

BRAZOS G REGIONAL WATER PLANNING AREA 2006 REGIONAL WATER PLAN SCOPE OF WORK

Introduction

The Brazos G Regional Water Planning Group (RWPG) developed and adopted the 2001 Regional Water Plan for the Brazos G region and subsequently submitted the water plan to the Texas Water Development Board (TWDB) in early 2001. The TWDB accepted the regional plan and incorporated it into the 2002 State Water Plan. Planning for water supply needs is a dynamic process and the Texas Water Code requires that the State Water Plan be updated every five years. Consequently, the TWDB is requesting scopes of work, schedules, and budgets from the Brazos G RWPG for development of the 2006 Regional Water Plan, which will in turn become part of the 2007 State Water Plan.

Some of the dynamics that necessitate the need for an update of the Regional Water Plan (and ultimately the State Water Plan) and that influence this scope of work are:

- Changes in population and water demands created by results of the 2000 census;
- Changes in water supply resulting from updated groundwater and surface water estimates provided by TWDB and TNRCC;
- Possible new drought of record in the western part of the region;
- Amendments in the Texas Water Code resulting from SB 2 and rule changes by the TWDB;
- Comments from the public on the 2001 Regional Water Plan and suggestions for scope items for the 2006 water plan; and,
- Amendments and additions requested by water utilities in the region.

HDR Engineering, in association with four subconsultants (R.W.Harden & Associates, Inc.; Freese & Nichols, Inc.; Hicks & Company, Inc.; and, Fletcher Communications), has worked closely with the Brazos River Authority in preparing this scope of work and is grateful for the valuable assistance provided by the BRA staff. Please note that references in the scope of work to “HDR” refer to the consulting team in aggregate.

This scope of work reflects guidance and funding estimates produced by the TWDB, as of February 19, 2002 and February 5, 2002, respectively. This scope of work and the associated fee estimate may change in response to other TWDB guidance and rule changes.

Overview

Pursuant to Texas Water Development Board *Rules for Regional Planning Grants, Regional Water Planning Guidelines* (31 TAC Chapters 357.5 through 357.11), and *Guidelines for Regional Water Plan Development* (Attachment B to the TWDB-BRA contract) the Brazos G Regional Water Planning Group hereby proposes a scope of work, schedule, and budget to prepare the 2006 Regional Water Plan for the Brazos G Region.

The development of the Regional Water Plan is organized into Phase 1, Phase 2, and Phase 3. Phase 1 corresponds with Task 0 and is the preparation of this Scope of Work. Phase 2 corresponds to the 2002–2003 State budget biennium and includes those work tasks to be completed in that time period. Phase 3 corresponds to the 2004–2005 State budget biennium and includes those work tasks to be completed in that time period. Table 1 summarizes the tasks included in each phase. Note that this schedule is intended to provide a general partitioning of the tasks between State budget biennium periods. In actuality, some overlap of tasks and biennium periods will likely occur. Table 2 lists the ten major work tasks identified in the guidance provided by the TWDB for organizing the scope of work and the work to be performed. Also listed in this table are the budget estimates for each task.

Table 1. Project Phases and Tasks

	Tasks
Phase 1	Task 0 - Scope of Work (due April 1, 2002)
Phase 2 (2002-2003 biennium)	Task 2 - Review and Revision of Population and Water Demand Projections Task 3 - Analysis of Current Water Supply in Region
Phase 3 (2004-2005 biennium)	Task 1- Description of Planning Area Task 4 - Identification, Evaluation, and Selection of Water Management Strategies Task 5 - Impacts of Selected Water Management Strategies on Key Parameters of Water Quality and Impacts of Moving Water from Rural and Agricultural Areas Task 6 - Water Conservation and Drought Management Recommendations Task 7 - Description of How the Regional Water Plan is Consistent with Long-term Protection of the State's Water Resources, Agricultural Resources, and Natural Resources Task 8 - Make Additional Recommendations Including Unique Ecological Stream Segments, Reservoir Sites, and Legislative and Regional Policy Issues Task 9 - Report to Legislature on Water Infrastructure Funding Recommendations Task 10 - Adoption of Plan, Including Public Participation, Facilitation, Implementation, and Project Management; Other Items

Table 2. Budget Estimate

<i>Task</i>	<i>Consultant Fee</i>		
	<i>Base Scope Items</i>	<i>* Unique Studies and Evaluations</i>	<i>Total</i>
0. Scope of Work	\$10,000	—	\$10,000
1. Description of Planning Area	\$22,263	—	\$22,263
2. Review and Revision of Population and Water Demand Projections	\$148,436	—	\$148,436
3. Analysis of Current Water Supply in Region Unique Study: Task 3C - Reservoir Inventory (\$21,069) Unique Study: Task 3F - Updated Droughts of Record (\$43,379) Unique Study: Task 3G(2) - Effect of Reservoir Level on Water Quality During Drought (\$12,235) Unique Study: Task 3I - Trinity Aquifer Pumpage (\$52,585)	\$433,659	\$129,268	\$562,927
4. Identification, Evaluation, and Selection of Water Management Strategies Unique Study: Task 4E - Additional Reservoir Site Evaluations (\$165,126)	\$604,069	\$165,126	\$769,195
5. Impacts of Selected Water Management Strategies on Key Parameters of Water Quality and Impacts of Moving Water from Rural and Agricultural Areas	\$76,955	—	\$76,955
6. Water Conservation and Drought Management Recommendations	\$12,922	—	\$12,922
7. Description of How the Regional Water Plan is Consistent with Long-term Protection of the State's Water Resources, Agricultural Resources, and Natural Resources	\$25,000	—	\$25,000
8. Make Additional Recommendations Including Unique Ecological Stream Segments, Reservoir Sites, and Legislative and Regional Policy Issues	\$16,591	—	\$16,591
9. Report to Legislature on Water Infrastructure Funding Recommendations	\$13,725	—	\$13,725
10 (A). Adoption of Plan, Including Public Participation, Facilitation, Implementation, and Project Management; Other Items Unique Study: Task 10C - Attorney Panel (\$22,080)	\$258,780	\$22,080	\$280,860
Total Consultant Fee	\$1,622,400	\$316,474	\$1,938,874
10 (B). RWPG Travel Reimbursement and Notice Expenses (reimbursement to BRA and RWPG)	\$34,530	—	\$34,530
Total Contract	\$1,656,930	\$316,474	\$1,973,404

* Subtasks included in this category are prioritized per TWDB guidance in Exhibit A.

