EXHIBIT B

Guidelines for Final Study Report Development

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EXHIBIT B

Guidelines for Final Study Report Development

Part 1: Regional Water Plan Tasks and Requirements for Deliverables

1.1 Description of Tasks

Included in this section are guidelines for the development of tasks or studies that are undertaken in order to update the current regional water plans and develop the 2011 Regional Water Plans. All provisions of 31 Texas Administrative Code (TAC) Chapter 357 will serve as the foundational guidance for the development of the 2011 Regional Water Plans. Any revisions to 31 TAC 357 adopted by the Texas Water Development Board (TWDB) during the planning effort may result in a change to the planning efforts. Provisions in statute or agency rules take precedence over this document.

1.1.1 Population and Water Demand Projections

The development of population and water demand projections for all water user groups and wholesale water providers will not be undertaken for the 2011 Regional Water Plans. This is primarily due to the fact that new census population numbers will not be available until the spring of 2011. The Planning Groups will have opportunities to revise the population and water demand projections for individual water user groups and wholesale water providers if the proposed projections meet revision criteria as described in Part 4.

1.1.2 Water Supply Analysis

This activity will focus primarily on updating 2006 Regional Water Plan water supply and availability numbers. The Water Availability Modeling (WAM) System, initiated by Senate Bill 1 in 1997, has now been completed for all 23 basins in Texas. Model results are available at TCEQ's web site address: http://www.TCEQ.state.tx.us/permitting/waterperm/wrpa/wambasin.html.

As was the case for the first and second rounds of Regional Water Planning, the TWDB will use the TCEQ approved Run 3 of the WAM System for the determination of surface water availability. Any deviations from Run 3 of WAM by the Planning Group will require written approval from TWDB. The TWDB will provide technical assistance upon request within available resources for surface water availability analysis including firm yield estimates for existing reservoirs and proposed reservoirs addressing the consensus environmental planning criteria, water diversion analysis for existing water rights, and evaluation of water availability for a new appropriation using WAM models provided by TCEQ.

The amount of groundwater available to the region will be determined based on the TWDB's determination of managed available groundwater for a groundwater supply based on desired future conditions submitted by groundwater districts within a groundwater management area, if the desired future conditions are submitted to the TWDB by December 1, 2007.

Completed Groundwater Availability Models (GAM) shall be used to update groundwater supply and availability numbers unless more accurate site-specific information is available. Where GAM models have been completed, TWDB staff will work with the Planning Groups to prepare any necessary model runs to reflect region-specific availability policies as resources allow. Contractors are encouraged to

check the status of GAM models for their regions at the following web site address: http://www.twdb.state.tx.us/gam/GAM_StatusMap.htm.

1.1.3 Identification, Evaluation and Selection of Water Management Strategies Based on Needs

A requirement will be to show the present value of the total cost (capital plus operation and maintenance) during the planning period of each water management strategy (WMS). This will require showing costs in the year in which they are incurred and using a standardized discount rate to express that cost in terms of its present value in the base year. A more complete description of the methodology is included in 4.1.6.

1.1.4 Impacts of Water Management Strategies on Key Parameters of Water Quality and Impacts of Moving Water from Rural and Agricultural Areas

Water quality impacts will be based on parameters important to the use of the water resource and comparing water quality conditions with the strategies in place to the current conditions using best available data. Similar to third-party impacts of voluntary redistribution, the Regional Water Plan shall include a quantitative reporting of socioeconomic impacts on agricultural resources including analysis of third-party gross business activity and employment impacts of moving water from rural and agricultural areas.

1.1.5 Consolidated Water Conservation and Drought Management Recommendations of the Regional Water Plan

The 77th Texas Legislature amended the Water Code to require water conservation and drought management strategies in Regional Water Plans. The Planning Groups must include water conservation strategies for each water user group to which TWC 11.1271 applies and must consider conservation strategies for each water user group with a need. To assist the Planning Groups, the TWDB has developed a best management practices guidebook that discusses different water conservation practices and the anticipated water savings and cost of each. This information can be used by the Planning Groups to determine the use of water conservation as a WMS. The Planning Groups shall consider water conservation strategies for each water user group beyond the minimum requirements resulting from implementation of plumbing fixture codes. If a Planning Group does not adopt a water conservation strategy for an identified need, it must document the reason. A more complete methodology is included in 4.2.7.

The Planning Groups must also consider drought management strategies for each identified need and must include strategies for each water user group to which TWC 11.1272 applies. Drought management strategies should decrease short-term peak requirements and thereby decrease the amount of water supply that must be addressed by other water management strategies. Strategies for drought management can be similar to those for water conservation, although there are some basic differences. For example, water conservation and drought management strategies differ in their longevity. Water conservation strategies generally are implemented on a full-time, permanent basis, whereas drought management practices are implemented during times of crisis, such as droughts. If a drought management strategy is not selected as a water management strategy, the reason must be documented. If adopted, drought management strategies are to be identified as to the type of strategy to be implemented, the estimated savings, timeline, and anticipated costs.

The Planning Group will include in its Regional Water Plan a model water conservation plan for use by holders of water rights as required by TCEQ and a model drought contingency plan for use by wholesale and retail public water suppliers and irrigation districts. The Regional Water Plan will also consolidate in

this chapter the water conservation and drought management recommendations developed by the Planning Group.

Guidance documents to assist planning groups in completing water conservation and drought management recommendations (Chapter 6) are available at the following addresses on TWDB's and TCEQ's web pages:

www.twdb.state.tx.us/assistance/conservation/Municipal/Plans/CPlans.asp
www.tnrcc.state.tx.us/permitting/waterperm/wrpa/conserve.html#forms
www.tnrcc.state.tx.us/permitting/waterperm/pdw/drought.html

1.1.6 Description of how the Regional Plan is Consistent with Long-Term Protection of the State's Water Resources, Agricultural Resources, and Natural Resources

A chapter must be included describing how the Regional Water Plan is consistent with long-term protection of the State's water resources, agricultural resources and natural resources. Amendment of 31 TAC Chapter 357.14(C) defines this requirement as satisfying the following rules:

a) 31 TAC §358.3 relating to guidelines for state water planning,
b) 31 TAC §357.5 relating to guidelines for the development of Regional Water Plans,
c) 31 TAC §357.7 relating to Regional Water Plan development,
d) 31 TAC §357.8 relating to ecologically unique river and stream segments, and
e) 31 TAC §357.9 relating to unique sites for reservoir construction.

Section 16.053 (h)(7)(C) of the Texas Water Code (Senate Bill 2 of the 77th Legislature) requires the TWDB, as part of its approval of a regional water plan, to determine if the regional water plan is consistent with long-term protection of the state's water resources, agricultural resources, and natural resources in accordance with Section 16.051 (d) of the Texas Water Code. Section 16.051 (d) requires the adoption of guidance principles that reflect the public interests of the entire state. The guidance principles are presented in 31 TAC 358.3 and include but are not limited to:

a) consideration of the effect of policies or water management strategies on the public interest of the state, water supply, and those entities involved in providing this supply throughout the entire state;
b) consideration of all water management strategies the board determines to be potentially feasible when developing plans to meet future water needs and to respond to drought so that cost effective water management strategies which are consistent with long-term protection of the state's water resources, agricultural resources, and natural resources are considered and approved;
c) consideration of a balance of economic, social, aesthetic, and ecological viability;
d) the orderly development, management, and conservation of water resources;
e) consideration of recommendations of river and stream segments of unique ecological value to the legislature for potential protection;
f) consideration of recommendation of sites of unique value for the construction of reservoirs to the legislature for potential protection; and
g) consideration of environmental water needs including instream flows and bay and estuary inflows.

Although much of the analysis pertaining to Chapter 7 in the regional water plan will be developed for other chapters, such as Chapters 4, 5, 6 and 8, the regional water plan needs to identify and include in Chapter 7 those considerations that provide for the long-term protection of the state's water resources, agricultural resources, and natural resources. Planning Groups are encouraged to identify the specific water resources, agricultural resources, and natural resources that are important to their regional water

planning areas and describe how those resources were protected through the regional water planning process.

