issues** and a United States government bond transaction. The Texas Water Resources Finance Authority (Created in 1987 and governed by the six TWDB members) can issue its revenue bonds to purchase the water revenue bonds of SAWS from the TWDB which sells its own state bonds for the funds required to purchase SAWS bonds. With funds from

TWRFA, the TWDB purchases United States government bonds to defease (retire over their life) its own state bonds. The water rate payers in San Antonio and Bexar County ultimately pay to retire the bonds and the fees paid to complete the transactions.

8) **If the intent of the Letter Of Intent is carried out** as proposed, the three bond issues to provide $629,820,000 for construction (¶ 2 above) and the fees paid to accomplish their issuance can be estimated from those paid for a similar amount of bonds issued by TWRFA.

9) **Texas Water Resources Finance Authority Revenue Bonds** in the amount of $511,755,000 were issued in 1989. These bonds were issued to purchase the municipal bond portfolio of the TWDB which used the funds to defease its own outstanding general obligation bonds. The fees paid were those incurred to issue only the TWRFA revenue bonds since the other bonds involved had been previously issued. The fees and discounts shown in the table below for SAWS and state bond issues are proportioned to those of the TWRFA bonds.

MATRIX OF COMPARABLE FEES AND DISCOUNTS TO ISSUE SAN ANTONIO WATER SUPPLY BONDS

	1989 TWRFA BONDS	SAWS BONDS	TWDB BONDS	TWRFA BONDS	TOTAL FEES & DISCOUNTS
Initial Payment to TWDB	$492,230,400[2]			$668,230,000	
Initial Payment to SAWS			$642,735,000		
Available for Construction		$629,820,000			
Deposit to Reserve Fund	6,000,000[2]	7,677,000	7,835,000	8,145,190	
Costs of Issuance	4,093,622[2]	5,238,000	5,345,330	5,557,180	$16,140,510
Underwriters' Discount	4,830,967[2]	Not	6,308,120[3]	6,558,180	12,866,300
Original Issue Discount	4,600,011[2]	Applicable	6,006,550[3]	6,244,450	12,251,000
TOTAL BOND ISSUES	$511,755,000[2]	$642,735,000	$668,230,000	$894,735,000	
					$41,257,810

[2] $511,755,000 Texas Water Resources Finance Authority Revenue Bonds, Series 1989, Dated February 16, 1989, p. 2.

[3] Since September 1, 1987 when an amendment to Water Code § 17.013 became effective, it has been lawful for the TWDB to sell Texas Water Development Bonds at a discount.

10) **The Letter Of Intent, supported by the San Antonio City Council,** could result in bond issues of over $2 Billion to bring water to Bexar County from the Guadalupe River. Should TWDB/TWRFA elect to use the finance mechanisms of Water Code §20.072, intermediate TWDB financing would be eliminated; and, in the above matrix, the column headed "TWDB BONDS" would be headed by "TWRFA BONDS". The matrix is, of course, a proportional example, but it is within reason. The additional costs to finance the construction of facilities to deliver 75,000 acre-feet of water per year from the Colorado River to the Guadalupe River Basin, as proposed in the **Letter Of Intent**, can be known only when project costs are estimated.

11) **Finance Fees & Discounts of about $41,257,810** are applicable no matter which entity, i.e. SAWS, SARA, or GBRA actually issue the bonds to finance construction.

12) **The estimated annual costs of $103,910,000** to build and operate <u>just</u> the Guadalupe River-Bexar County segment of the proposal (¶ 2 above) will cost each of the 355,000 Bexar County water customers an average water bill increase of about $30.00 per month.

$$\frac{\$103,910,000}{355,000 \times 12} \times 1.25 = \$30.00$$

The 1.25 factor is necessary because the issuance of revenue bonds, like those of SAWS, require an issuer to show net revenues of at least 25% above its annual bond requirements.

CONCLUSIONS:

13) **Water will run uphill, but it costs money,** and the fees & discounts shown are running this show by incremental changes in the law to avoid elections and advance the institutional ambitions of runaway governments that disclaim past election results.

February 15, 1996

ARTHUR E. POSTEL
RETIRED PROFESSIONAL CIVIL ENGINEER
AND MUNICIPAL BOND SPECIALIST
101 ARCADIA PLACE
SAN ANTONIO, TEXAS 78209-5857
(210) 805-8083

03-18-96 -

BEXAR-MEDINA-ATASCOSA COUNTIES

WATER CONTROL AND IMPROVEMENT DISTRICT NO. 1

P. O. Box 170

NATALIA, TEXAS 78059

Phone (210) 665-2132

Fax (210) 663-3519

March 15, 1996

Trans-Texas Water Program
Policy Management Committee
West-Central Study Area
c/o San Antonio River Authority
100 East Guenther Street
P.O. Box 830027
San Antonio, Texas 78283-0027

via Telecopier

Attn: Steve Raabe, P.E.
Project Coordinator

Re: West Central Study Area Phase I Interim Report (Vol. 4) - Comments on "Guadalupe River Diversion Near Comfort to Recharge Zone via Medina Lake (G-30)

Dear Steve:

On behalf of the Board of Directors of the Bexar-Medina-Atascosa Counties WCID No. 1 ("BMA"), I am submitting the following three comments on "Alternative G-30." I would like to preface BMA's comments with the observation that the report published reflects a substantial amount of work and thoughtful consideration for the preliminary evaluation of the feasibility of Alternative G-30. BMA assumes that further study of Alternative G-30 is contemplated under the Trans-Texas Program before any thought toward implementation would proceed. With these premises in mind, BMA would offer the following three comments:

1. HDR's "90 Percent" Assumption

At p. 3-685 of the study report HDR states:

> For Alternative G-30, a volume of water equal to about 90 percent of that diverted from the Guadalupe River would be diverted from

> Diversion Lake for transmission to the recharge zone.

No documentation supporting the "90 percent" figure is provided. Instead, at p. 3-689 of the study report HDR states:

> In the absence of detailed technical analysis, it was assumed that 90 percent of the volume of water imported from the Guadalupe River would be available for recharge after consideration of channel losses in the Medina River and evaporation losses in Medina Lake.

(emphasis added). No explanation for that assumption is provided. Moreover, no explanation for the failure to include "seepage losses" in Medina and Diversion Lakes in that "90 percent" assumption is provided.

Historically, the "seepage losses" from these reservoirs have been assumed by some to be significant. Those assumptions have greatly affected the estimated firm yield available from the Medina/Diversion Lake reservoir system. Accordingly, BMA believes that "seepage losses" should be taken into consideration including the quantity of water to be available for recharge, even in preliminary "assumptions."

BMA has never officially supported any of the various estimates of recharge to the Edwards and/or water availability from its reservoir system. Those historical statements are fairly well summarized in two reports from the Texas Water Development Board. In its 1990 "Water for Texas" report the Texas Water Development Board observed:

> The [Medina] Lake and diversion facilities [Diversion Lake] also recharges the Edwards-Balcones Aquifer. It is estimated that the Lake recharges as much as 50,000 acre-feet per year to the aquifer. Depending upon its operation, the supply available from Lake Medina can range from zero up to 60,000 acre-feet per year.

See Water for Texas, 3-89 (TWDB 1990). In its "Recommendations for the 1992 Update of the Texas Water Plan" the TWDB stated:

> A new study by the U.S. Bureau of Reclamation has indicated that the Medina Reservoir (Medina and Bandera Counties) could produce a firm annual yield of 29,000 acre-feet per year in the vicinity of the dam. Downstream of its

> existing diversion structure, yield estimates have been reduced to zero as a result of channel losses into aquifer recharge ...

See Water for Texas, 100 (TWDB 1992) (emphasis added).