Task 1. Description of Planning Area

A. Update of previous plan information.

This task is a limited effort to update the area description contained in the 2001 Regional Water Plan. Based on TAC 357.7, the description is to include information on the following:

1. Wholesale water providers
2. Current water use
3. Identified water quality problems
4. Sources of groundwater and surface water, including major springs
5. Major demand centers
6. Agricultural and natural resources
7. Social and economic aspects of the regional water planning area, including information on current population and primary economic activities, including businesses dependent on natural water resources
8. Initial assessment of current preparations for drought within the regional water planning area
9. Summary of existing regional water plans, summary of recommendations in State water plan
10. Summary of local water plans
11. Identified threats to the agricultural and natural resources due to water quantity problems, or water quality problems related to water supply.

B. Inventory of Water Conveyance Facilities (TAC 357.7(a) (1)(M))

The TWDB will provide information on water pipelines and other facilities that could be used for water conveyance, including, but not limited to currently used and abandoned oil, gas, and water pipelines. This information will be developed by a contractor to the TWDB and will be provided to the RWPG for inclusion in the Regional Water Plan.

Task 2. Review and Revision of Population and Water Demand Projections

- ### **A.**
- TWDB staff, in conjunction with TNRCC, TPWD, and TDA, will prepare draft population and water demand projections for all water user groups. New population projections will be developed using the 2000 Census and other sources. TWDB will publish draft projections and request input from the regions and water user groups. Development of new municipal water use estimates will be based on data through 2000 from the TWDB Water Use Survey. Demand projections for all non-municipal water user groups will also be developed by TWDB. Water demand projections will be prepared for six water use categories: municipal; manufacturing; mining; steam-electric; irrigation; and livestock.

- B. Projections will be prepared for:
 - 1. Cities with population greater than 500.
 - 2. Water utilities for counties that have less than five utilities that provide more than 280 acft/yr. The TWDB estimates that there are 29 water utilities in this category. See Exhibit B (I) for listing of utilities in this category identified by the TWDB.
 - 3. Individual utilities or collectives as allowed by TAC 357.7(a)(2)(A)(iii). The RWPG estimates that it will adopt approximately 26 individual utilities in this category. See Exhibit B (II) for listing of utilities in this category.
 - 4. Wholesale water providers. The RWPG estimates that there are 19 wholesale water providers. See Exhibit B (III) for listing of utilities in this category.
 - 5. County-other category.
- C. Water use for each category of use and for each water user group will be reported for each county and portion of a county in the region. If a county or portion of a county is in more than one river basin, data shall be reported for each river basin in that county.
- D. An estimate will be presented to the RWPG of those water savings that can be obtained by using plumbing fixtures identified in Chapter 372 of the Texas Health and Safety Code. The RWPG will determine the extent to which such plumbing fixture water savings impact projected municipal water use using parameters approved by the TWDB. (TAC 357.7(a)(2)(C). Net water demand with plumbing fixture savings taken into account will become the Base water demand for estimating projected municipal water surpluses and shortages.
- E. Comments received on population and water demand projections will be reviewed by HDR and summarized to the RWPG. The RWPG will direct HDR whether any revision requests should be prepared for submission to TWDB. Criteria for requesting revisions to draft population and water demand projections are included in section 4.2.5 in *Attachment B: Guidelines for Regional Water Plan Development*.
- F. Based on RWPG input and review, stakeholder meetings, and results of revision requests to TWDB, HDR will report high-case population and water demand projections for those entities as directed by the RWPG.
- G. A comparison will be prepared of population and water demand projections in the 2001 Regional Water Plan to the revised (after TWDB approval) projections.

Task 3. Analysis of Current Water Supply in Region

This task focuses on updating water supply availability estimates included in the 2001 Regional Water Plan. Specific guidance for methodology to be used to estimate surface water availability, ground water supply, and reuse supply during drought of record conditions is included in Sections 3.1 and 3.2 in *Attachment B: Guidelines for Regional Water Plan Development*. A portion of Task 3 involves modification and application of the TNRCC Water

Availability Model (WAM) to determine water available to surface water rights held in the Brazos River Basin. The TNRCC WAM includes all of the Brazos River Basin and San Jacinto-Brazos Coastal Basin. As much of the lower Brazos River Basin and all of the San Jacinto-Brazos Coastal Basin are located in the Region H planning area, application of the TNRCC WAM will be closely coordinated with Region H.