1.2 Requirements for Deliverables

1.2.1 Introduction

The Legislature has directed TWDB to establish formatting standards for reports and data presented in the Regional Water Plans. Texas Water Code, §16.053(d) states: "The board shall provide guidelines for the format in which information shall be presented in the Regional Water Plans". This document, along with 31 TAC §357.7 and 357.12, serves as part of the specifications intended to provide the Planning Groups a common format for the Regional Water Plans.

This section addresses the technical requirements regarding data transfer and presentation by discussing general requirements, Geographic Information System (GIS) and mapping requirements and standards, and desktop publishing requirements. These data management and transfer guidelines include specific requirements regarding the forms and formats of data files provided by Planning Groups to the TWDB. The TWDB requires that all text and data files adhere to these minimum guidelines to facilitate the inclusion of all regional data into statewide databases to the maximum extent possible.

All computer files and formats shall be 100 percent compatible with PC-type computers. Electronic files may be physically shipped using *ZIP* discs, *JAZ* discs, or CD (ISO 9600). Planning Groups shall deliver 1 copy of electronic files (on disc or CD) and 1 copy each of electronic file lists and file description print outs (including metadata file printouts). Prior to the transfer of electronic files to the TWDB using email, system compatibility should be established with the Planning Group's TWDB project manager.

All files and data shall be transferred to TWDB in ready-to-use format. Formats of all computer files provided to the TWDB by Planning Groups should be compatible with the widely distributed versions of the following programs:

- Word Processor Files - Microsoft Word (MS Office 2000 or newer versions)
- GIS coverages - Arc/Info (7.21 or newer)
- GIS shape files – *ArcGIS (9.0 or newer)*
- Database Files - Microsoft Access (MS Office 2000 or newer) for general database files. However, each region will access and update the web-based database application via the Internet and will not need to have any particular database software to use the Internet application. Additionally, a run-time version of the database tables behind the Internet application will be available for download at the TWDB website. The use of the run-time database does not require the user to have a specific database software application.
- Internet Browsers – Internet Explorer (5.5 or newer) or Netscape (6 or newer).
- Spreadsheets Files - Microsoft Excel (MS Office 2000 or newer)
- Graphs, Bar-charts, Pie-charts - Microsoft Excel (MS Office 2000 or newer)

The Planning Group shall receive approval from the Executive Administrator as to the compatibility of alternative software. Metadata (data description) and a printed file/disc description shall accompany all electronic files. The Planning Groups need to provide an electronic plot file and an EOO coverage file for all GIS materials. File description documentation must explain the file naming convention and contents of each disc and each file. Electronic file naming conventions shall follow a recognizable pattern. Files submitted shall be 100 percent compatible with Microsoft Excel. If using software other than Microsoft Excel, the Contractor shall first receive approval from the Executive Administrator as to its compatibility.

All drawings and graphs included in all reports shall be provided to TWDB in an Encapsulated PostScript (EPS) format with a tiff preview using Pantone Process Colors (Pantone Matching System Colors – PMS colors) capable of being separated into four colors –Cyan, Yellow, Magenta, and Black (CYMK).

1.2.2 Data Units

The following units of measurement shall be used in all data presentations. In addition, the information may be reported simultaneously in other units, such as metric equivalents.

- Land Area – square miles (mi^2)
- Water Area – acres (ac)
- Water Volume – acre-feet (ac-ft)
- Demand and Supply Rates – acre-feet per year (ac-ft/yr)
- Treatment Plant Capacities – million-gallons per day (mgd)
- Water Use Per Capita - gallons per capita per day (gpcd)
- Stream Flows and Reservoir Releases – cubic feet per second (cfs)
- Pumping Rates – gallons per minute (gpm) or million gallons per day (mgd)
- Cost – 2007 US Dollars (Engineering News Record (ENR) Construction Cost Index)

1.2.3 Data Time Frame and Time Steps

For purposes of comparison and data organization, the current and projected population and water demand projections, as well as other data which have been provided by TWDB to Planning Groups was organized into specific time periods. These same time periods shall be utilized by the Planning Groups in their preparation of the Regional Water Plans in order to facilitate consistent analysis from region to region throughout the state. The time periods and increments for the Regional Water Plans that shall be submitted to TWDB will be 2005 for the current year and 2010, 2020, 2030, 2040, 2050, and 2060 for planning.

PART 2: Introduction to Regional Water Planning Data

2.1 General Requirements

Data shall conform and comply with all 31 TAC 357 rules. The rules require an evaluation of the amount of existing water supplies, supplies that are currently legally and physically available to the regional water planning area for use during a drought of record. This evaluation shall consider surface water and groundwater data developed by the guidance in section 1.1.3 above, existing water rights, contracts and option agreements, other planning and water supply studies, and analysis of water supplies currently accessible to the regional water planning area.

For the purposes of regional water planning, there are two critical concepts to make clear for data development, water "availability" and water "supply".

Existing water availability is defined as the maximum volume of water obtainable for use from a current water source during drought-of-record conditions, taking into consideration legal and physical constraints, management philosophies, and using appropriate numerical methods of analysis.

Existing water supply is defined as the volume of water apportioned to a WUG or WWP from each currently existing, connected, and accessible water source, during drought-of-record conditions, taking into consideration all constraints that limit the supply amount. A supply is current if it exists, connected, and accessible for use as of January 1, 2011 or anticipated to be existing, connected, and accessible for use at the conclusion of the current regional water planning cycle. A source can be used as a supply if it is "connected", i.e. has the infrastructure in place currently to be used. Supplies that are "non-connected" would include lakes for which there is no current pipeline.

The current infrastructure of each supply (excluding the internal water distribution network) shall be researched to determine the maximum amount of water that can be transported, pumped, or distributed. This value must be compared against any supply constraints (source availability, regulatory restrictions, water quality, contracts, etc.) to determine the most limiting factor and final supply volumes. If increases in supply are reported, such as those related to open-ended contracts, the infrastructure and capacity to support such an increase must be in place currently and verified by the Planning Group. When current infrastructure does not support an increase in supply, a WMS to expand the infrastructure must be developed.

Part 3: Water Sources

This section contains information related to water sources, and should be followed as appropriate if sources are evaluated under region-specific studies.

3.1 Introduction

The data within the *Sources* Form shall document all currently available sources as well as the total availability volumes from these sources. Sources should not be reported more than once. Sources are either groundwater, surface water, or reuse.

The *Sources* Form shall include the availability volume from each unique, currently existing water source located in or available to each region under drought-of-record and under current development conditions. Further details concerning several conditions that must be met are explained in the following paragraphs.

3.1.1 Source Delineation

Include all existing water supply sources located physically within or outside of the region that are available for use within the region during a drought of record as sources.

All sources and availability quantities, groundwater, surface water, and reuse, with the exception of reservoirs and the surface water components of systems, will need to be identified and quantified by county and basin location. For reservoirs and the surface water components of systems, the availability quantities shall be developed at the basin level.

3.1.2 Systems

Sources can be categorized as systems if they meet at least one of the following criteria:

- The source includes groundwater and surface water.
- Several reservoirs operate together but the supply from a specific reservoir cannot be tracked directly to an end user.
- Two or more reservoirs operate as a system resulting in a system gain.

When the reservoirs that comprise the surface water component of a system can be tracked to an end user, list the reservoir availability volumes separately and the system gain, if any, should be shown as an additional entry. For systems composed of groundwater and surface water, both components must be identified and tracked separately.

Report system availability data as annual values, under drought-of-record conditions, for each system component (basin for surface water, county-basin for groundwater). If any component of a system is shared between regions or is part of the total volume for a source, list the total availability volume as well as each shared portion.

The report shall include a description of the operation of the system and an estimate of the portion of availability for each component of the system, which may include a portion for the gain achieved by the system operation. TWDB will provide a list of system codes.

If components of water systems are used by more than one region, then the system's availability must be consistent among all regions. For example, if Region X is using a reservoir located within Region Y,

Region X and Region Y need to agree on the availability estimate. Both regions will report the same availability estimate in the same way, along with each region's share of that availability.

If the system's availability from specific reservoirs can not be tracked directly to end users, list the total combined system yield, including a system gain, if any exists. If any reservoir is part of a system but also has a non-system portion, the system portion may be part of the combined system yield or listed as a separate entry. List the total non-system portion of the reservoir as well.