Again, BMA is not "sponsoring" any of these statements or any other existing estimate of either the "yield" or "recharge" from its Medina/Diversion Lake reservoir system. They are acknowledged strictly to point out the fact that for far to long BMA's Medina/Diversion Lake reservoir system has been considered over the years using only "assumptions" -- assumptions that were tailored to meet the end result desired no matter how contrary they might be to other historical assumptions or to the best interests of BMA. BMA is weary of folks considering its fate based upon unsubstantiated "assumptions."

Like the "90 percent" number presented in the G-30 analysis, all of the historical "estimates" are based upon assumptions, they are not supported by any technical real-time data. Accordingly, BMA considers all of them --including the G-30 Alternative assumption -- to be too speculative to do anything more than serve as a basis to conduct additional studies to develop real-time data to maintain a technically supportable recommendation on whether to pursue Alternative G-30. The water crisis we face is too severe to make long term decisions premised upon unsupported assumptions.

As you know, BMA in cooperation with the Bexar Metropolitan Water District, Texas Water Development and USGS is conducting an indepth real-time "Water Balance Study" on the Medina/Diversion Lake reservoir system to quantify the losses (evaporative and seepage) which occur. That study has a $1,000,000.00 budget and a scope of work covering approximately a three year period. The results of the study, which should be reported in 1998, will likely be of significant benefit to the evaluation of the long term feasibility of Alternative G-30.

In summary, BMA believes that the assumption that "90 percent" of the water diverted from the Guadalupe and routed through BMA's Medina/Diversion Lake reservoir system is very speculative and, in fact is so suspect as to be unreliable without further documentation. BMA would recommend against any decision to implement Alternative G-30 without further study and analysis. Please keep in mind that BMA would like to see documentation that supports the "90 percent" availability of the diverted water. Confirmation of that number would significantly enhance the firm yield from Medina and/or Diversion Lakes.

2. Implementation Issues (G-30)

At pages 3-690-3-691, the study outlines the "Implementation Issues" for Alternative G-30. Without attempting to "color" or otherwise influence any decision making process regarding the final implementation of Alternative G-30, BMA would observe that the issues involved, particularly as they relate to "permitting," "constructing" and/or "contracting" issues on BMA's Medina/Diversion Lake reservoir system, are far more complicated and involved than the simplistic summary outline presented. For example, it does not consider how existing contracts or pending litigation affecting Medina Lake waters may impact the proposal. Moreover, it does not discuss how the proposal to increase the quantity of water running through and/or stored in the reservoir system may impact BMA's water rights in the system, for example by increasing the "head pressure" and the attendant seepage and evaporative losses. Accordingly, BMA would recommend that the outline be "fleshed-out" considerably in order to afford the PMC the opportunity to make a fully informed decision about the feasibility of Alternative G-30.

3. Legal Impediments

BMA was curious to note the lack of discussion of Alternative G-30 and the existing legal prohibition against the proposed project. The interbasin transfer issue involved in the project is one that can be overcome under existing law. However, the project contemplates using the normal and ordinary flows of the Guadalupe River to recharge the Edwards Aquifer in Bexar County (see p. 3-675). Assuming that the implementation of Alternative G-30 would include establishing by expert testimony (i) that an unreasonable loss of state water would not occur and (ii) that the water recharged could be withdrawn at a later time for beneficial use, the report does not address how to overcome the ambiguous prohibition against the use of the normal or ordinary flow of a stream or water course for purposes of recharging the Edwards Aquifer in Kinney, Uvalde, Medina, Bexar, Comal or Hays Counties. See Texas Water Code §11.023(c). That statutory prohibition would appear to be a fatal flaw to the implementation of Alternative G-30. BMA believes that this issue is critical and should be addressed before further effort or resources are expended.

CONCLUSION

Thank you for the opportunity to provide these comments. Should there be any questions, or if BMA can provide you with any further information, please call me at the District's office in Natalia, Texas. That number is 210-665-2132.

Sincerely,

BEXAR-MEDINA-ATASCOSA COUNTIES WCID NO. 1

John W. Ward, III
President, Board of Directors

GBRA

GUADALUPE-BLANCO RIVER AUTHORITY

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WASTEWATER
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Fax: 512-578-9039

March 13, 1996

Mr. Fred Pfeiffer, General Manager
San Antonio River Authority
and Administrator, West Central Study Area
Trans-Texas Water Program
P.O. Box 830027
San Antonio, TX 78283

Re: Trans-Texas, Phase I, Volume 4

Gentlemen:

The GBRA has reviewed the Phase I Report, Volume 4, for the West Central Study Area of the Trans-Texas Water Program and offer the following comments:

Comment 1

Under SB 1477, permitted withdrawals from the Edwards Aquifer may not exceed 450,000 acre-feet per each calendar year through the year 2007, and 400,000 acre-feet for each year thereafter. For all hydrologic analyses, this report assumed that withdrawals were set at a constant 400,000 acre-feet for every year, and did not address the fact that significant additional reductions are needed during droughts to keep the springs flowing at adequate rates at all times. GBRA did not object to performing the hydrologic studies with the 400,00 acre-foot pumpage since it will result in conservative estimates of water availability from the Guadalupe Basin. However, regarding meeting water demands in the Bexar County region, planning that assumes an annual withdrawal rate of 400,000 acre-feet per year significantly underestimates the amount of water needed in Bexar County from alternative sources.

We urge that future studies estimate the significant additional reductions in withdrawal rates that will need to be made during droughts, and more accurately estimate the total additional water needs for the Bexar County area.

Comment 2

The Trans-Texas environmental criteria are not appropriate for use in the Guadalupe River Basin, due to the fact that the river is springflow-dominated. The springflow produces a high base flow condition and, as a result, the criteria would allow little unappropriated water to be captured. Instead of helping this region, use of the Trans-Texas environmental criteria to evaluate proposed projects in the Guadalupe River Basin may unnecessarily delay development of environmentally-sound projects that can help bring much-needed alternative water supplies to the Bexar County area.

We urge that more realistic planning criteria be developed and used for the Guadalupe Basin, as quickly as possible.

Comment 3

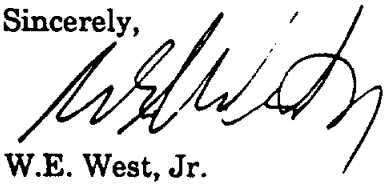
We believe that use the term "enhanced springflow," and the exercise of determining "enhanced springflow," are misleading. We understand that "enhanced springflow" is calculated by establishing a baseline model run with springflow resulting from a 543,677 acre-foot per year continuous pumpage, and subtracting it from the model run with 400,000 acre-feet of continuous pumpage. The difference in the two model runs simply represents the difference in outflow through the springs resulting from the two withdrawal assumptions. The real question is whether the assumed withdrawals adequately protect the minimum springflows required by law, at all times. If not, the withdrawals must be reduced further. Once adequate minimum springflows are protected at all times, then those springflows should be assumed in models to determine the extent to which unappropriated water is available in the Guadalupe Basin.

An example of how efforts to use "enhanced springflow" can result in errors is found under Alternative G-33. In this alternative, a portion of the water available for diversion from the Guadalupe River below Comal Springs resulted from "enhanced springflow." Capture of this "enhanced springflow" occurred only after first honoring downstream existing water rights, but not after honoring Canyon Reservoir, an upstream existing water right. This is an incorrect legal assumption. In determining how much unappropriated water there is in the Basin, it must be assumed that all surface water in the Basin, including "enhanced springflow," will first be used to honor the face value of all existing rights in the Basin. Only the water that remains is unappropriated.

To the extent it was hoped that the "enhanced springflow" concept might allow some unappropriated water in the Guadalupe Basin to be appropriated, under a new permit, without having to satisfy the restrictive Trans-Texas environmental criteria, we believe alternative approaches are more appropriate. In particular, we believe environmental criteria that are much less restrictive than the Trans-Texas criteria should be developed for the Guadalupe Basin (see discussion above).

We urge that future studies eliminate the use of the term "enhanced springflow." Such studies should simply assess more accurately the springflows, and the amount of unappropriated water, that will result from the much lower withdrawal rates required by law.