- A. Modify the TNRCC WAM as necessary to be consistent with water supply planning purposes in the Brazos G region and Region H. Typical modeling assumptions adopted by the TNRCC and included in the WAM may be inconsistent with assumptions adopted by the RWPG for water planning purposes. For example, the model run scenario typically selected by the TNRCC for permitting of perpetual water rights in all river basins (commonly called Run 3) includes no return flows (effluent discharges), and may not be suitable for evaluating current water supplies that are dependant upon indirect reuse of treated wastewater. Features of the TNRCC WAM that are not necessarily suited for assessment of current water supply will be modified as follows:
1. The water rights held by the Brazos River Authority (BRA) are assumed in the TNRCC WAM to be diverted directly from the individual BRA reservoir associated with each BRA water right. Contractual diversions by BRA customers, which often occur downstream, are not placed in the model at their actual points of diversion. The WAM input files will be modified such that the BRA contracts are diverted downstream of BRA reservoirs, where appropriate.
 2. The BRA system of reservoirs is not operated conjunctively in the TNRCC WAM to meet downstream BRA contractual commitments. Many of the BRA customers divert at locations where it is possible to receive releases from more than one BRA reservoir. The BRA operates its reservoir system in order to maximize available water supply and minimize demands on a single reservoir, as authorized in a System Operations Order. The TNRCC WAM input files will be modified to include a base system operation policy (within the constraints of the current model code) in order to conjunctively meet downstream contractual diversion requirements using the BRA reservoirs in a coordinated fashion. The BRA will be consulted in developing the base set of system operating parameters for the BRA system.
 3. Rights authorized for multiple uses are typically modeled at their highest priority use in the TNRCC WAM (in order: municipal, industrial, irrigation, mining) when the specific allocation between uses is not stated in the water right. Each right authorized for multiple uses will be modeled assuming the types of use projected for the wholesale provider holding the water right.
 4. Reservoirs are included in the TNRCC WAM at their authorized storage. Volumetric survey data and/or reduction in storage capacity due to sedimentation are not included in the TNRCC WAM. The TNRCC WAM data sets will be adjusted to reflect the most recent volumetric survey data for each major reservoir, and then further adjusted to simulate sedimentation conditions representative of Year 2000 and Year 2060 conditions.

5. The TNRCC WAM assumes 100 percent consumptive reuse of treated wastewater effluent. It is unlikely that this level of reuse will occur during the SB1 planning horizon, and reasonable assumptions concerning reuse and discharge of treated effluent are appropriate for the regional planning process. The TNRCC WAM data sets will be modified to reflect discharges of treated wastewater effluent consistent with assumptions adopted by the RWPG concerning indirect and direct reuse of wastewater. Discharge of treated wastewater will be included in the model as constant annual values, distributed to monthly on a uniform basis.
- B. Using the TNRCC WAM (modified as necessary for planning purposes), HDR will determine water available from existing sources, including
1. Estimated water available from run-of-river water rights
 2. Estimated water available from major BRA and non-BRA reservoirs using stand-alone firm yield operation
 3. Estimated water available from the BRA system of reservoirs, operated in a coordinated fashion to meet downstream contractual commitments
 4. Estimated water available under safe yield operation from those reservoirs whose owners have petitioned the RWPG to use safe yield operation
- C. Reservoir Inventory (UNIQUE STUDY)

Compile an inventory of all reservoirs in the region, including owner, permit number, watershed, firm yield, surface area, volume (if information is available), and date of most recent volumetric survey. Inventory is to be completed for:

1. Major Reservoirs
2. Other Reservoirs – all reservoirs with a municipal and/or industrial use

This information is generally available from several sources for larger reservoirs (greater than 5,000 acft capacity), but is generally not available in a central database for both larger and smaller reservoirs. This information, compiled into a central database, will be helpful in determining water supplies from these sources.

- D. Review Groundwater Conservation District (GCD) plans for conformance with GAM results and with 2002 State Water Plan.

After review with the RWPG, groundwater availability estimates will be refined to reflect model simulations completed for the various groundwater availability models (GAMs) currently under development by the TWDB. (Note: GAMs being created in the Brazos G region and their due dates are: Central Carrizo-Wilcox (Jan '03); Northern Edwards (Dec '03); Northern Trinity (Dec '04); Seymour (Dec '04))

1. Using GAM results, present possible groundwater management goals and strategies, with
 - i. Pumpage at sustainable development;
 - ii. Pumpage at other development amounts.
2. Identify areas of common goals and strategies with GCDs
3. Identify conflicts between GCD plans and 2002 State Water Plan
4. Report other data needs

E. Updated Droughts of Record (UNIQUE STUDY)

New droughts of record might have occurred since 1997 in the western portion of the Brazos G region. The WAM results only include data through 1997, and supplies from several major reservoirs in this area might be reduced from previous yield estimates, or be less than determined by the TNRCC WAM. This task does not include updating the TNRCC WAM. Reservoir-specific hydrologic analyses or adoption of recently-completed yield studies will be used to report to the RWPG whether new drought(s) of record have occurred and the corresponding yields of these reservoirs:

1. Millers Creek Reservoir
2. Hubbard Creek Reservoir
3. Lake Fort Phantom Hill
4. Stamford Reservoir
5. Lake Proctor
6. One small (less than 10,000 acft capacity) reservoir to be selected at a later date

F. Compile information on water availability from contracts

1. Term Contracts
2. Renewable Contracts

G. Evaluate water quality effect on water supply

1. General effects of water quality on water supplies.

The quality of each water supply identified will be described as data allow, and the effects of that water quality on the current or projected uses will be qualitatively discussed.

2. Effect of Reservoir Level on Water Quality During Drought. (UNIQUE STUDY)

For one selected reservoir in the western portion of the region with sufficient available data, correlations between water quality constituents and reservoir level will be developed in order to determine if degradation in water quality occurs at lower lake levels. The implications of any degradation of water quality during drought with regard to the usability of the water supply from the reservoir will be discussed.