3.1.3 Water Rights

When water rights are consolidated into one source per basin, a water right included in the consolidation should not also be listed as an individual water right source. Water rights can not be counted more than once as a source with an available volume. If a reuse source is permitted, categorize the source as reuse then enter the associated water rights in the water rights field.

3.1.4 Reuse

Classify all reuse, direct and indirect, in the reuse category. This includes all discharges of effluent to streams and rivers in accordance with TCEQ permits. The reuse volume should not exceed the drought-of-record supply apportioned to a WUG or a system.

Indirect reuse is process water that re-enters the river or stream system and is diverted and used again downstream. If the amount diverted is equal to or greater than 1,000 acre-feet/year, it should be listed individually using the county-basin of diversion as the location. Diversions less than 1,000 acre-feet/year should be summed by county-basin and listed as county-basin totals.

Direct reuse is process water that is recirculated within a system. If the amount is equal to or greater than 1,000 acre-feet/year, it should be listed individually with the same location as the water treatment plant. Amounts less than 1,000 acre-feet/year should be summed by county-basin at the associated water treatment facilities and listed as county-basin totals.

3.2 Methodology

3.2.1 General

This section describes the methodology to determine groundwater, surface water, and reuse availability during drought-of-record conditions, definition and criteria for firm yield simulation, and adequacy of supply.

There are three major types of currently available sources: groundwater, surface water, and reuse. These sources may be categorized as systems if the specified system requirements are met. This section describes general rules and specific methods to use when compiling and interpreting the source data.

Sources may not be over-allocated on a permanent basis. The sum of WUG supply amounts per source per county-basin cannot exceed the amount of water that a particular water source for county-basin has available during a drought of record. For example, if a source in a particular county-basin has 1,000 acre-feet per year available, under drought-of-record conditions, the sum of the amounts being used by WUGs can not exceed 1,000 acre-feet per year. Additionally, the amount of water that a source has available cannot be exceeded by the sum of the supplies being used by WUGs (for each source county-basin) *plus* the sum of the supplies allocated for WMSs, from the source county-basin. For example if a source in a particular county-basin has 1,000 acre-feet per year available, under drought-of-record conditions, and

500 acre-feet per year of that source county-basin has been apportioned to WUGs, then no more than the remaining 500 acre-feet per year can be used to supply needs. WMSs cannot claim to provide more than 500 acre-feet per year in supply from that source county-basin if no more than 500 acre-feet per year remains.

3.2.2 Groundwater

The amount of groundwater available to the region will be based on the TWDB's determination of managed available groundwater for a groundwater supply based on desired future conditions submitted by groundwater districts within a groundwater management area, if the desired future conditions are submitted to the TWDB by December 1, 2007.

The Planning Groups may use other groundwater availability for a source if desired future conditions are not submitted to the TWDB by December 1, 2007 for that source. Calculate the largest annual amount of water that can be pumped from a given aquifer without violating the most restrictive physical, regulatory or policy conditions limiting withdrawals, under drought-of-record conditions. Regulatory conditions refer specifically to any limitations on pumping withdrawals imposed by groundwater conservation districts through their rules and permitting programs. If there are no permitting restrictions, groundwater withdrawals may also be limited by physical conditions.

Planning Groups shall incorporate GAM information for an area within a region unless better site-specific information is developed. However, there will be instances where GAMs for some of the minor aquifers will not be available in a timely enough manner to be used in the third round of regional water planning.

For groundwater, describe the calculation methodology for the aquifer. Use natural hydrological conditions for the period of record for each source of water supply. The TWDB's GAM must be used to determine availability of groundwater unless desired future conditions are submitted to TWDB by December 1, 2007 or better site-specific information is available. If GAM is available and is not used, the Planning Group must receive prior written approval from the Executive Administrator.

3.2.3 Surface Water

Use the results from the TCEQ's WAM Run 3. The Planning Groups may modify the input data set for WAM Run 3 to reflect return flows covered by TCEQ permits and changed conditions after receiving written approval from the Executive Administrator. Documentation must be provided for such modifications of the input data set. WAM Run 3 is the best methodology for determining surface water availability that can be applied on a statewide basis. The Guidance has been revised to allow changes to the input data to WAM Run 3 specifically to address return flows and changed conditions. Calculate the surface water available under drought-of-record conditions using the following constraints:

1. For run-of-the-river diversions, use the firm diversion (see definition later in this section).
2. For direct reuse, use the amount of water from a direct-reuse source that is expected to be available during drought-of-record conditions from currently installed wastewater reclamation infrastructure. This amount should not exceed the amount of water supply available to the utility generating the wastewater. Future potential direct reuse sources not currently in place shall be considered as a WMS. Provide adequate justification to explain the methods for estimating the available amount of reuse under drought of record.

3. For indirect reuse use either currently permitted reuse projects that have the required infrastructure in place to divert and use this water or permitted indirect reuse. Some situations may need to be resolved on a case-by-case basis.

Report the maximum amount of water that may be available for diversion under drought-of-record conditions, assuming full utilization of all senior water rights. This amount should not exceed the infrastructure's diversion capacity and permit amount. Future potential indirect reuse sources not currently in place will require new permits and additional infrastructure and shall be considered WMSs. Provide adequate justification to explain the methods for estimating the available amount under drought of record.

4. For unpermitted supplies (domestic, livestock, and other purposes) without water rights, estimate water available under drought of record based on the information available.

5. For lakes and reservoirs, use firm yield, the TCEQ-permitted yield, or operational supply, whichever is smaller.

Single Reservoir:
If the lake or reservoir is operated individually, report the firm yield for each single reservoir.

Multiple Reservoirs:
For multi-reservoir systems, the minimum system gain during drought-of-record conditions can be considered additional water available. The system gain is the amount of water the system operation creates that would otherwise not be available for use if the reservoirs were operated independently. The total water available from a system should be no less than the sum of the firm yield of individual reservoirs in the system. The methods of calculating the system gains must be adequately described in the submitted scope of work.

Operational Procedures:
Where special conditions exist, such as the Rio Grande Project, water available based on operating procedures during drought-of-record conditions will be used in place of reservoir firm yield analysis. These special conditions, other than the Rio Grande Project, must be adequately described in the submitted scope of work.

Bordering Reservoirs:
Report the value available to Texas, for reservoirs bordering neighboring states or countries, according to existing legal agreements.

3.2.3.a Simulation Period

The period of simulation shall include all drought periods with data that are covered by the TCEQ Water Availability Modeling Package (WAM).

For reservoir firm yield analysis, a drought period is a period of time beginning with the reservoir levels declining significantly from the full (or very close to full) level of the water supply storage and before recovery to the full (or very close to full) level of the water supply storage. The drought of record is a drought period which includes the record minimum reservoir level and begins and ends with the full (or very close to full) level of the water supply storage. The reservoir levels are derived by using a maximal constant diversion the reservoir can accommodate without shortages.

For run-of-the-river diversions analysis, a drought period is a period of time beginning with the un-appropriated flow in the river declining significantly from its normal level or above and before the full recovery to the normal level or above. The drought of record is a drought period that includes the record

minimum river channel un-appropriated monthly flow rate and begins and ends with the un-appropriated flows at or above the normal level.

3.2.3.b Firm Yield Definition

Firm yield is defined as the maximum amount of water the reservoir can provide each year during a drought of record using reasonable sedimentation rates and reasonable pre-determined withdrawal patterns, assuming full utilization of upstream and downstream senior water rights and full satisfaction of environmental flow requirements and bay and estuary requirements if they apply. Unless better methods have been approved by the Executive Administrator, use TCEQ official WAM Run 3, with necessary modification of the data files for permitted return flows and changed conditions, for firm yield analyses. The modification is allowed only when it has received prior approval of the Executive Administrator. When using WAM for firm yield analysis, TWDB recommends using an "adding-in" approach. In this approach, each water right is added into the model one by one, starting with the most senior right.