Sincerely,



W.E. West, Jr.
General Manager

TRANSEL
03-3396-1

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Ecological Services Field Office
10711 Burnet Road, Suite 200
Hartland Bank Bldg.
Austin, Texas 78758

MAR 27 1996

Steven J. Raabe, Project Manager
San Antonio River Authority
P.O. Box 830027
San Antonio, Texas 78283-0027

Dear Mr. Raabe:

This letter provides comments on the Trans-Texas Water Program, West-Central Study Area, Phase 1, Interim Report, Volume 3.

General Comments

As previously stated in our September 1, 1994, letter commenting on Volumes 1 and 2 of the Phase 1 report for this study area, we recommend that the proposed Trans-Texas Environmental Criteria for Instream Flows should be re-examined. They are too generic in nature and may not provide sufficient flows that adequately mimic seasonal patterns for many aquatic species throughout the year. These flow criteria are partially based upon providing minimum flows utilizing averages and medians for long-term periods. Supplying only continuous, minimum flows will not only degrade the riverine environment over the long-term, but will also make the system more susceptible to potentially catastrophic events such as prolonged drought. Higher flows are important in moving sediments downstream and scouring deeper pools.

Under the "Implementation Issues" sections, permitting under sections 7 or 10 of the Endangered Species Act of 1973, as amended, may be required. These permits deal with the incidental "take" of federally listed species when federal or non-federal actions are involved, respectively.

Specific Comments

Page 3-683. As pointed out here, the relative abundance of fish species in the Guadalupe River appeared to be affected by instream flows. The Trans-Texas Environmental Criteria are too general and at times likely not sufficient to protect aquatic habitat values adequately.

Page 3-697. The basis for assuming a fixed Edwards Aquifer pumpage of 400,000 acre-feet/year should be explained. Additionally, some alternatives are only evaluated using the 400,000 acre-feet/year scenario while others use both 400,000 and 200,000 acre-feet/year.

At other times the highest pumpage on record, 543,677 acre-feet/year, is used. The rational for the usage of the various pumping scenarios should be clearly explained.

Page 3-702. This page's and other references to golden-cheeked warbler or black-capped vireo habitat state that new pipelines will occur mostly along existing ROW's and, therefore, suitable warbler or vireo habitat is unlikely to be encountered and important habitats can be avoided by selection of the pipeline route. Disturbance is also a factor that needs to be considered. It is also imaginable that construction in existing ROW's may still impact suitable warbler or vireo habitat since complete avoidance may not be possible or practical. In these instances, if adverse effects are anticipated that involve take of federally listed species, an incidental take statement or permit under section 7 or section 10(a)1(B) of the Endangered Species Act, respectively, may be necessary.

Page 3-706. Cibolo dam is located in an area that has potential for caves containing endangered species. Page 3-705 states that the ways in which hydrologic changes might affect resident communities are unknown. We recommend that the methodologies needed to quantify potential effects be determined or developed as early as possible and be subjected to peer review.

Page 3-717. The potential benefits of increasing stream flows under appropriate conditions by utilizing unallocated or un-used water, including water stored in existing reservoirs, should be reconsidered if an environmental benefit can be demonstrated. Previous hydraulic modifications that have resulted in adverse effects could be evaluated for remediation as well as those that may occur under the alternatives being considered by the Trans-Texas Water Program.

Page 3-717. An assumed baseline of 543,677 acre-feet/year is used which is based on the highest estimated aquifer pumpage. This is not likely a reasonable "baseline". While the use of this pumpage level may be appropriate for certain analyses, the rational behind its use should be explained.

Page 3-717. References are made to "unappropriated flow". There may be certain hydrologic segments that are "overappropriated", meaning that it would be theoretically impossible for everyone to receive the entirety of their water right if they all fully exercised their water right. While it appears that water availability has been carefully researched, we wish to point out that this condition still may exist in some circumstances.

Page 3-724. The general assumptions for G-33 of available yield of simulated streamflows without the project include the springflows resulting from fixed Edwards Aquifer pumpage of 543,677 acre-feet/year. While this would likely be the most conservative estimate, the use of this pumpage level should be explained.

Page 3-724. As pointed out here, monthly median streamflow decreases associated with G-33 (and other alternatives) were greatest in the low flow months. This is likely the worst time for additional reductions to occur since the available aquatic habitat is already at its most limited point of the year. A 50 percent flow reduction at high flows is likely to have significantly less of an effect than a 50 percent reduction during low flows. We do not believe the current Trans-Texas Environmental Criteria adequately account for this difference.

Page 3-725. The text suggests that instream flow studies should be conducted in the reaches below Lake Dunlap in order to evaluate the potential effects on the general ecology of the river and Cagle's map turtle, Guadalupe bass, and blue sucker, which are Federal candidate species. Does this suggest that something other than the modified Tennant's method listed in the Trans-Texas Environmental Criteria will be used? If so, we recommend a more robust approach be used to adequately address the impacts to these and other species of concern.

Page 3-727. The text refers to the possibility of mitigation for impacts to caves. Do to the likely difficulty in providing mitigation for impacts to caves, we recommend that the mitigation methodology be identified or developed prior to the feasibility phases and subjected to peer review if the methodology is untested. Additionally, adverse impacts to federally listed species that reside in caves may have to be dealt with through an incidental take statement or permit under section 7 or section 10(a)1(B) of the Endangered Species Act, respectively.

Page 3-749. The effects of S-15D to freshwater inflows to bays and estuaries needs to be further analyzed. Whether the Trans-Texas Environmental Criteria for inflows to bays and estuaries was used is not clear. Furthermore the criteria for freshwater inflows to bays and estuaries are cited as preliminary and we recommend that they be updated/completed prior to the feasibility study phase.

Page 3-766. An explanation should be provided as to why water availability estimates from the Colorado River presented in this study (S-15E) were not subjected to Trans-Texas Environmental Criteria and may therefore overstate quantities of unappropriated streamflow.

Page 3-774. Whether this alternative violates the Trans-Texas Environmental Criteria for instream flows should be clearly stated since this alternative would decrease monthly median flows up to 63.4 percent.

Page 3-776. See comments for page 3-725 as applied to this alternative.

Page 3-780. The text states that for S-15E, actual additional yield due to importation of unappropriated streamflow from the Colorado River could be reduced significantly by the application of environmental criteria for freshwater inflows to bays and estuaries. Does this

statement suggest that the environmental criteria would not be applied to certain alternatives? If so, what criteria are to be used to exempt alternatives from the environmental criteria?

Page 3-786. Alternative S-17 involves the sealing of the Kainer Formation (about 1,400 acres, ref. page 3-799). We suggest that an analysis be completed of how this sealing may affect the karst features underlying and interconnected with this formation.

Page 3-790. There are eight known caves within the area to be inundated. See above comments under page 3-727.

Page J-3. The analysis for alternative G-29 looks at both 200,000 and 400,000 acre-feet/year scenarios. See above comments under page 3-697.

We realize that some of our comments may be resolved more appropriately during the feasibility phase of the Trans-Texas Water Program. However, we are providing them to you at this time to assist you in preparation for this next phase.

We appreciate the opportunity to provide comments at this time and we look forward to continued coordination in the evaluation of Trans-Texas Water Program alternatives. If you have any questions regarding this response, or if we can be of any further assistance, please contact Richard Szlemp at the above address or by phone at 512/490-0063.