H. Trinity Aquifer Pumpage (UNIQUE STUDY)

Estimate current groundwater pumpage in the Trinity aquifer and compare to estimated sustainable yields. Using information from various sources, including groundwater districts, water utilities, aerial photos, tax appraisal districts, water well driller records and other sources, make estimates of the number and types of users of groundwater. By applying typical estimated usage rates for each type of user, make estimates of current groundwater usage from the Trinity Aquifer in these counties:

1. Bosque County
2. Comanche County
3. Hill County

4. Hood County
 5. Johnson County
 6. Somervell County
- I. Update sedimentation rate and the effect on yield of Lake Mexia

Task 4. Identification, Evaluation, and Selection of Water Management Strategies

- A. Compare demand and supply to determine needs using same level of detail as described in Tasks 2(B) and 2(C).
1. Compare current supplies to base case water demand projections.
 2. Compare current supplies to those entities for which a high case water demand projection was made.
- B. Identify and evaluate water management strategies to meet needs based on results of Task 4(A).
1. Document the process by which all possible water management strategies will be listed and how the water management strategies that are potentially feasible for meeting a need will be identified. (TAC 357.5(e)(4)).
 2. Present the process to the public for comment (TAC 357.5(e)(4)).
 3. Evaluate all water management strategies the RWPG determines to be potentially feasible, including the list provided in TAC 357.7(a)(7)(A through F).
 4. Evaluations of water management strategies are to include a quantitative reporting of:
 - i. The quantity, reliability, and cost of water delivered and treated, including costs of debt, present costs, and discounted present value costs. The quantity of water available to new reservoir or diversion projects will be evaluated with respect to the Consensus Criteria for Environmental Flow Needs (CCEFN), as described in subheading C (below).
 - ii. Environmental factors including effects on instream flows, wildlife habitat, cultural resources, and effect on discharges to bays, estuaries, and arms of the Gulf of Mexico. Effects on instream flows will be estimated by comparing “baseline” and “with-project” streamflows.
 - iii. Impacts on other water resources of the State, including other water management strategies, and groundwater-surface water interrelationships.
 - iv. For each threat to agricultural and natural resources identified in Task 1(A) a discussion of how that threat will be addressed or affected by the water management strategies evaluated.
 - v. Any other factors deemed relevant by the RWPG, including recreational impacts.
 - vi. Consideration of third party social and economic impacts resulting from voluntary redistributions of water

- C. Develop data sets and model capabilities necessary to apply Consensus Criteria for Environmental Flow Needs (CCEF) or results of site-specific studies for assessment of dependable supplies associated with new reservoir or diversion projects.
1. Based upon the guidance provided by the TWDB in Sections 4.2.8.d and 4.2.8.e in *Attachment B: Guidelines for Regional Water Plan Development*, develop monthly statistics from daily naturalized streamflows, or applicable TNRCC water quality standards, at locations of new reservoirs or diversion projects that are to be evaluated as water management strategies. Daily naturalized streamflows will be calculated from the monthly naturalized flows developed for the TNRCC WAM. One or more nearby streamflow gages will be used to provide a daily flow pattern by which to distribute the monthly flows to daily values.
 2. The TNRCC WAM model does not include the capability to simulate reservoir operations nor evaluate water availability on a daily time step, subject to CCEF. The TNRCC WAM will be enhanced to include these capabilities so that the water management strategies involving new reservoir or diversion projects can be evaluated in accordance with TWDB guidelines.
- D. Reservoir sites not considered in the 2001 Regional Water Plan

Study the following projects to the same level of detail as similar types of projects studied in the 2001 Regional Water Plan, including yield estimates, impacts on yields of existing reservoirs, environmental impact and mitigation cost, preliminary spillway hydraulics and design, and estimated project costs. Yield estimates will be evaluated subject to CCEF.

1. Throckmorton (Throckmorton County)
2. Double Mountain Fork (Stonewall County)
 - i. Site No. 1
 - ii. Site No. 2
3. Turkey Peak (Palo Pinto County)

E. Additional reservoir site evaluations (UNIQUE STUDY)

Two of the following individual proposed reservoirs, the Little River and Millican reservoirs, were identified as potential water management strategies in the 2001 Brazos G and Region H water plans. Both potential reservoir sites are physically located in Region G. The proposed Little River reservoir was ultimately recommended in the 2001 water plans to meet shortages in both regions; however, public comments and questions regarding this strategy have raised technical issues that the Brazos G RWPG chooses to study in developing its 2006 regional water plan. Study of these technical issues is supported by Region H and will be closely coordinated between both regions. The remaining two individual reservoirs, South Bend and Breckenridge, have been identified as potential water management strategies to meet needs in the upper part of the Brazos River Basin, and will be evaluated to the same level of detail as the projects listed in 4(D). Where appropriate, data from the 2001 Regional Water Plan will be utilized. Yield estimates will be

evaluated for all four projects subject to CCEF. The technical issues to be studied at each potential reservoir site are:

1. Little River

i. Expected water quality – using available USGS, BRA and TNRCC data, make quantitative estimates of chlorides and sulfates and qualitatively describe other pollutants detected by USGS, BRA and TNRCC sampling.

ii. Sedimentation rates and effect on long-term yield

iii. Socio-economic effects on area

1. Quantify value of inundated farm land and impact on short-term tax base

2. Approximate the impact on the local economy based on the percentage loss in tax base

3. Based on historical data of impact of other reservoirs in the area, estimate potential long-term impact

iv. Environmental effects

1. Impacts to the aquatic environment. An aquatic habitat classification of the specific project area will be conducted from interpretation of current digital orthophotographic imagery (or other digital imagery acquired by aircraft or satellite) of the site and from existing biological documentation. The impact assessment will include an evaluation of the project footprint relative to inundation / conversion of lotic to lentic habitat, physio-chemical parameters, migration barriers, and construction disturbance. Alteration of streamflows in the downstream reach will be evaluated by comparing “with project” hydrologic conditions to “baseline” hydrologic conditions. Changes in the “baseline” versus “with project” aquatic conditions will provide a preliminary estimate of potential environment impacts for the project.