After a water right is added into the model, the simulated water supply shortage is checked. If a supply shortage exists, the diversion amount of the newly added water right should be reduced until the supply shortage disappears. The next right is added in ONLY when all senior rights have been given the maximum diversion without supply shortage (capped by their permitted amounts). The process terminates when no further diversions can be added in. If all the rights have been fully satisfied and the reservoir still has surplus supply, a hypothetical “junior” water right should be added, using a uniform monthly distribution that reduces the supply source to zero. The firm yield is the sum of the model specified diversions (including extended diversion) of all added-in water rights. Environmental flow requirements including bay and estuary and instream flow requirements (if it applies) should be fully satisfied when modeling the hypothetical add-in water right.

3.2.3.c Firm Yield Simulation Criteria

When performing a simulation for firm yield determination, the following criteria must be met, as applicable:

1. inflow to the reservoir is to be the remainder of naturalized stream flows if data are available, after assuming at all times the full exercise of all upstream water rights that are senior to the reservoir;
2. the passage of sufficient water to satisfy all downstream senior water rights valued at their full-authorized amounts and conditions is required. This is passage of inflows through the reservoir and does not require release of water from the reservoir’s water supply storage volume unless specifically stated in an existing water right;
3. Bay and estuary and instream flow requirements should be fully satisfied, if these requirements are included in the permit that authorized the reservoir or if the simulation is for a new water right or a proposed diversion;
4. the minimum allowable reservoir level is the top of dead storage;
5. the maximum allowable reservoir level is the top of water supply storage volume;
   for a reservoir with existing water right(s), all special conditions of the water right(s) shall be honored. This may result in a different minimum and/or maximum allowable reservoir level;
6. evaporation losses will be based on evaporation rate data that best coincide with the period of record and time steps for inflow;
7. water supply annual demand will be a constant value in all years, in units of acre-feet per year and the distribution of the water supply annual demand within a year will be constant in all years and will consider the type of use expected, and
8. use time steps no longer than a month.

3.2.3.d Firm Diversion Definition

The firm diversion is defined as the maximum annual diversion, without shortages from the river at the diversion site, each year during a drought of record using reasonable diversion distribution patterns. Assume there is full utilization of senior water rights.

Unless better methods have been approved by the Executive Administrator, the Planning Groups should use WAM Run 3 for this firm diversion analysis. The WAM parameters of official TCEQ WAM models will not be altered. When using WAM for firm diversion analysis, TWDB recommends using the same "adding-in" approach as for firm yield analysis. The firm diversion is the sum of the model specified diversions (including extended diversion) of all added-in water rights. Environmental flow requirements (if they apply) should be fully satisfied when modeling the hypothetical add-in water right.

3.2.3.e Firm Diversion Simulation Criteria

When performing a simulation for firm diversion determination, the following criteria must be met, as applicable:

1. inflow to the diversion site is to be the remainder of naturalized stream flows if data are accessible, after assuming at all times the full exercise of all upstream water rights that are senior to the diversion right;
2. the passage of sufficient water to satisfy all downstream senior water rights valued at their fully-authorized amounts and conditions is required. The desired planning is for drought-of-record conditions. During times of drought it is possible that senior water rights will be withdrawn to the legal limit either for use or sale and transfer. Nevertheless, if documentation can be provided that shows a lower demand than the legal maximum, the input for WAM Run 3 can be modified accordingly.
3. Bay and estuary and instream flow requirements should be fully satisfied, if these requirements are included in the permit that authorized the diversion or if the simulation is for a new water right or a proposed diversion;
4. annual diversion amount will be a constant value in all years, in units of acre-feet per year, and the distribution of the diversion within a year will be constant in all years and will consider the type of use expected, and
5. use time steps no longer than a month.

Part 4: Data for Water User Groups

4.1 Methodology

4.1.1 Water User Group Description

WUGs are defined as one of the following:

- cities with population 500 or more, per the Texas State Demographer's July 2005 population estimate,
- individual utilities providing more than 280 acre-feet per year of water for municipal use in 2005 (for counties having four or less of these utilities),
- Collective Reporting Units (CRUs) consisting of grouped utilities having a common association,
- rural/unincorporated areas of municipal water use (referred to as County-Other and aggregated on a county basis)
- manufacturing (aggregated on a county basis),
- steam electric power generation (aggregated on a county basis),
- mining (aggregated on a county basis),
- irrigation (aggregated on a county basis), or
- livestock (aggregated on a county basis).

4.1.2 Criteria for Revision of Population and Water Demands

Deviation from approved population and demand figures in the 2007 State Water Plan will require prior TWDB approval.

4.1.2.a Process

Any entity or rural area (County-Other) wishing to have their respective population or water demand projections revised will address their request through their Planning Group. If the Planning Group agrees with the request, the Planning Group will submit the request to the Executive Administrator of the TWDB along with the data required showing how the entity meets the specific criteria for eligibility for revisions, as specified in these guidelines. Additionally, the proposed revised projections for any specific entity or rural area of a county must accompany the request along with documentation of how the revisions or alternative projections were derived.

TWDB staff will coordinate the review of each request with the staff of TCEQ, TPWD, and TDA based on specific criteria and data requirements as set forth in these guidelines and will consult the Planning Group and/or their consultant concerning the review of the information and will present any recommended changes to the TWDB for formal approval.

4.1.2.b Population

The projected population growth throughout the planning period for the cities, utilities and rural area (County-Other) within a county is a function of a number of factors, including the entity's share of the county's growth between 1990 and 2000, as well as local information provided by Planning Groups.

Criteria: One or more of the following criteria must be verified by the Planning Group and the Executive Administrator for consideration of revising the sub-county population projections:

a. The July 2005 State Demographer's population estimate is greater than the 2010 projected population of the city.
b. The population growth rate for a city, utility or County-Other over the most recent five years is substantially greater than the growth rate between 1990 and 2000.
c. Identification of areas that have been annexed by a city since the 2000 Census.
d. Identification of the expansion of a utility's CCN or service area since the last update by the TCEQ to the digital boundary data.
e. Identification of growth limitations or build-out conditions in a city or utility that would result in maximum population that is less than was originally projected.

Data Requirements: The Planning Group must provide the following data associated with the identified criteria to the Executive Administrator for justifying any revisions to the sub-county-level population projections:

1. Population estimates for cities developed and published by the State Data Center or by a regional council of governments will be used to verify criteria (a) or (b) for cities.
2. The verified number of residential connections and permanent population served will be used to verify criteria (b) for utilities.
3. The estimated population of an area that has been annexed by a city (for criteria c) or has become part of a CCN or service area for a water utility (for criteria d). In addition, the geographical boundary of the area must be presented in an acceptable map or ArcView shapefile.
4. Documentation from an official of a city or utility describing the conditions expected to limit population growth and estimating the maximum expected population will be used to verify criteria (e).
5. Other data that the Planning Group believes is important to justify any changes to the population projections.

4.1.2.c Municipal Water Demand

Municipal water demand is defined as residential and commercial water demand. Residential demand includes single and multi-family residential household water demand. Commercial demand includes water demands of business establishments, public offices, and institutions, but does not include industrial water demand. Residential and commercial water demands are categorized together because they are similar types of demands, i.e., each category uses water primarily for drinking, cleaning, sanitation, cooling, and landscape watering. Reported municipal water use data for the year 2000 was used to calculate the base per capita water demand for each city. The municipal water demand projections shall incorporate anticipated future water savings due to the natural installation of plumbing fixtures to more water-efficient fixtures, as detailed in the 1991 State Water-Efficient Plumbing Act. All other future water savings due to conservation programs undertaken by cities, utilities or county-other will be classified as WMSs by the Planning Group.

Criteria: One or more of the following criteria must be verified by the Planning Group and the Executive Administrator for consideration of revising the municipal water demand projections:

1. Any changes to the population projections for an entity will require revisions to the municipal water demand projections.
2. Errors identified in the reporting of municipal water use for an entity.
3. Evidence that the year 2000 water use was abnormal due to temporary infrastructure constraints.

4. Evidence that per capita water use from a year between 2000 - 2005 would be more appropriate because that year was more representative of below-normal rainfall conditions.
5. Trends indicating that per capita water use for a city, utility or rural area of a county have increased over the latest period of analysis, beginning in 1995, and evidence that these trends will continue to rise in the short-term future.
6. Evidence that the number of fixture installations to water-efficient fixtures between 2000 and 2005 is different than the TWDB schedule.