Sincerely,

Joseph E. Johnston

Acting Field Supervisor

26495 Natural Bridge Caverns Road
Natural Bridge Caverns, Texas 78266

NATURAL BRIDGE CAVERNS

(210) 651-6101
I-35 Between San Antonio and New Braunfels

March 28, 1996

Fred N. Pfeiffer
General Manager
San Antonio River Authority
PO Box 830027
San Antonio, TX 78283-0027

Dear Mr. Pfeiffer,

We would like to go on record as being strongly opposed to the Upper Cibolo Creek Reservoir proposal. We feel it would have a direct and detrimental impact on Natural Bridge Caverns. The Caverns opened on July 3, 1964. They play a very important economic role as a major tourist destination to the San Antonio - New Braunfels, Texas area. The Caverns also have an important educational role to thousands of public school science and geology students. Many college geology classes and the Edwards Underground Water District use the caverns as an outdoor classroom for their students. Natural Bridge Caverns is a State Historical Site and a U. S. Registered Natural Landmark. It is an nonrenewable natural resource that deserves to be respected and protected.

We challenge the validity of the statement made by the geologist who was consulted on this project by the proposing party whereby he claimed that neither the sealing of the project site nor the resulting impoundment of water would threaten Natural Bridge Caverns. Such a claim would have to be supported by extensive research into the geology and hydrology of the area surrounding and including Natural Bridge Caverns and the nearby Cibolo Creek basin. No such research has been done, and data to support such a claim does not exist.

Much of what we know about the related hydrology affecting Natural Bridge Caverns we have learned from living with and observing the natural water processes therein during the past 35 years. We have learned that the water table will rise in the caverns during periods of excessive rainfall over this area. How high the water rises and how long it remains is determined by a number of factors, all of which are natural and can be expected to eventually cycle with the weather and the seasons on the surface. For example, during the winter of 1991 and 1992, we received an abnormal amount of rainfall over a three month period of time. On December 23, 1991, the water began rising in the caverns and continued to do so for the duration of the storms. For almost two months after the rains ceased, Cibolo Creek continued to flow and the water level inside Natural Bridge Caverns continued to cover the cavern trails in certain places. Approximately 1/3 of the cavern trail was impassable, that is until August 7, 1992 when the waters finally receded to the point we could return to the normal cavern tours. Although we have frequently experienced water-over-the-trail conditions for shorter periods of time, this event marked the longest such conditions persisted since development of the cavern began in 1962. We have learned to cope with this

in the cavern for extended periods of time. This is a normal event and one which we come to accept as part of the "natural" cycle. However, once the aquifer system is changed — once the normal storage, porosity, and permeability are altered — rains less than four inches may then cause a substantial rise in the water level. Additionally, with the permeability of the aquifer changed, waters may remain in the cavern for an extended period of time.

Admittedly, the link between water rising on Cibolo Creek and water rising in the Cavern is based partially on subjective observations of the management of Natural Bridge Caverns over 32 years. Whereas we know exactly where the water rose in the Cavern, how long it took to reach that level, and how much rain it required to cause said rise, there exists no quantitative data as to precisely how high water rose on Cibolo Creek. There is no study which has tied waters along the Cibolo directly to waters in Natural Bridge Caverns. This is one of many elements which merits further study *before* any water is induced to flow along Cibolo Creek. Mr. Postel's notion that this project "lends itself to incremental development" by pumping water from Canyon Lake to the Cibolo and retaining such water with a small dam is preposterous given the potential damage such a test could have on Natural Bridge Caverns. Before *any* amount of water is artificially retained on the Cibolo, all potential effects to the surrounding environment, including those effects to Natural Bridge Caverns, must be fully explored and researched.

We believe a relationship exists between Cibolo Creek and Natural Bridge Caverns. The current system in existence on the Cibolo is what led to the creation of one of the biggest caverns in the state of Texas. We cannot support any plan which threatens to change this system and potentially harm this cavern.

Sincerely,

Brian Vauter, Staff Geologist
Natural Bridge Caverns, Inc.

26495 Natural Bridge Caverns Road
Natural Bridge Caverns, Texas 78266

NATURAL BRIDGE CAVERNS

(210) 651-6101
I-35 Between San Antonio and New Braunfels

April 2, 1996

Fred N. Pfeiffer
General Manager
San Antonio River Authority
PO Box 830027
San Antonio, TX 78283-0027

Dear Mr. Pfeiffer:

Enclosed you will find a report detailing abnormal water levels within Natural Bridge Caverns. Abnormal water levels are defined as those levels which obstruct the everyday flow of tours through the Cavern. Such obstructions occur when water covers the concrete bridge located 180 feet below the surface at a point midway on the Cavern tour. The enclosed report describes events from May 1965 up to October1995. During this period of time, the water backed up inside the cavern and at least covered the bridge at Purgatory Creek a total of 17 times. The water has risen even further and covered the trail in Castle of the White Giants a total of eight times.

The current historical high water mark inside the cavern is at approximately 120 feet below the Natural Bridge. This depth would correspond approximately to an elevation of 890 feet above msl. This event occurred on December 23, 1991 after local storms produced 13.5 inches of rainfall over a period of about six days. Over the next six months, 17.9 inches of rain fell with sufficient frequency that the waters were never allowed to completely drain from the Cavern. The event lasted 232 days. Mr. Postel comments in his report, "If infiltration from the creek could occur, water in the caverns would have been above 860." This statement seems to imply that none of the waters within Cibolo Creek flow into the Natural Bridge Caverns system. Considering the observations made at the Caverns over 32 years, we do not feel this to be the case. The current high water mark placed approximately 91 vertical feet of water above the deepest room in the cavern in December, 1991. These waters enter the cavern from the deepest point and back up into the upper chambers. We do not believe that direct infiltration of water from the surface could account for this much water. Some subterranean connection must exist between Cibolo Creek and Natural Bridge Caverns. This connection must be thoroughly researched before any amount of water is placed permanently within Cibolo Creek.

Of additional concern to us is the proposed sealing of fractures along Cibolo Creek. Sealing any fractures or other voids within the subsurface along Cibolo Creek reduces both the porosity and the permeability of the aquifer system, not to mention also reducing the effective storage. With the current aquifer system, only substantial rains in excess of approximately four inches cause the water in the Cavern to rise above the trail, and usually these rains do not cause the water to remain

process over the years and know that the water will eventually recede when excessive amounts of rain cease over our local area. The proposed dam on Cibolo Creek would alter the hydrology effecting Natural Bridge Caverns that we would no longer be dealing with the natural processes of groundwater movement. Instead, we would face impounded waters which would not recede.

Proceeding with this proposal is wrong without *absolute and conclusive* proof that the sealing of the site and impoundment of the water would not harm Natural Bridge Caverns. In the absence of such proof, the Upper Cibolo Creek Reservoir proposal should be dropped.

Sincerely,

Clara Heidemann, President
Natural Bridge Caverns, Inc.

Reggie Wuest, Vice-president

RECORDS OF HIGHER THAN NORMAL WATER LEVELS IN NATURAL BRIDGE CAVERNS

DATE OF RECORD		RAINFALL AND/OR WATER LEVEL NOTATION
1965:	May	Water covering walkway of Purgatory Creek Bridge. There is no written record to confirm the water height nor length of time water was up, but developer Harry Heidemann recalls the time during May of 1965 that water covered the walkway of the Purgatory Creek Bridge. He recalls it specifically because they were involved in building the exit tunnel at that time.
1967:	Sept. 21	Heavy local rainfall (Hurricane Beulah)
	Sept. 22	Water covering bridge walkway in Purgatory Creek and over the trail in the lower level of Sherwood Forest.
	Sept. 23	Water higher today—now water is up to the first switchback into Sherwood Forest and only the handrail of Purgatory Creek bridge is visible.
	Sept. 24	Water receding—down to base of 3rd column you pass entering Sherwood Forest.
1968:	Jan. 21	Over 21" rainfall locally in past three days. Water over roads leading to Cavern. Cibolo Creek crossings closed.
	Jan. 22	Water coming up in Purgatory Creek.
	Jan. 24	Purgatory Creek full to ceiling. Water up to 3rd step in Castle of the White Giants.
	Jan. 25	Water continuing to rise -- up to 18th step on stairway leading from Castle of the White Giants to Emerald Lake. (No notation of when or how fast water receded.)
1972:	May 7	Heavy rainfall on previous days, over 6 inches today. Water over roads leading to Natural Bridge Caverns.
	May 8	At 11:00 A.M. water began to cover the walkway in Sherwood Forest and the lower end of Purgatory Bridge walkway.
	May 10	Hard rain today. Water has filled Purgatory Creek Section and Sherwood Forest and covers all the floor of the Castle of the White Giants up to the 9th step of the stairs leading up to Emerald Lake.
	May 15	Water crested at 9th step in Castle of the White Giants. Started to recede today.
	May 20	Water going down slowly. Today tours could walk all around Bomb Burst in Castle of the White Giants. Purgatory Creek and Sherwood Forest still underwater.
1973:	April 15	Heavy local rain.
	April 16	Water beginning to rise.
	April 17	Water waist deep in Sherwood Forest.
	June 25	2.5 inches local rain today.
	June 26	Water covering formations in bottom of Purgatory Creek.
	July 19	Water covering walkway of Purgatory Creek bridge.
	July 21	Sherwood Forest and Purgatory Creek completely underwater.
	July 22	Water starting to go down.
	July 26	Water still covering rail of Purgatory Creek bridge.
	July 28	Water still over trail in Sherwood Forest.
	July 30	Less than one foot of water on trail in Sherwood Forest at 5 P.M.