2. Impacts to wildlife habitat. A vegetation map of major cover types occurring in the project footprint will be produced from interpretation of current digital orthophotographic imagery (or other digital imagery acquired by aircraft or satellite) of the site. Acreages of occurring cover types will be calculated employing ArcView software. Wildlife habitat quality ratings will be assigned to each of the mapped cover types including any identified wetlands based on the dominant occurring plant associations, and the density, spatial distribution, and juxtaposition of vegetation cover portrayed by the photographic imagery. The size of each cover type multiplied by its quality rating will generate a habitat unit value that will be used to assess impacts and provide a preliminary estimate of mitigation requirements.

3. Impacts to threatened or endangered species. The reservoir site will be evaluated for potentially occurring threatened, endangered or other sensitive species using a cataloging system that incorporates the listing status by the U.S. Fish and Wildlife Service and Texas Parks and Wildlife

Department (Endangered, Threatened, or Species of Concern) with the projected level of impact.

4. Impacts to freshwater inflows to the Gulf of Mexico. An evaluation of net changes in streamflow will be conducted relative to the contribution of freshwater at the mouth of the Brazos River.
5. Estimate mitigation methods and costs
- v. Effects on cultural resources
 1. cursory archeological investigation. The number of recorded cultural resource features potentially impacted will be investigated. This will include: the total number of National Register Listed Properties (NRHP), State Archeological Landmarks (SALs), Registered Texas Historic Landmarks (RHTLs), and Official State Historical Markers (OSHM)s and cemeteries occurring within the project area. Known archeological sites will also be referenced in the project area. A generalized summary of the potential for cultural resources will be provided. Two sources of data will be consulted. Electronic databases will be consulted for NRHP, SAL, RHTL, and OSHM resources. The topographic maps of the Texas Archeological Research Laboratory (TARL) will be consulted for numbers of archeological sites and cemeteries for each project area. These results will be compiled in tabular format. No official hardcopy files of cultural resources will be accessed.
 2. Develop scope and cost of pre-construction archeological investigation, including mitigation costs
- vi. Perform desk-top geotechnical evaluation using available information, including expected seepage and other issues
- vii. Evaluation of possible groundwater – surface water interaction with the Little River
- viii. Impact on water and mineral rights and mitigation costs
- ix. Impact on oil wells and mitigation costs
- x. Coordinate with Region H on possible alternatives to Little River Reservoir to meet each respective region's water needs
- xi. Consider smaller configurations of Little River Reservoir including off-channel storage alternatives
2. Millican (Bundic Crossing site)
 - i. Expected water quality– using available USGS, BRA and TNRCC data, make quantitative estimates of chlorides and sulfates and qualitatively describe other pollutants detected by USGS, BRA and TNRCC sampling.
 - ii. Sedimentation rates and effect on long-term yield
 - iii. Socio-economic effects on area
 1. Quantify value of inundated farm land and impact on short-term tax base
 2. Approximate the impact on the local economy based on the percentage loss in tax base

3. Based on historical data of impact of other reservoirs in the area, estimate potential long-term impact
- iv. Environmental effects
1. Impacts to the aquatic environment. An aquatic habitat classification of the specific project area will be conducted from interpretation of current digital orthophotographic imagery (or other digital imagery acquired by aircraft or satellite) of the site and from existing biological documentation. The impact assessment will include an evaluation of the project footprint relative to inundation / conversion of lotic to lentic habitat, physio-chemical parameters, migration barriers, and construction disturbance. Alteration of streamflows in the downstream reach will be evaluated by comparing “with project” hydrologic conditions to “baseline” hydrologic conditions. Changes in the “baseline” versus "with project" aquatic conditions will provide a preliminary estimate of potential environment impacts for the project.
 2. Impacts to wildlife habitat. A vegetation map of major cover types occurring in the project footprint will be produced from interpretation of current digital orthophotographic imagery (or other digital imagery acquired by aircraft or satellite) of the site. Acreages of occurring cover types will be calculated employing ArcView software. Wildlife habitat quality ratings will be assigned to each of the mapped cover types including any identified wetlands based on the dominant occurring plant associations, and the density, spatial distribution, and juxtaposition of vegetation cover portrayed by the photographic imagery. The size of each cover type multiplied by its quality rating will generate a habitat unit value that will be used to assess impacts and provide a preliminary estimate of mitigation requirements.
 3. Impacts to threatened or endangered species. The reservoir site will be evaluated for potentially occurring threatened, endangered or other sensitive species using a cataloging system that incorporates the listing status by the U.S. Fish and Wildlife Service and Texas Parks and Wildlife Department (Endangered, Threatened, or Species of Concern) with the projected level of impact.
 4. Impacts to freshwater inflows to the Gulf of Mexico. An evaluation of net changes in streamflow will be conducted relative to the contribution of freshwater at the mouth of the Brazos River.
 5. Estimate mitigation methods and costs
- v. Effects on cultural resources
1. cursory archeological investigation. The number of recorded cultural resource features potentially impacted will be investigated. This will include: the total number of National Register Listed Properties (NRHP), State Archeological Landmarks (SALs), Registered Texas Historic Landmarks (RHTLs), and Official State Historical Markers (OSHM)s and cemeteries occurring within the project area. Known archeological sites

will also be referenced in the project area. A generalized summary of the potential for cultural resources will be provided. Two sources of data will be consulted. Electronic databases will be consulted for NRHP, SAL, RHTL, and OSHM resources. The topographic maps of the Texas Archeological Research Laboratory (TARL) will be consulted for numbers of archeological sites and cemeteries for each project area. These results will be compiled in tabular format. No official hardcopy files of cultural resources will be accessed.