Data Requirements: The Planning Group must provide the following data associated with the identified criteria to the Executive Administrator for justifying any revisions to the municipal water demand projections:

1) Annual municipal water production (total surface water diversions and/or groundwater pumpage and water purchased from other entities) for an entity measured in acre-feet.
2) The volume of water sales by an entity to other water users (cities, industries, water districts, water supply corporations, etc.) measured in acre-feet.
3) Net annual municipal water use, defined as total water production less sales to other water users (cities, industries, water districts, water supply corporations, etc.) measured in acre-feet.
4) Documentation of temporary infrastructure constraints.
5) Drought index or growing season rainfall data to document a year different than 2000 as the dry year.
6) Documentation of the number of water-efficient fixtures replaced between 2000 and 2005.
7) In order to verify increasing per capita water use trends for a city or rural area of a county and therefore revising projections of per capita water use to reflect this increasing trend, the following data must be provided with the request from the Planning Group:
   a) Historical per capita water use estimates based on net annual municipal water use for the city, utility or rural area of a county, beginning in 1995.
   b) A trend analysis which must take into account the variation in annual rainfall.
   c) Revised projections of per capita water use for a city, utility or rural area of a county will be submitted by the Planning Group, where an increasing trend in per capita water use has been verified for a city or rural area of a county.
   d) Growth data in the residential, commercial and/or public sectors that would justify an increase in per capita water use.
8) Other data the Planning Group believes is important to justify any revisions to the State Water Plan municipal water use projections.

4.1.2.d Industrial Water Demand

Industrial water demand is defined as water used in the production process of manufactured products, steam-electric power generation, and mining activities, including water used by employees for drinking and sanitation purposes.

Criteria: One or more of the following criteria must be verified by Planning Group and the Executive Administrator for consideration of revising the industrial water demand projections:

a. An industrial facility which has recently located in a county and may not have been included in the Board's database. Documentation and analysis must be provided that justify that the new industrial facility will increase the future industrial water demand for the county above the industrial water use projections.
b. An industrial facility has recently closed its operation in a county.
c. Plans for the construction of an industrial facility in a county at some future date.

Data Requirements: The Planning Group must provide the following data associated with the identified criteria for justifying any revisions to the industrial water demand projections.

1. The quantity of water used on an annual basis by an industrial facility that has recently located in a county and was not included in the Board's database.
2. The North American Industrial Classification (NAIC) of the industrial facility that has recently located in a county. The NAIC is the numerical code for identifying the classification of establishments by type of activity in which they are engaged as defined by the U.S. Office of Management and Budget and is a successor of the Standard Industrial Classification (SIC).
3. Documentation of plans for an industrial facility to locate in a county at some future date will include the following data:
   a. Confirmation of land purchased for the facility or lease arrangements for the facility.
   b. The quantity of water required by the planned facility on an annual basis.
   c. The proposed construction schedule for the facility including the date the facility will become operational.
   d. The NAIC for the planned facility.

4.1.2.e Irrigation Water Demand

Irrigation water demand will be defined as water used for crop production as described by TWDB irrigation data derived from a number of state and federal government sources, in addition to water used for the growth of other plants produced for sale that the Planning Group may be able to identify.

Criteria: One or more of the following criteria must be verified by the Planning Group and the Executive Administrator for consideration of revising the irrigation water demand projections:

a) Evidence that a year between 2000 – 2005 would be more representative of typical irrigated acreage or below-normal rainfall than 2000.
b) Evidence that irrigation water use estimates for a county from another source are more accurate than those used by TWDB.
a) Evidence that the expectation of conditions in the region are such that the projected annual rates of change for irrigation water use in the 2007 State Water Plan are no longer valid.

Data Requirements: The Planning Group must provide the Executive Administrator the following data associated with the identified criteria for justifying any revisions to the irrigation water demand projections:

1) Acreage and water use data for irrigated crops grown in a region, as published by the Texas Agricultural Statistics Service, the Texas Agricultural Extension Service, or the Farm Service Agency (USDA), for the base year 2005 and/or a different year that the Planning Group wishes to present for consideration.
2) Any economic, technical, and/or water supply-related evidence that may show cause for revision in the future rate of change in irrigation water use.

4.1.2.f Livestock Water Demand

Livestock water demand will be defined as water used in the production of livestock, both for drinking and for cleaning or environmental purposes.

Criteria: One or more of the following criteria must be verified by the Planning Group and the Executive Administrator of the TWDB for consideration of revising the livestock water demand projections:

a) Plans for the construction of a confined livestock feeding operation in a county at some future date.

b) Other evidence of change in livestock inventory or water requirements that would justify a revision in the projected future rate of change in livestock water use.

Data Requirements: The Planning Group must provide the following data associated with the identified criteria for justifying any revisions to the livestock water demand projections:

1. Documentation of plans for the construction of a confined livestock feeding facility in a county at some future date will include the following:
   a. Confirmation of land purchase or lease arrangements for the facility.
   b. The construction schedule including the date the livestock feeding facility will become operational.
   c. The daily water requirements of the planned livestock feeding facility.
2. Other evidence that would document an expected increase or decrease in the livestock inventory in the county.

4.1.3 Water Management Strategies (WMS)

All potential WMSs shall be included and those selected as final recommendations should be annotated as such (Selected field shall show Y). The Planning Group shall evaluate potentially feasible WMSs for each WUG when future water supply needs are known to exist. Needs will be indicated in the Needs/Surpluses section of the *Water User Groups* form as negative values when they occur. These needs shall be addressed in the WMSs section of the *Water User Groups* form by presenting potentially feasible WMSs to meet needs within the 50-year planning period. If a portion of a WUG has a need even if the WUG as a whole appears to have adequate water supplies, then a WMS for that portion of the WUG showing a need shall be included. For example, if a WUG exists partly in one county and partly in another county and data show that one part of the WUG has a need while the other part of the WUG does not, then a WMS shall be listed to satisfy the portion of the WUG showing a need. It is the intent of the WMSs section of the *Water User Groups* form to list all potentially feasible WMSs and their related costs, therefore the Planning Group will be able to make an informed decision on the final recommended WMSs.

The WMSs section of the *Water User Groups* form shall show the water supply under drought-of-record conditions from each WMS that could feasibly be made available from current or potential water supply sources, to each WUG with a future need. Current water rights, water contracts, and option agreements shall be protected, although amendments to these may be recommended, realizing that consent of the owner will be needed for implementation. The Planning Groups are not restricted to using only the WMSs listed or following the order listed in the rules or format guidelines. All unique strategies, however, should be listed separately and discussed in the report. Additionally, water quality must be considered as a factor when evaluating WMSs.

Each potentially feasible WMS evaluation conducted by Planning Groups to meet needs will include the cost of water that is delivered and treated for end user requirements along with the present day value discounted cost. If Planning Groups are unable to quantify costs for a WMS, then the cost fields will be left blank and the WMS will be discussed in the report. Examples of this could include brush control.

If a WMS redistributes or reallocates supplies, the entity providing the supply must be noted in the name of the WMS. Reallocations and redistributions require original source information and supplier information.

4.1.4 Conservation Strategies

4.1.4.a Water Conservation and Drought Management Recommendations

Water conservation and drought management activities should be shown in the identification, evaluation and selection of WMSs as outlined in Exhibit C. Water conservation and drought management strategies must be considered for each identified need. If water conservation or drought management are not adopted as a WMS, the reason non-selection must be documented. In addition, the Planning Group will include conservation WMS for each water user group or wholesale water provider that will obtain water from a new interbasin transfer that will result in the most practicable, achievable level of water conservation and efficiency. The Planning Group will include in its Regional Water Plan a model conservation plan. The Planning Group will also include in its Regional Water Plan a model drought contingency plan.

The Regional Water Plan will include a chapter consolidating water conservation and drought management recommendations developed by the Planning Group.

4.1.4.b Water Conservation

Reductions due to the installation of water-efficient plumbing fixtures in new construction, as well as from the replacement of older fixtures, will be included in the Regional Water Plans based on data provided by the TWDB. Other water conservation measures will be shown in the identification, evaluation and selection of WMSs as outlined in Exhibit C. Water conservation practices must be considered for each identified need. If water conservation is not adopted as a strategy, the reason must be documented.