	DATE	RAINFALL AND/OR WATER LEVEL NOTATION
1973:	Sept. 26	6.4 inches local rainfall.
	Sept. 28	Water coming up. Now covers Purgatory Creek Bridge and is up into Sherwood Forest.
	Oct. 4	Water down enough for normal tours to resume.
	Oct. 12	Water in Sherwood Forest in the morning. By noon, Purgatory Creek bridge covered.
	Oct. 14	Purgatory Creek room and Sherwood Forest room completely underwater.
	Oct. 20	Castle of the White Giants walkway all underwater up to 6th step of stairway leading to Emerald Lake.
	Oct. 28	Water down out of Castle of White Giants but still covering Purgatory Creek bridge.
1976:	Oct. 24	Heavy local rainfall. Cibolo Creek 4 feet over road at crossing.
	Oct. 25	Water came up during the night and was over the Purgatory Creek bridge walkway this morning.
	Oct. 29	Water over the trail all week. More rain.
	Oct. 30	Water filled Sherwood Forest and Purgatory Creek and starting to cover lower trail in Castle of White Giants (side of room where Grendel's Canyon emerges)
	Nov. 5	Water down out of Castle of White Giants but still over Purgatory Creek bridge.
	Nov. 7	Water still over Purgatory Creek bridge.
	Nov. 10	Water below trail in Sherwood Forest. Normal tours resumed today.
1977:	Apr. 18-22	Over seven inches of rain this week.
	Apr. 21	Water covering walkway of Purgatory Creek Bridge.
	Apr. 24	Water covering Purgatory Creek bridge.
	May 1	Water below trail in Sherwood Forest and Purgatory Creek bridge.
1978:	July 28	6.5" rain
	Aug. 1	Water coming up in cavern.
1981:	June 3	Extensive local rains began.
	June 13	Heavy local rain. Creeks over roadways leading to Natural Bridge Caverns.
	June 14	Fri. (6-12) to Sun. AM 5.2" rain. Water up on bridge today, first two tours went through this AM, then split tours.
	June 15	Rain
	June 16	Rain
	June 17	No rain. Over past 6 days 8" rain. Water up in White Giants now, as of Wed. AM.
	June 19	Fri. - AM water to 3rd step in Castle of White Giants.
	June 20	Sat. - AM water below first step in Castle of White Giants. Crest was on third step on Friday. (HH)
	June 21	Water going down slowly - enough room in Castle for a large group to turn around at foot of stairway. (HH)
	June 26	Rain in PM (RW)
	June 28	Sun. - 0.8" rain in PM
	July 1	Only taking tours in exit due to water in Sherwood and to save time. (RW)
	July 4	Water in Sherwood Forest. (JW)
	July 5	0.8" rain

	DATE	RAINFALL AND/OR WATER LEVEL NOTATION
	July 7	From 12th June 'till today 12.5" - 13" rain (RW). Rails visible on walkway.
	July 8	Last tour - you can walk about 2 ft. on bridge from White Giants side. Water going down fast now. (RW)
	July 10	Last two tours went in at entrance. Water below bridge now. June 15 to July 10 water on bridge. (RW) (This would correspond to the 5:30 tour)
1982:	Jan. 11	Mon. temp 9° AM and a high of 29°
	Jan. 12	Tue. AM ice about 1/4" to 1/2"
	Jan. 13	Wed. Noon we had snow about 1/2" to 1"
	Jan. 22	Wet
	Feb. 5	Fri. AM rainy and freezing (HH) (No amounts given)
	Feb. 25	Some rain Thu. night (HH) (No amounts given)
	Mar. 26	Cool Thu. and Fri. Light rain Fri. PM
	Mar. 27	Sat. rain (RW) (No amounts given)
	Apr. 9	Fri. - cloudy temp. 55°, some rain (RW) (No amounts given)
	Apr. 22	Thu. - 1.4"
	Apr. 30	Fri. AM 0.2"
	May 15	Sat. - Water in Purgatory covering mud bank. (HH)
	May 16	Rain PM Sunday - not covering mud bank (HH).
	May 24	Mon. - AM 0.4"
	June 10	Hot
	June 30	0.6" at 4:00 PM.
	July 7	Hot
	July 11	Hot
	July 22	Thurs. AM 0.2" rain
	Aug. 1	Hot and dry
	Aug. 12	Hot and dry
	Aug. 26	Hot and dry
	Aug. 31	Hot and dry
	Sep. 1	Hot and dry
	Sep. 10	P. cloudy, cool AM and PM. Hot days. Need rain.
	Sep. 11	Mon. 0.3"
	Sep. 13	Wed. 0.1"
	Sep. 20	Sun (9-19) AM and Mon. (9-20) AM. 2.4" here, 1.1" home
	Oct. 8	Thu. and Fri. Rain 1.1"
	Oct. 10	Sunny. Rain AM 0.8"
	Nov. 19	Warm and damp (JW)
	Nov. 26	Rain 3.1" Thurs. and Fri.
	Dec. 2	Thu. night 0.9"
	Dec. 12	Sunny and warm

	DATE	RAINFALL AND/OR WATER LEVEL NOTATION
1983:	Jan. 1	Rain 1.5" (RW)
	Jan 8	Sat. - cloudy and cool
	March 14 - 17	Power off temporarily several times due to thunderstorms. (JW)
	March 18	Fri. (3-17) 1.1" rain this week. (RW)
	April	RECORDS MISSING
	May 1	cloudy (RW)
	May 2 - 6	dry (very)
	May 10	Mon. (5-9) and Tue. (5-10) Rain 1.1"
	May 15	Sun. AM 0.7" rain
	May 20	Rain Fri. (HH) (No amounts given)
	May 22	5" rain Fri. AM to Sat. AM. Water started coming up Sat. and Sun. AM. 6' below bridge. (RW)
	May 27	Mon. AM - water about 4' over trail in Sherwood Forest. Split tours 'til Tue. (5-24) afternoon. Fri. (5-27) PM water about 6' deep in Purgatory.
	May 28	P. Cloudy, 86
	May 29	P. Cloudy, mid 80's. Water down to streambed flow in Purgatory Creek.
	June 5	Rain 0.7" - 1:00 AM Sun.
	June 6	Mon. - 0.5"
	June 15	Wed. - 1.2"
	June 16	Thu. - 0.9"
	June 22	Wed. - 0.2"
	June 25	2.2" in AM
	July 2	Hot past two weeks 95 - 98
	July 15	1.8"
	July 16	1.2"
	July 18	0.3"
	July 25 - 27	Hot, no rains
	July 31	Hot
	Aug. 3	Hot, no rains
	Aug. 5	Thu. (8-4) night - 0.8" rain
	Aug. 6	Rain 5:00 PM 0.3"
	Aug. 8	Mon. - 2"
	Aug. 20	Hot
	Sep. 1 - 3	Hot and dry
	Sep. 9	Rain Thu. and Fri. 1.1" (RW)
	Sep. 10	Sat. rain 0.8"
	Sep. 19	Rain Sun. (9-19) PM and Mon. 2.3" Cool front this week. Wed. AM temp 46
	Oct. 9	Sun. AM 0.6"
	Oct. 17	0.1"
	Nov. 27	Sat. (10-26) night - 0.4"
1984:	Jan. 2	Warm 70°
	Jan. 8	Sun. night 1.4" (RW)
	Jan. 15	Cloudy and cold