2. Develop scope and cost of pre-construction archeological investigation, including mitigation costs
 - vi. Perform desk-top geotechnical evaluation using available information, including expected seepage and other issues
 - vii. Evaluation of possible groundwater – surface water interaction with the Navasota River
 - viii. Impact on water and mineral rights and mitigation costs
 - ix. Impact on oil wells and mitigation costs
 - x. Coordinate with Region H on possible use of Millican Reservoir
 - xi. Consider smaller configurations of Millican Reservoir including off-channel storage alternatives
 3. South Bend
 - i. Update yield using TNRCC WAM (as enhanced), taking into account existing projects
 - ii. Update cost estimates from previous studies
 4. Breckenridge (Reynolds Bend Site)
 - i. Update yield using TNRCC WAM (as enhanced), taking into account existing projects
 - ii. Update cost estimates from previous studies
- F. Systems Analysis of Potential Major Reservoirs Upstream of Possum Kingdom Reservoir

Using the enhanced TNRCC WAM and taking into account existing projects, estimate effect on reservoir yields and system effects of various combinations of proposed reservoirs. Report information to RWPG on benefits of a single new reservoir and multiple new reservoirs upstream of Possum Kingdom Reservoir.

G. Off-Channel Reservoir Sites

HDR will evaluate water availability and firm yields for the following off-channel reservoir sites. The water availability and firm yield analyses will utilize the enhanced TNRCC WAM and will be subject to the CCEFAN.

1. City of Groesbeck
2. City of Glen Rose
3. Augmentation of Millers Creek Reservoir

4. Little River Reservoir

5. Peach Creek

H. Water Conservation

The RWPG must consider water conservation strategies for each identified water need. If the RWPG does not adopt a water conservation or drought management strategy for a need, it must document the reason (TAC 357.7(a)(7)(A)). In support of this requirement, two Water Conservation Case Studies will be performed. This work will: document, compare, and contrast the funding and commitment to water conservation of two communities; gather statistics on water use, population, economic activity; industrial water use; building permits issued; and weather data, in order to make estimates of the effectiveness of water conservation programs on municipal water use. Two cities are proposed to be studied – one in Williamson County (probably Cedar Park); and one in Bell County.

I. Groundwater/Surface Water Conjunctive Use

1. Identify areas currently employing conjunctive use of groundwater and surface water
2. Incorporate results of any on-going work by BRA
3. Identify potential conjunctive use projects
 - i. Seymour aquifer/WCTMWD System
 - ii. Others

J. Wastewater Reuse

K. Desalination

Due to the dynamic technological and cost changes in desalination market place, HDR will identify one potential groundwater source and one surface water source that could utilize desalination technology.

L. Aquifer storage and recovery

1. Identify areas favorable to groundwater banking of excess surface water and estimate quantities potentially available that could be diverted and banked.
2. Seymour aquifer study – using results of GAM model for Seymour aquifer (to be available in 2004), evaluate hydrologic controls and ASR potential
3. Trinity aquifer study – Johnson County area
 - i. Using results of GAM model for Trinity aquifer (to be available in 2004), evaluate hydrologic controls and ASR potential
 - ii. Identify institutional barriers and report on regulatory agency concerns
 - iii. Report on potential costs and benefits
 - iv. In coordination with local utilities, develop a proposed field trial program; after review by RWPG, present the field trial program to TWDB and request funding; and
 - v. Update cost estimates and expected benefits based on field trials and report to RWPG.

M. Voluntary Redistribution

N. Interregional Water Management Strategies

1. Johnson and Parker Counties regional study with BRA, Tarrant Regional Water District, City of Mansfield and the City of Fort Worth
2. Coordination with Region H regarding Little River and Millican studies

O. Interconnection of Regional and Community Water Systems

1. Midway Pipeline Project
 - i. Stephens-Shackelford County Regional Project
 - ii. Abilene-Stephens-Shackelford County Regional Project
2. Bosque County Regional Project

P. Brush Control

Review completed studies in the Brazos and adjacent basins and develop an estimate of the hydrologic benefit of brush control. Study one potential brush control project and estimate impact on available supplies.

Q. Weather Modification - Brazos G Case Study – West Central Texas COG Area

R. Other water management strategies as required by TWDB (TAC 357.7(a)(7)(D-F)

1. Expanded use of existing supplies, including systems optimization and conjunctive use of resources; reallocation of reservoir storage to new uses; subordination of existing water rights through voluntary agreements; other enhancements of yields of existing sources.
2. Improvements of water quality, including control of naturally occurring chlorides.
3. Water supply that could be made available by cancellation of water rights based on data provided by the TNRCC
4. Interbasin transfers
5. Other Measures

S. Water Management Plans

Plans to meet needs will include specific recommendations of water management strategies to meet near-term needs in sufficient detail to allow State agencies to make financial or regulatory decisions to determine the consistency of the proposed action before the State agency with an approved regional water plan.

1. Update, as necessary, water management plans for water user groups from the 2001 Regional Water Plan using revised water demand and water supply projections.
2. Develop water management plans for new Water User Groups and Wholesale Water Providers identified in Task 2(B) that have inadequate supplies.