In determining water savings due to a water conservation strategy the Planning Group should discuss each strategy in the Regional Water Plan, the cost (in dollars per acre-foot of supply realized), of water that is delivered and treated for end user requirements along with the present day value discounted cost as outlined in Exhibit C as well as the estimated savings and timeline for implementation and the anticipated costs.

Water conservation WMSs identified to meet needs in the agricultural sector should also be identified as to the type of measure to be implemented, the estimated savings, timeline, and anticipated costs. The Planning Group should discuss each strategy in the Regional Water Plan. A delineation should be made by the Planning Group as to increased water use efficiency, such as improved application, amount of water applied and estimated reduction in total water use.

4.1.4.c Drought Management

Drought management strategies must be considered for each identified need. If drought management is not selected as a strategy, the reason must be documented. Drought management strategies may also include water demand management. Whenever applicable, drought management strategies must be consistent with the guidance provided by the TCEQ to implement Texas Water Code Section 11.1272. Drought management WMSs identified to meet needs should be identified as to the type of strategy to be implemented, the estimated savings, timeline, and anticipated costs. The Planning Group should discuss each strategy in the Regional Water Plan.

4.1.5 Environmental Impacts

These guidelines are intended to improve on the overall process and yield a more consistent quality of regional water planning.

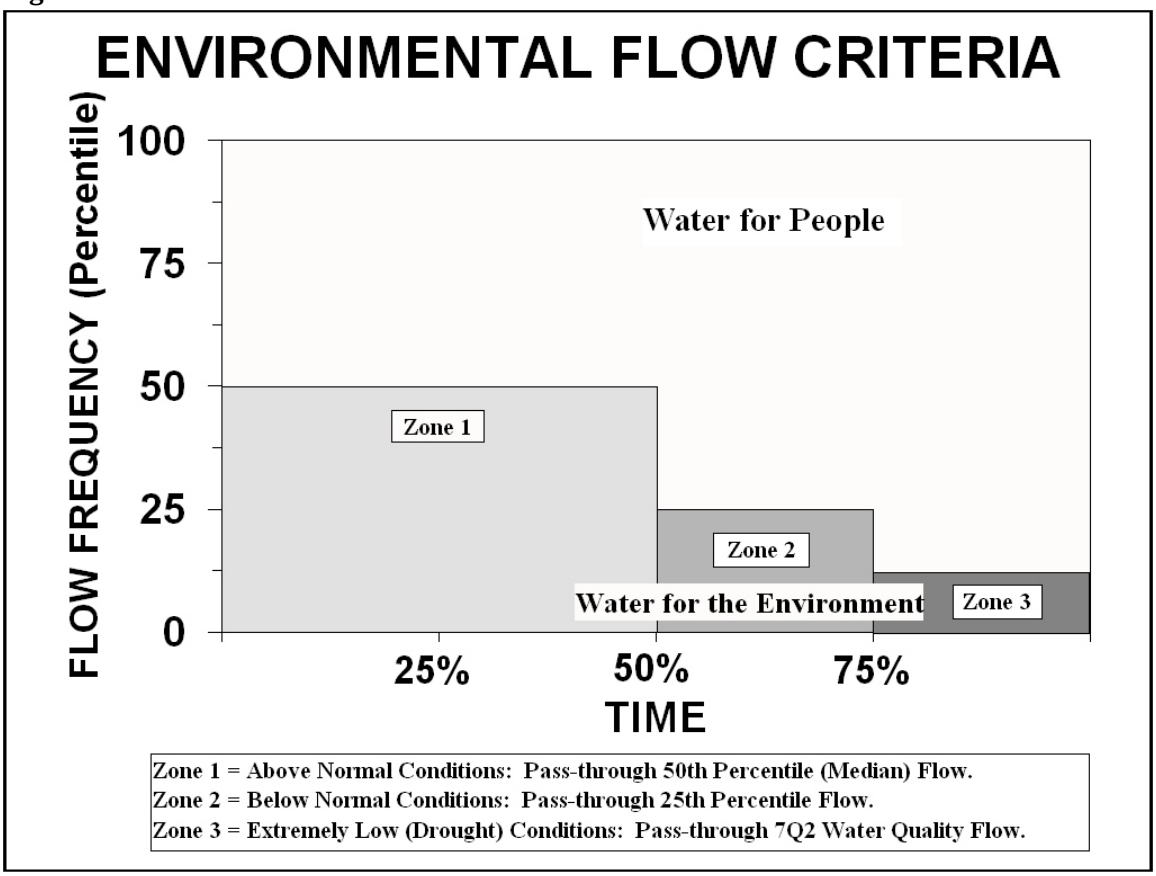
4.1.5.a New Environmental Assessment Tools

Some of the Planning Groups and their consultants developed innovative assessment tools and procedures during the first round of regional water planning for evaluation of WMSs. For example, a procedure was developed for comparative evaluations of potential environmental and cultural resource impacts of complex regional water supply projects. The procedure was employed to assess and compare the potential effects of possible water supply options. For each category in the environmental checklist, a standard analytic protocol was developed that considered regional context, relative value of natural and cultural resources, and the expected probability and magnitude of associated impacts. Within each resource category, impact scores for WMSs were ranked, normalized, and then aggregated over the different categories to produce a total relative impact score for each of the strategies. The overall result was a quantitative tool that could be implemented to more accurately evaluate the comparative impacts of alternative WMSs.

4.1.5.b Consensus Criteria for Environmental Flow Needs

State and regional water planning guidelines require use of site-specific studies where available. If such studies are not available, then water planners should use the 1997 Consensus Criteria for Environmental Flow Needs (CCEFN) on all new surface water development WMSs requiring permit authorization. It applies to both instream flow and freshwater inflow needs. The criteria were developed through extensive collaboration among scientists and engineers from the State's natural resource agencies (i.e., TWDB, TPWD, and TCEQ), as well as academics, engineering consultants, and informed members of the public. Specifically, the criteria are composed of multi-stage rules for environmentally safe operation of impoundments and diversions during above normal conditions, below normal conditions, and drought of record conditions.

Figure 1. Environmental Flow Criteria



The primary goal of the CCEFN is to provide an indication during the planning process of the amount of water that may be available through the permitting process. They also provide balance by sharing the adverse impacts of drought so that neither human nor environmental needs unacceptably prevail over the other at all times. However, it should be recognized that the state and federal permitting processes may require different environmental flow constraints based on the results of intensive field studies or other permitting considerations.

The CCEFN is commonly referred to as a "desktop" technique because it is based on a statistical analysis of hydrological records for a potential water development site. No fieldwork is required, but the results may not be as precise or reliable as those derived from field studies. It should be noted that intensive field study and modeling assessment of the actual flow needs for environmental maintenance are generally required during the State and Federal permitting process. However, the CCEFN is considered adequate and appropriate for planning purposes. All new water resource developments are required to consider the ecological flow needs of riverine and estuarine fisheries, wildlife habitats, and water quality requirements.

A comprehensive instream flow study program is in the development stage by the natural resource agencies, as required by Senate Bill 2. The results of this program will be used to evaluate ecological flow needs at potential future water development sites. Information from this program will be made available to the Planning Groups. Because instream flow studies of a single river or stream may take more than one year, this program is expected to be a long-term, statewide effort continuing through year 2010.

4.1.5.c Criteria for the Planning Process

Application of the CCEFN, as described below for different types of water development projects, provides for a priority to human needs during dry and drought conditions, while sharing of the adverse impacts of drought with the environment. The environmental flows specified below are representative of what may be required in the regulatory process. For planning purposes, the environmental pass-through requirements for all zones will be added to those for downstream water rights. The protection of downstream water rights will be accomplished by using the full recorded amount of the existing water rights in the WAM.