DATE	RAINFALL AND/OR WATER LEVEL NOTATION
Feb. 5	Thu. - 0.8", warm (RW)
Feb. 19	Sun. night 0.2" rain (RW)
Mar. 11	Sun. - cloudy and drizzle, cold (JW)
Mar. 19	0.5" rain
Apr. 15	Very dry winter and spring. Not much rain (RW)
May 6	No rain since March 19. The springs in New Braunfels stopped flowing this past week. (RW)
May 7	Mon. - 0.2" (RW)
May 8	2.5"
May 20	0.6"
June 4 - 5	Mon. and Tue. 1.4" (RW)
June 26	Hot and dry
June 30	Sat. - 0.2"
July 4	Hot and dry
July 18	Wed. - 0.1"
July 19	Thu. 0.4"
July 26	Thu. 0.3"
Aug. 5	Hot and dry
Aug. 12	5:30 PM trying to rain (quick showers) (RW)
Aug. 14	Tue. night - 1.4"
Aug. 31	Dry - dry - dry
Sep. 1	0.1"
Sep. 3	Mon. - 0.9"
Sep. 23	Dry
Sep. 28	cloudy and cool
Oct. 7	Good rain, 2.3"
Oct. 11	Thu. - rain all day, 2.8"
Oct. 14	Note: from 10-7-84 about 6" of rain. Sun. (10-14) Purgatory Creek flowing in PM. (RW)
Dec. 13	Thu. - 0.6", warm (RW)
1985: Jan. 3	Snowed on the 2^{cd}. Covered ground.
Jan. 11	We had about 12 - 15" of snow.
Jan. 26	Sat. night - 0.5"
Mar. 11 - 15	Some rain (HH) (No amounts given)
Apr. 7	Cloudy (HH)
Apr. 12	Some rain, 1.2" (RW)
May 18	Fri. night - 0.8"
June 1	hot (HH)
June 5	Rain 1.3"
June 6	Rain 3.5" Thu. - water flowing in Purgatory Creek.

	DATE	RAINFALL AND/OR WATER LEVEL NOTATION
1985:	June 7	Fri. - about half way up to bridge. Water very murky looking. (RW)
	June 8	Sat. - Water within about 9' from bridge (RW)
	June 9	Water going down.
	June 22	Rain 1.4"
	July 3	Hard rain. Wed. afternoon and night - 6"
	July 4	Partly cloudy and sunny PM. Water on trail in Sherwood at 5:00 PM. (RW)
	July 5	Sunny. Water over bridge today.
	July 6	Water over trail at Purgatory Creek.
	July 9	Water going down 8' or so a day. (RW)
	July 10	Water going down.
	July 12	Rain AM 1.8" (HH)
	July 14	Sun. - water about 4' below bridge this afternoon.
	July 26	Hot - 101°
	Aug. 2	Hot and dry
	Aug. 17	Hot and dry
	Aug. 20	No rain since 1st of July (RW)
	Aug. 26	Sun. (8-25) night - 0.1"
	Aug. 31	Hot and dry
	Sep. 6	0.4" here, home 0.6"
	Sep. 25	Wed. night - 0.3"
	Sep. 28	Sat. PM - 0.5"
	Sep. 29	All day 1.8"
	Sep. 30	Mon. Temp. 49°
	Oct. 8	Tue. 0.2"
	Oct. 14	Mon. 2.4"
	Oct. 19	Rainy (HH) (No amounts given)
	Nov. 23	Rain Sat. night - some Sunday (HH) (No amounts given)
	Nov. 29	Water Friday (No other notations given as to what this means)
1986:	Jan. 24	Fri. - drizzle (HH)
	Feb. 26	Hot - 94°
	March	RECORDS MISSING
	Apr. 6	Some rain, cloudy (HH) (No amounts given)
	Apr. 25	Dry - no rain! (RW)
	May	RECORDS MISSING
	June 1	Cloudy - no rain as of 5:30 PM today. Water about half-way up to bridge. *(No amounts given - records for this event are within May. Judging from other events, it may be speculated that the rainfall was at least on the order of 1.5")*
	June 4	Tue. night and Wed. AM - 1.7"
	June 6	Fri. - water about 6' below bridge *(No record of water receding)*
	July 11	Hot (need rain) (RW)
	July 15	Hot - cloudy - light sprinkles (HH)

	DATE	RAINFALL AND/OR WATER LEVEL NOTATION
1986:	July 31	Hot - 102° and very dry (HH)
	Aug. 3	Hot - 104°
	Aug. 12	Tue. - 0.3"
	Aug. 13	Wed. Hot and dry
	Aug. 18	Hot and dry - 102°
	Aug. 19	Very hot - 108°
	Aug. 21	Cloudy - 0.2"
	Aug. 25	Wed. - 0.3"
	Sep. 1	Sun. (8-31) night - 0.3"
	Sep. 5	Fri. (9-5) night - 0.8" Sat. 1.3"
	Sep. 8	Sun. - 0.3"
	Sep. 21	Sun. - 0.1"
	Oct. 6 - 8	Mon. to Wed. - 1.9"
	Oct. 11 - 12	Rain Sat. AM and Sun. AM - 4.4"
	Oct. 21 - 22	Tue. PM and Wed. AM - 1.5"
	Oct. 26	Shower on Sunday (HH) (No amounts given)
	Dec. 22	Rain - Rain - Rain (HH) (No amounts given)
	Dec. 23	Water in caverns starting (HH)
	Dec. 28	Water still on trail! (HH) (*No indications as to how high*)
	Dec. 29	Sunny and warm 60°. Water still (?)
1987:	Jan. 3	Sat. AM water below bridge.
	Feb. 15	Electrical storm and small amount of rain Sat. night *(No amounts given)*
	Feb. 23	Mon. night - 1"
	Feb. 27	Wed. (2-25) - 2"
		Fri. (2-27) - 0.3" Purgatory creek flowing.
	Apr. 5	Rainy and cool (HH) (*No amounts given*)
	Apr. 20	Fri. hard rain and some hail, 0.6"
	May 4 - 8	1" rain this week (RW)
	May 9	0.2" rain Fri. (5-8) night
	May 16	Rain AM (No amounts given)
	May 17	Fri. (5-15) and Sat. (5-16) - 0.6" (RW)
	May 26	Intermittent thunderstorms all week (JW) (No amounts given)
	June 1 - 5	Rain 8.5" + (*June 4 - water up in cavern, possibly just getting into Castle of White Giants due to comments on Guide Roster*)
	June 5	Water on 18th step
	June 6 - 7	Water still in Castle
	June 8	Mon. night 1"
	June 9	Tue. - cloudy and light rain. (No amounts given) Water going down, now at 16th step Tue. AM
	June 10	Wed. Hard rain 1.1"
	June 11	Thu. 0.4" - water still on steps.
	June 13	More rain this AM 1.1"
		From May 5 - June 13 AM 19.4" of rain. Fri. (6-12) - water on 24th step.
		Sat. (6-13) - 6:00 PM water ½" on 26th step.