Task 5. Impacts of Selected Water Management Strategies on Key Parameters of Water Quality and Impacts of Moving Water from Rural and Agricultural Areas

A. Describe the Impact of Recommended Water Management Plans on Water Quality

In consultation with the BRA and TWDB, HDR will develop a list of potential water quality parameters that should be evaluated relative to the recommended water management plans. The proposed list will be presented to the RWPG. After the RWPG adopts key water quality parameters, HDR will make a comparison of current water quality conditions compared to possible conditions with implementation of the water management plan.

B. Reporting of Impacts on Agricultural Resources

Develop a quantitative reporting of the amount of water potentially to be moved from agricultural use to urbanizing areas, including an analysis of third-party impacts of moving water from agricultural areas.

Task 6. Water Conservation and Drought Management Recommendations

A. Develop a consolidated summary of water conservation and drought management recommendations of the Regional Water Plan (TAC 357.7(a)(11)).

B. Model Water Conservation Plan

A model water conservation plan will be included in the appendix of the Regional Water Plan.

C. Model Drought Management Plan

A model drought management plan will be included in the appendix of the Regional Water Plan.

Task 7. Description of how the Regional Water Plan is Consistent with Long-term Protection of the State's Water Resources, Agricultural Resources, and Natural Resources

Much of the analysis for this task will be undertaken in other tasks. This task is primarily one of assembling and coordinating information developed elsewhere. The information to be reported under this task is:

- A. number of water management strategies
- B. nature of environmental water needs
- C. number of river and stream segments of unique ecological value
- D. number of unique reservoir sites
- E. number of water rights holders.

Task 8. Make Additional Recommendations Including Unique Ecological Stream Segments, Reservoir Sites, and Legislative and Regional Policy Issues.

- A. Develop recommendations for legislative, administrative and rule changes
At the request and direction of the RWPG, HDR and Attorney panel will assist with possible recommendations for legislative, administrative, and rule changes
- B. Unique Reservoir Sites
At the direction of the RWPG, HDR will evaluate whether any proposed reservoirs meet the requirements of a “unique reservoir site” as defined by TAC 357.9 and make recommendations accordingly to the RWPG. If the RWPG adopts any sites as uniquely suited for reservoirs, HDR will document accordingly in the Regional Water Plan.
- C. Unique Stream Segments
Due to the thorough evaluation performed for the Brazos G RWPG in the previous planning effort, HDR will republish the previous report on stream segments that appear to meet the criteria for unique stream segments. No additional effort will be expended to further evaluate or identify possible segments. Stream segments adopted by the RWPG as unique will be documented accordingly in the Regional Water Plan.

Task 9. Report to Legislature on Water Infrastructure Funding Recommendations

New water user groups with needs will be surveyed to determine: (1) how new water user groups propose to pay for their infrastructure projects; and (2) the role proposed for the State in financing projects identified in the Regional Water Plan.

Task 10. Adoption of Plan, Including Public Participation, Facilitation, Implementation, and Project Management; Other Items

- A. Public Participation and Information
 1. Public meetings on development of Scope of Work
 2. Quarterly Newsletters. Up to 12 quarterly newsletters will be published with a total quantity of 1,000 printed.
 3. Web page update and maintenance will coincide with publication of quarterly newsletters.
 4. Contact with water supply entities and other stakeholders through video tapes, speakers bureau; summaries of reports; and other means. The speaker’s bureau will include expertise on role of groundwater districts and interface with regional water planning.
- B. Briefings and panel discussions for topics of interest, including project implementation and financing

C. Attorney Panel (UNIQUE STUDY)

Briefings will be presented to the RWPG and others from the attorney panel on water law and legislative initiatives in order to facilitate a strategic understanding of legal issues that may affect the Brazos G Regional Water Plan. The attorney panel consists of Ron Freeman, Ed Small and Cullen Smith.

D. Coordinate review and revision of public, RWPG, and State agency comments

E. Evaluation of petitions to RWPG to amend or revise the 2001 Regional Water Plan

The RWPG will evaluate one petition to amend or revise the 2001 Regional Water Plan. Any additional requests to revise the 2001 Regional Water Plan will be evaluated only if additional funding is supplied by the TWDB.

F. Coordinate with Texas Water Development Board and Groundwater Conservation Districts to resolve conflicts between Groundwater Conservation District Water Management Plans and the 2001 Regional Water Plan

G. Initially prepared and adopted regional water plans or amendments to the 2001 Regional Water Plan will include the following:

1. A technical report and data prepared in accordance TAC 357 and TWDB specifications (Exhibit B specifications).
2. An Executive Summary that documents key regional water plan findings and recommendations.
3. Summaries of all written and oral comments received, with a response by the RWPG

H. Data Entry into Relational Database

The data associated with the above tasks will be entered into a Microsoft 2000 relational database. The TWDB will populate the database with much of the previously submitted 2001 Regional Water Plan data. HDR will review and revise pre-entered data and add new data.