New Project On-Channel Reservoirs

As illustrated in Figure 3, the conservation storage of a new on-channel water supply reservoir would be divided into three zones for water management purposes as follows:

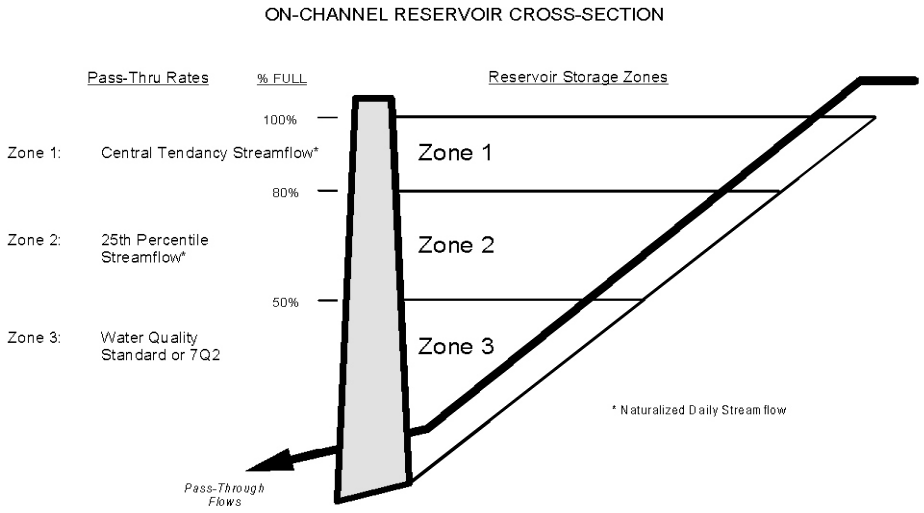
Zone 1
In Zone 1 of the reservoir, when the reservoir water level is greater than 80 percent of storage capacity, inflows will be passed up to the monthly medians that are calculated with naturalized daily streamflow estimates.[1]

Zone 2
As dry conditions develop and the reservoir water level declines into Zone 2 between 50 and 80 percent storage capacity, inflows passed would be reduced to an amount up to the monthly 25th percentile flow values that are calculated with naturalized daily streamflow estimates.

Zone 3
As more severe drought conditions develop and the reservoir level declines into Zone 3 below 50 percent storage capacity, environmental pass-throughs would be further reduced to an amount up to the established water quality standard for the downstream segment. In lieu of any established water quality standard, the 7Q2 low flow value, as published in the TCEQ's Water Quality Standards, would be used as the default criterion for Zone 3 pass-throughs. If in Zones 1 and 2, the value necessary to maintain downstream water quality is higher than the medians or 25th percentiles, then the value necessary to maintain downstream water quality will be used instead of the other target flow values.

[1] Naturalized streamflow is the estimated amount of water that would have been present in a watercourse with no direct manmade impacts in the watershed. It is calculated by taking values of historically measured streamflow, adding amounts of estimated man-made losses from the upstream watershed caused by diversion and lake evaporation, then subtracting amounts of transfers.

Figure 2. On-Channel Reservoir Cross-Section



In all zones, it is the State's intent that flows passed for instream purposes would also reflect the needs of the associated bay and estuary system. Therefore, instream flows are not to be considered available for impoundment before they reach the receiving bay and estuary. In addition to passage of environmental flows, adequate flows will be passed through for protection of downstream water rights. In all zones, water that can be captured by reservoirs in excess of the environmental provisions is available for water supply storage, and no water will be released from storage to meet environmental targets when inflows are below these limits.

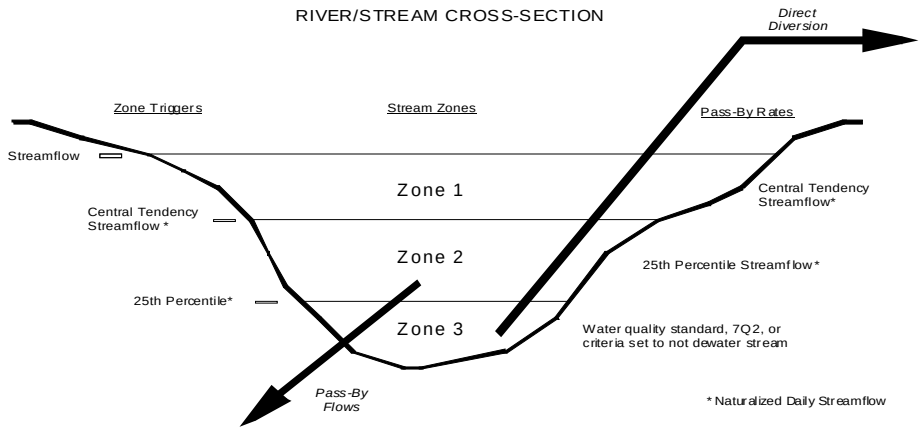
New Project Direct Diversions

As illustrated in Figure 4, the CCEFN for direct diversions from a river or stream that are recommended in the Regional Water Plan would be based on streamflow conditions just upstream of the diversion point, and would also be divided into three zones as follows:

Zone 1
Zone 1 occurs when actual streamflow is greater than monthly medians calculated with naturalized daily streamflow estimates. When streamflow is within Zone 1, minimum flows passed will be the monthly medians that are calculated with naturalized daily streamflow estimates.

Zone 2
Zone 2 occurs when actual streamflow is less than or equal to medians, but greater than monthly 25th percentile values. When streamflow is within Zone 2, minimum flows passed will be the monthly 25th percentile values that are calculated with naturalized daily streamflow estimates.

Figure 3. River/Stream Cross-Section



Zone 3

Zone 3 occurs when actual streamflow is less than or equal to monthly 25th percentile values. When streamflow is within Zone 3, minimum flows passed will be the larger of: (1) the value necessary to maintain downstream water quality or (2) a continuous flow threshold to be determined by the water agencies (e.g., 10th percentile flow) that will not allow the diversion, by itself, to dry up the stream.

For perennial river/stream segments where a water quality standard has been established for a stream segment, that value will be used as the pass-by target. Where such a standard has not yet been established, the default planning criterion is the 7Q2 value as published in the TCEQ's Water Quality Standards. For Zones 1 and 2, if the value necessary to maintain downstream water quality is higher than the medians or 25th percentiles, this value necessary to maintain downstream water quality will be used instead of the other values.

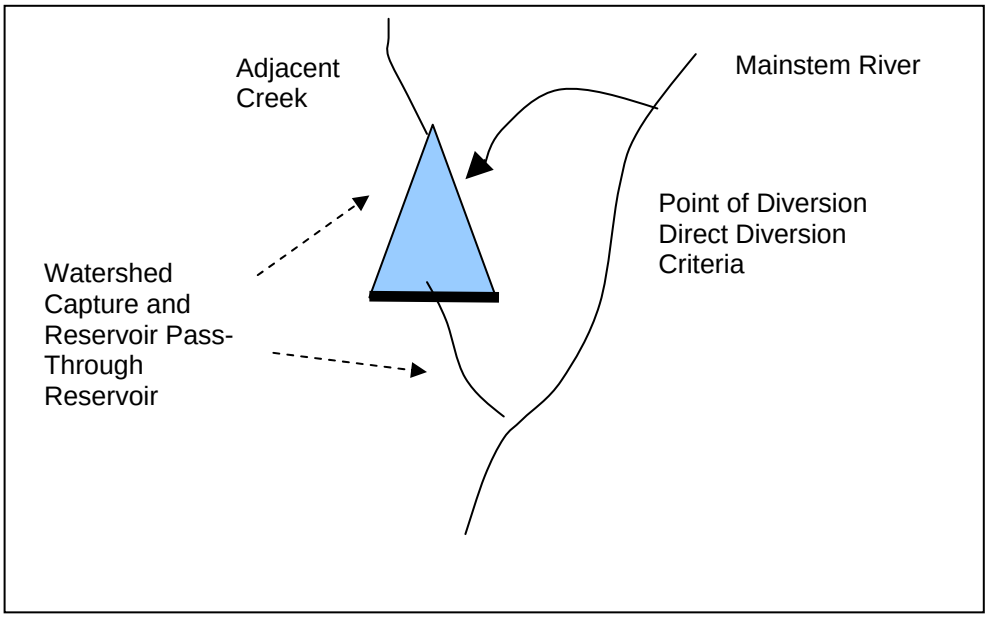
All Zones

The trigger values above are calculated with naturalized daily streamflow estimates. In addition to passage of environmental flows, adequate flows will be passed through for protection of downstream water rights. The above stepping procedure does not have smooth transition between zones, leaving brief periods when the instantaneous diversion rate is zero.