	DATE	RAINFALL AND/OR WATER LEVEL NOTATION
1987:	June 14	Sun. sunshine Sun. AM. **Water up to 27th step.** Water peaked at 27th step and stayed there all day. Sun. - Mon. AM - water is now going down. (*This marks the highest recorded water level since the caverns were discovered in 1960*)
	June 17	Hot and sunshine Water going down. On 22nd step.
	June 18	Thu. AM - 0.1"
	June 19	Fri. PM - water down to 19th step
	June 20	Water is on 16th step
	June 24	Hot - mid 90's. Water down on 7th step.
	June 26	Water in Castle of White Giants dropped to below bottom of stairs (JW)
	June 27	Water below steps now (RW)
	June 28	Water in White Giants (RW)
	July 2	Hot and dry on surface. Water still on trail in Castle on Touch Stone side. Backside down past Bomb Burst. (RW)
	July 4	Hot 95°. Still a little water on each end of Castle of White Giants.
	July 5	Hot - about 95°. Water down below fork of trail in Castle.
	July 7	Partly cloudy and hot. Mid 90's. Water still over bridge.
	July 10	Partly cloudy and hot. Water up on walk June 1. 40 days tours going in Exit and then in entrance.
	July 17	Rain Fri. AM 0.9". Water in Sherwood and over Bridge. This makes 47 days now.
	July 19	About 3' water on trail in Sherwood.
	July 22	Water off trail in Sherwood Forest. Water over walkway from June 1 to July 21 for a total of 51 days. (RW)
	Aug. 15	Temp. 99° and very dry.
	Aug. 28	0.3"
	Sep. 7	0.5" about 5:00 PM
	Sep. 11	Thu. PM and Fri. AM - 0.4"
	Sep. 18	0.6" Fri. PM
	Nov. 8	Sun. - 1.0"
	Nov. 16	1.1"
	Dec. 12	Thu. and Fri. AM 0.8". Wet and cloudy all day.
1988:	Apr. 17	0.3"
	Apr. 29	1.1"
	May 20	2.3" Fri. night
	May 29	0.4" Sun. night
	June 3	2.8" Fri. night
	June 26	2.4" Sat (6-25) night
	July 4	1.3" at 5:00 PM
	July 20	3.5" Wed. PM and Thu. AM
	July 31	0.9" Fri., Sat., Sun. (RW)
	Aug. 16	0.5" this afternoon

	DATE	RAINFALL AND/OR WATER LEVEL NOTATION
1988:	Sep. 18	1.3" Fri. and Sat.
	Sep. 30	0.8" Fri. AM
	Oct. 2	0.1" Sat. night
	Dec. 11	0.6" Fri. and Sat. (RW)
1989:	Jan. 26	2.0" Tue. and Wed.
	Mar. 29	0.8" Mon. (3-27) AM
	Apr. 13	2" Thu.
	Apr. 28	2" and some hail Fri. PM
	May 26	Hot - 103°
	June 4	0.3" Sun. night (RW)
	June 7	Hot - 107°
	June 14	1.6" Tue. (6-13)
	June 26	0.4"
	July 17	104°
	July 24	1.1" (RW)
	Aug. 8	0.6" Tue. AM
	Sep. 8	0.3" Wed. (9-6), 1.0" at home
	Sep. 11	0.2"
	Sep. 15	0.4"
	Oct. 9	1.0" Sat. (10-7)
	Oct. 27	0.9" Fri. night
	Oct. 29	0.6" Sat. night
1990:	Feb. 20	1.4" Tue.
	Mar. 14	2.3" Wed. night
	Mar. 28	1.5"
	Apr. 9	0.3" Sun. (4-8) and Mon. (4-9). Wet and cloudy.
	Apr. 27	3.9" Thu. (4-26) AM
	June 3	0.6" Sun. night
	July 15	1" Sun (7-15) PM. Sun night to Mon. AM 2". Rain all day Mon.
	July 17	Sun PM to Tue. - about 6". Water up under bridge in caverns.
	July 18	1.3" here, 2" at home
	July 19	1.3" Wed. (7-18) PM
	Aug. 22	0.5" Tue (8-21) PM

	DATE	RAINFALL AND/OR WATER LEVEL NOTATION
1990:	Sep. 2	1.1" Sat. (9-1) PM
	Sep. 14	4.8" Sun. (9-9) night to Wed. (9-12)
	Sep. 18	2" Sat. (9-15) night
	Oct. 9	3.3" Tue. (10-9) AM. Northern blew through - Wed.'s temp in low 50's.
	Nov. 4	1.1" Sun AM
	Nov. 9	2"
1991:	Jan. 18	2.1" Fri. AM
	Feb. 4	2.2" Mon. AM. Water flowing under bridge
	Feb. 18	0.6" Mon. night
	Apr. 5	Thu. PM started raining at 9:30 and rained all night. Fri. AM we had over 6" of rain (the gauge runs over at 6"). Fri. water flowing in caverns. Sat AM water up in Sherwood Forest and on bridge.
	Apr. 6	Water on bridge this AM
	May 3	4" Fri. AM
	June 23	3.2" Fri. (6-20) night
	June 29	Cool all day and some rain. (No amounts given)
	Aug. 22	0.6" here, 0.1" home
	Oct. 29	1.8" Tue, Wed. and Thu. AM
	Dec. 20	Fri. - Water started coming up Thu. (12-19). Water on trail Friday AM in Sherwood Forest. As of Fri. AM - 6.3" (RW) Morning 0.8", 2.5" 10:30 = 0.5" 3:30 = 1.0"
	Dec. 22	1.0" (off of Tour Guide Roster) Sun. - From Tue. to Sat. AM we have had 13.5" of rain. Water up to 15th step this AM. It was below the first step Fri. PM. The last tour could still step off the steps and turn right and walk 10' or so in the White Giants. This is the fastest I think I have seen the water come up. (RW)
	Dec. 23	**Mon. - Water was highest it has ever been, covered the 29th step with about 2" of water.** (RW) (Water in the front of the cavern rose to the set of benches at the exit-side of Pluto's Anteroom. (BV) (*Given the elevation of the Cavern's entrance at 1020' above msl, the water table inside Castle of the White Giants would correspond to something on the order of 890' above msl (about 130' below the cavern entrance).*
	Dec. 24	Tue. - On 12-23 (Mon.) AM water was covering the 29th step about 2" deep. This is a new record. Previous was on the 27th step in 1987. Tue. AM water started going down slowly. (RW)
	Dec. 27	Water on trail! (WAP)
	Dec. 29	Water on walkway (WAP)
	Dec. 30	Water on trail! (WAP)
	Dec. 31	Water on walkway (WAP)

	DATE	RAINFALL AND/OR WATER LEVEL NOTATION
1992:	Jan. 3	Water on trail (WAP)
	Jan. 4	0.5"
	Jan. 5	0.5" - Water still up in Castle - even with Bomb Burst on walkway. (WAP)
	Jan. 8	Water in Castle even with Bomb Burst on walkway. (RW)
	Jan. 10	Water on trail! (RW)
	Jan. 12	Water on trail (WAP)
	Jan. 17	0.8" on 16th (Fri.) night
	Jan. 26	Water is still over bridge. The handrail is just showing. Note: rained all Sat. night and all day Sunday. About 2" more rain. Creeks are flowing so I guess water will come up more in cavern. (RW)
	Jan. 31	Water on trail! (WAP)
	Feb. 3	Water on trail (WAP)
	Feb. 9	Water on trail (WAP)
	Feb. 22	1.4" Fri. (2-21) night
	Feb. 23	Water on trail (WAP)
	Feb. 29	Water on trail (WAP)
	Mar. 6	Water on trail (WAP)
	Mar. 8 - 27	Water on trail (WAP)
	Mar. 28	More rain. (No amounts given)
	Mar. 29	Sunny most of the day. Late afternoon thunderstorms with wind and hail and heavy rain. (No amounts given)
	Apr. 4	1.5" (RW)
	Apr. 5	Water still over walkway (RW)
	Apr. 12	Water on trail! (WAP)
	Apr. 19	Water still up.
	Apr. 26	Water going down. Post in fork of trail in White Giants showing (RW)
	May 8	Water going down. We have been going down in the Castle since last Sat. (5-2). Maybe in two weeks it will be off of the bridge if no big rains fall. Water has been up since 12-23-91. (RW)
	May 21	Hard rain - 4.6". Water rising (RW)
	May 22	Hard rain Wed. night and Thu. AM. 4.6" All creeks flowed. The Cibolo crested from about 7" of rain at Boerne. It was up on 1863 across from the radio tower. Water was about 3' over bridge in caverns before all of this rain and was going down nicely. Not any more after all of this rain. Fri. AM water was even with Bomb Burst. At 4:00 PM it had risen to within 10' of steps even with King's Throne.
	May 24	Water back up to the 15th step. A week ago the handrail on the bridge was beginning to show. Sunday the ticket wait in line was about one hour. (RW)
	May 25	Water up to the 18th step. (RW)
	May 28	Water on the 17th step. (RW)
	June 2	Mon. night/Tue. AM - hard rain 3". Water was on 15th step and going down. Coming up AGAIN. Wed. AM water on 18th step.
	June 5	Water on 20th step. From Thu. to Fri. water dropped about 3 or 4". (RW)
	June 8	Water today on 17th step. Hard rain this AM of 1.2". (RW)
	June 30	1.2" Mon. (6-29) night. (WAP)