Exhibit A

Priority Listing of Unique Studies and Evaluations Requested for Funding

Priority Ranking	Task No.	Name and Description	Required Funding
1	3F	<p>Update Drought-of-Record Yields for West Central Reservoirs New droughts-of-record may be underway in the West Central part of the Brazos G region. TNRCC WAM results and other work performed for the 2002 SWP only include data through 1997 or earlier. Because of the continuing drought in the West Central area, indications are that the current drought is drier than the previous drought-of-record and yields may be lower than previously estimated. Reservoir-specific hydrologic analyses and/or recently completed yield studies will be used to report whether new droughts-of-record is occurring and the corresponding yields of these reservoirs: Millers Creek; Hubbard Creek; Lake Fort Phantom Hill; Stamford; Proctor, and one small reservoir to be selected at a later date.</p>	\$43,379
2	4E	<p>Additional Reservoir Site Evaluations The proposed Little River and Millican reservoirs were identified as potential water management strategies in the 2001 Brazos G and Region H water plans. Both reservoir sites are physically located in Region G. The proposed Little River reservoir was ultimately recommended in the 2001 Water Plan to meet shortages in both regions; however, public comments and questions regarding this strategy have raised technical issues that the Brazos G RWPG chooses to study in developing its 2006 Regional Water Plan. Study of these technical issues is supported by Region H and will be closely coordinated with both regions. Issues to be studied include: water quality; sedimentation rates; socio-economic effects; terrestrial and aquatic habitats; archeology; geotechnical conditions; and evaluation of possible groundwater-surface water interaction.</p>	\$165,126
3	3I	<p>Estimate Trinity Aquifer Pumpage Using information from various sources, including TNRCC, TWDB, groundwater districts, water utilities, aerial photos, tax appraisal districts, water well driller records, and other sources, estimates will be made of the number and types of users of Trinity Aquifer groundwater in these counties: Bosque, Comanche, Hill, Hood, Johnson, and Somervell. These updated pumpage estimates will be used in conjunction with the GAM work to report to the RWPG the expected long term groundwater trend in the area, along with the need (if any) of new water supplies.</p>	\$52,585
4	3G(2)	<p>Effect of Reservoir Level on Water Quality During Drought For one selected reservoir in the western portion of the region with sufficient available data, correlations between water quality constituents and reservoir level will be developed in order to determine if degradation in water quality occurs at lower lake levels. The implications of any degradation of water quality during drought with regard to the usability of the water supply from the reservoir will be discussed.</p>	\$12,235
5	10C	<p>Create an Attorney Panel In development of the 2002 SWP, comments were received that input from attorneys active in the water business and project finance would have been helpful in considering water management strategies and in development of legislative recommendations. Three attorneys active in water issues (Ron Freeman), land-owner rights (Ed Small), and finance (Cullen Smith).</p>	\$22,080
6	3C	<p>Reservoir Inventory An inventory of all reservoirs with a municipal and/or industrial use will be developed regardless of the reservoir's size. Information to be compiled includes owner, permit number, watershed, firm yield, surface area, volume, and date of last survey. This information is generally not available for reservoirs under 5,000 acft capacity and will be useful in estimating water availability from these sources.</p>	\$21,069
Total			\$316,474

Exhibit B

Proposed Water User Groups for

- I. List of utilities in counties with fewer than five retail public water supply entities using more than 280 acft/yr to be classified as Water User Groups (list as provided by the TWDB).
- II. Additional individual utilities proposed by the Brazos G RWPG to be classified as Water User Groups.
- III. Wholesale Water Providers meeting the definition in TWC Chapter 16 and 31 TAC Chapter 357.2 (8).

I. List of utilities in counties with fewer than five retail public water supply entities using more than 280 acft/yr to be classified as Water User Groups (list as provided by the TWDB).

1. ACTON MUD
2. BETHESDA WSC
3. BISTONE MUNICIPAL WSD
4. BITTER CREEK WSC
5. CHALK BLUFF WSC
6. CHILDRESS CREEK WSC
7. COLEMAN COUNTY WSC
8. CROSS COUNTRY WSC
9. ELM CREEK WSC
10. FORT BELKNAPP WSC
11. HAWLEY WSC
12. JOHNSON COUNTY FWSD 1
13. JOHNSON COUNTY RURAL WSC
14. KEMPNER WSC
15. LEE COUNTY WSC
16. MILANO WSC
17. MOUNTAIN PEAK WSC
18. NORTH BOSQUE WSC
19. NORTH CENTRAL TEXAS MWA
20. OAK TRAIL SHORES SUBDIV.
21. POTOSI WSC
22. ROBERTSON CO. WSC
23. SOUTHWEST MILAM WSC
24. STEAMBOAT MOUNTAIN WSC
25. STEPHENS COUNTY RURAL WSC
26. TRI COUNTY SUD
27. WELLBORN WSC
28. WEST BRAZOS WSC
29. WICKSON CREEK SUD

II. Additional individual utilities proposed by the Brazos G RWPG to be classified as Water User Groups.

1. 439 WSC
2. ARMSTRONG WSC
3. BELL-MILAM-FALLS WSC
4. BETHANY WSC
5. BLOCKHOUSE MUD
6. CHISHOLM TRAIL SUD
7. CORYELL CITY WSD
8. DOG RIDGE WSC
9. EAST BELL CO. WSC
10. FERN BLUFF MUD
11. FILES VALLEY WATER SUPPLY
12. G & H MANAGEMENT, INC.
13. HILL COUNTY WSC
14. JARRELL-SCHWERTNER WSC
15. JONAH WATER
16. LAKE WHITNEY WATER CO., INC.
17. MANVILLE WSC
18. MOFFAT WSC
19. N. E. WASHINGTON COUNTY WSC
20. PARKER WSC
21. PENDLETON WSC
22. WEST BELL COUNTY WSC
23. WESTERN HILLS WATER SYSTEM
24. WILLIAMSON-TRAVIS MUD 1
25. WOODROW-OSCEOLA WSC
26. SUN WSC

**III. Wholesale Water Providers meeting the definition in TWC Chapter 16 and 31
TAC Chapter 357.2 (8).**

1. Bell Co. WCID 1
2. Central Texas WSC
3. City of Temple
4. Bluebonnet WSC
5. City of Gatesville
6. North Central Texas MWA
7. City of Stamford
8. Aquilla WSD
9. Kempner WSC
10. Bistone WSC
11. City of Waco
12. City of Sweetwater
13. City of Abilene
14. City of Round Rock
15. Brazos River Authority
16. Upper Leon MWD
17. West Central Texas MWD
18. Palo Pinto MWD
19. Lower Colorado River Authority