	DATE	RAINFALL AND/OR WATER LEVEL NOTATION
1992:	July 1	Thu. water off 1st. step. It has taken from 6-3 to go down from the 20th step.
	July 2	Today water finally going down off the steps. We had hoped it would at least be out of the Castle by the 4th but looks like no chance. (RW)
	July 9	Water going down slowly now. Just past the Bomb Burst. Maybe in a few days we can walk around the White Giants. (RW)
	July 16	Able to go around the Castle! (WAP)
	July 17	Water going down slow, we can now walk around the Castle. (RW)
	July 20	1.2" rain in PM
	July 28	Water about 10' deep in Sherwood Forest at start of bridge. Tue. AM Ed Zimmerman with Edwards Underground Water District did underwater photo for an educational film to show school children. Filming was in Purgatory Creek area.
	Aug. 3	1.2" Mon. (8-3) AM. Cloudy and overcast. (WAP)
	Aug. 6	Water off the trail! 10:55 AM tour . 232 days. (WAP)
	Sep. 18	Hot and dry. Now we could use some of that rain during winter and spring. (RW)
	Nov. 1	1.5" Sat (10-31) night. (RW)
	Nov. 20	4.8" wed (11-18) and Thu. (11-19). Water up in Purgatory Creek. Sat. AM formations in bottom of Creek covered. (RW)
1993:	May 5	8" (WAP)
	May 6	Water on trail in Sherwood around 2:00 PM (JW)
	May 7	Water on trail! Covered handrail at Purgatory Creek bridge. (WAP)
	May 12	Water still covering bridge. (WAP)
	May 15	Water off trail in Sherwood (WAP)
	June 26	1.4" - Fri. (6-25) to Sat. AM
	Nov. 13	0.2" Sat. night
1994:	Apr. 30	Cool today.
	May 15	Water in Purgatory Creek Sun. AM (No record of rainfall)
	Aug. 9	Good rain. Has been very dry. 2.8" AM (RW)
	Oct. 14	1" Fri. night.
	Dec. 28	2" - rained all day (WAP)
1995:	Apr. 16	Cloudy and overcast all day. (RW)
	May 27	1" Sat. AM
	May 30	1.9" Mon. (5-29) night. Water starting to come up in Purgatory Creek. (RW)
	May 31	Water flowing in Purgatory Creek. (RW)
	June 10	2.3" Sat. night. (RW)
	June 29	0.8"
	Oct. 31	1.3"

DATE RAINFALL AND/OR WATER LEVEL NOTATION

The preceding information was gathered from written records kept from Oct. 1, 1966 through the present time in 1996. Records for the months of January, February, and March 1979; the months of February, March, and April of 1980; and the months of March and May of 1986 are not available. In addition, none of the records for Nov. 1995 through to the present day were available at this time. This report would not, then, contain any high water events recorded during those months.

It is of significance to note that the water frequently has flowed through the Caverns at Purgatory Creek after local rainfall, but the water has not flown in sufficient quantity to cover the trail. Since this does not interfere with normal guided tours, most of these instances are not noted on the records.

4/2/96
BKV

United States Department of the Interior
NATIONAL PARK SERVICE
INTERMOUNTAIN FIELD AREA
Southwest System Support Office
P. O. Box 728
Santa Fe, New Mexico 87504-0728

APR 19 1996

Mr. Steven J. Raabe, P.E.
Chief, Engineering Division
San Antonio River Authority
P.O. Box 830027
San Antonio, Texas 78283-0027

Dear Mr. Raabe,

Thank you for allowing us the opportunity to review a copy of Section 3.48 Upper Cibolo Creek Cost Analysis, Volume 4 Phase 1 Interim Report. As expressed in our letter of August 1, 1995, from Joe Sovick to the Natural Bridge Caverns staff geologist Mr. Brian Vauter regarding the proposed Cibolo Creek Dam project, the current report continues to demonstrate to us that this proposal could impact upon the natural process of Natural Bridge Caverns and the adjacent South Cave.

The Natural Bridge Caverns is a registered National Natural Landmark. The National Natural Landmarks Program was established by the Secretary of the Interior in 1962, under authority of the Historic Sites Act of 1935 (16 U.S.C. 461 et seq) to identify and encourage the preservation of the full range of geological and ecological features that are determined to represent nationally significant examples of the Nation's natural heritage.

In our recent Section 8 report to Congress on the status of National Natural Landmarks in the Southwest, we noted that Natural Bridge Caverns should be considered a threatened site because of the proposed Upper Cibolo Creek dam site.

As you note in section 3.48.3 Environmental Issues of the report, the possible effects on Natural Bridge Caverns are unknown at this time and extensive studies would be needed to assess possible impacts to not only the natural process associated with the karstic process of the area but also the continued viability of the cave as a show cave.

Karstic processes are the reason for the size, shape, and decorations of the cave, as well as all associated fauna, including aquatic fauna. Any changes in this system would alter all of the factors. Exactly how the process would be altered could only be determined with a comprehensive study.

Granted
07-10-96 -2

COUNTY OF WILSON

OFFICE OF THE COUNTY JUDGE

JUDGE MARTHA B. SCHNABEL
WILSON COUNTY COURTHOUSE
210-393-7303
FAX: (210) 393-7359
1420 THIRD STREET
FLORESVILLE, TEXAS 78114

July 9, 1996

Mr. Steve Raabe
Chief of Engineering
San Antonio River Authority
100 E. Guenther
San Antonio, Texas 78204

Dear Mr. Raabe:

I would like to officially protest the proposed transfer of water from the Carrizo/Wilcox Aquifer. As you know, the Carrizo-Wilcox Aquifer is a sand aquifer with a slow rate of recharge. It is also evident that the recharge area is in a semi-arid to arid area of the State, which compounds the problem. Therefore, it doesn't make sense to me or my constituents why the Trans-Texas Water Study is proposing transferring water from an area which is dryer than the area to which the water is being transferred.

I would ask that this proposal be withdrawn from consideration and that instead the TransTexas Study concentrate on transferring water from wetter to dryer areas of Texas. This should result in a proposal which would increase the amount of water available to support the residents of Wilson County.

During each of the drought years water purveyors have experienced problems with their wells and have had to dig new wells, lower existing wells or otherwise make costly repais to their systems. This is a never ending problem with withdrawing water from a sand aquifer.

Sincerely,

Martha B. Schnabel

MARTHA B. SCHNABEL
WILSON COUNTY JUDGE

MBS/mp

cc: Mr. Mike Mahoney
President
Evergreen Underground Water Conservation District