New Direct Diversions into Large Off-Channel Storage

In those cases where a large water supply project would divert its water from a river or stream into off-channel storage, a combination of the direct diversion and reservoir criteria would apply (Figure 5). The direct diversion criteria will govern the ability to divert water into the off-channel project. The reservoir criteria will address the ability of the reservoir to capture water from its own watershed, as well as define the reservoir's multi-stage operations that pass-through environmental flows, and flows for protection of downstream water rights.

Figure 4. Direct Diversions into Large Off-Channel Storage



Bay and Estuary Conditions

As a planning place-holder value, the Zone 1 reservoir pass-throughs or direct diversion pass-bys described previously will also provide freshwater inflow to the bays and estuaries. However where inflow values adequate to meet the beneficial inflow needs as described in Texas Water Code §11.147 have been determined, those recommended inflow volumes will be used for projects within 200 river miles of the coast, commencing from the mouth of the river, as the basis for calculating the relative contributions of fresh water from the associated rivers and coastal basins during times of Zone 1 conditions. No other special provisions would be made for estuarine maintenance under Zone 2 or 3 conditions for either new reservoirs or large direct diversions except that the instream flows are not to be considered available for impoundment or diversion before they reach the receiving bay and estuary. Freshwater inflow needs analyzed by the water agencies may be determined by TPWD until that agency and the TCEQ jointly make a determination in accordance with Texas Water Code §11.1491.

The target flows in Zone 1 of the reservoir operating procedure should be established to provide the beneficial flows as defined in §11.147(a) of the Texas Water Code (i.e., the "salinity, nutrient, and sediment loading regime adequate to maintain an ecologically sound environment in the receiving bay and estuary system that is necessary for the maintenance of productivity of economically important and ecologically characteristic sport or commercial fish and shellfish species and estuarine life upon which such fish and shellfish are dependent").

In practical terms, that means it is not necessarily MinQ or MaxQ produced by the optimization model, but a point along that curve between these values that provides some margin of safety (comfort) in providing sufficient flows in Zone 1 to maintain average historic productivity on the fisheries. The state recommended freshwater inflow target is one that has been validated by comparing the seasonal

distribution of estuarine salinity regimes with the patterns of abundance and distribution of selected estuarine-dependent plants and animals.

Bay and estuary pass-through requirements for a new water development project will be based on a pro-rata share of that location's contribution of flow to the estuary in question. Once the target amount of water reaches an estuary during a month, no additional flows need to be provided for purposes of estuarine maintenance during that month. For the remainder of the month, environmental flows revert to the instream criteria.

Results of Inflow and Instream Studies – Use of State Determinations

When the results of freshwater inflow or instream flow studies are available, those criteria will be used in the planning process rather than any generic rule such as the CCEFN. When established criteria are available and agreed to by TPWD and TCEQ, bay and estuary inflow requirements would be apportioned to each new project identified in the Regional Water Plan according to its proportional share (based on contribution hydrology), and as provided for by TCEQ's A Regulatory Guidance Document for Applications to Divert, Store or Use State Water (June, 1995, as amended or superceded). Where possible, this process seeks to restore seasonal flow patterns and minimize cumulative impacts from water development projects.

4.1.6 Costs of Strategies

Each potentially feasible WMS evaluation performed by Planning Groups to meet needs will include the cost, quantity, environmental impacts, and water quality that is delivered and treated for end user requirements and shall be evaluated by each unique water supply source. If Planning Groups are unable to quantify costs, quantity, and water quality for a WMS, then the cost fields will be left blank and the WMS will be discussed in the report. An example of this could be brush control and weather modification. Only WMSs with water quantity and water quality quantified may be used in Regional Water Plans to meet needs within the planning area.

Each WMS evaluation will include the cost of water delivered and treated for end user requirements, incorporating factors used to calculate infrastructure debt payments. Total capital costs and annual costs by decade to deliver treated water to the user, which include debt service, power, water purchase, and operation and maintenance shall be presented for each WMS evaluated.

Calculation of debt service shall use the following parameters:

1. Length of debt service: Usually represented in 20 year terms with the terms never being longer than the life of the project, appropriate contract limits, or 40 years for reservoirs, or 35 years for state participation projects. Except for reservoirs and state participation projects, Planning Groups may use different payback periods for the length of debt service, provided the periods are based on sound engineering judgement and are applied in a consistent manner to all similar projects within the region. For projects crossing or otherwise impacting more than one region, the consultants for the affected regions should coordinate to arrive at mutually acceptable payback periods.
2. Level debt service is to be used, except for state participation, which would have the following parameters:
   a) Defer interest payments in the following manner:
      Year 1 - 100% of interest amount due that year,
      Year 2 - 100%,

Year 3 - 80%,
Year 4 - 80%,
Year 5 - 70%,
Year 6 - 60%,
Year 7 - 45%,
Year 8 - 30%,
Year 9 - 15%.

b) Interest payments on remaining principal to begin in year 10 and continue for life of the loan.
c) Total interest deferred to be repaid in uniform amounts during years 13 through 19 as additional interest.
d) No principal paid until all deferred interest is repaid.
e) Level payment of interest and principal for years 20 through 35.

3. Interest rates would be 6 percent per year. Interest for State participation projects is simple interest.

WMS Project Costs

Cost elements to be included in the estimates are listed below:

A. Capital Costs

1. Construction Costs. Construction costs include those costs that would be expected to be obtained from qualified contractors bidding on a public works project. Updates of previous cost estimates to second quarter 2007 price levels and trending of unit costs should be performed using the Engineering News Record (ENR) Construction Cost Index. When presenting costs in report text, please note the basis of construction cost estimates. For example, footnote whether a cost estimate is an original calculation using standard unit costs (e.g. based on published *Means* construction unit costs) or if cost is based on previous reports, contractor quotes, or recent projects. Construction cost examples include:
   a) Pump Stations
   b) Pipelines
   c) Intake Structures
   d) Water Treatment Plants
   e) Water Storage Tanks
   f) Reservoirs
   g) Well Fields
   h) Relocation (e.g. roads, utilities)
   i) Other Items

2. Other Capital Outlays. Other capital outlay costs include the costs for engineering, contingencies, financial, legal, administration, environmental permitting and mitigation, land, interest during construction, etc. These costs need to be added to the construction costs to obtain the total capital cost. Use the following guides, if applicable, for estimating these costs:

   a) **Engineering (Design, Bidding and Construction Phase Services, Geotechnical, and Surveying), Legal, Financing, Bond Counsel, and Contingencies:** Engineering, contingencies, financial and legal services should be lumped together and estimated as 30 percent of total construction costs for pipeline projects and 35 percent for all other facilities (unless otherwise noted).

b) **Land and Easements:** Easement costs vary significantly with location and economic factors. Costs should include legal services, sales commissions, land appraisals, and surveys in the cost per acre used. Easement costs for pipelines should include a permanent easement plus a temporary construction easement plus rights to enter the easement for maintenance.
c) **Environmental – Studies & Mitigation (including Archeology – Studies, Mitigation, and Permitting):** Environmental and archeological studies and mitigation and permitting costs are generally estimated on an individual project basis using accessible information and qualified professionals judgement. In the case of reservoir projects, a preliminary estimate of mitigation costs can be based on acreage of inundation times the cost per acre to purchase an equal land area. For many potential future reservoir sites, estimated acres required for mitigation has been evaluated (see "A Natural Resource Survey for Proposed Reservoir Sites and Selected Stream Segments in Texas," by TPWD and TWDB, 1991, Interagency Contract #1756). The cost can then be estimated using this mitigation acreage assessment which incorporates habitat value of the proposed inundated land.
d) **Interest During Construction:** Interest and debt service during construction are estimated assuming the total estimated project cost (excluding interest during construction) will be drawn down at a constant rate per month during the construction period. Interest during construction is the total of interest accrued at the end of the construction period using a 6 percent annual interest rate on total borrowed funds, less a 4 percent rate of return on investment of unspent funds.
e) **Purchased Water Cost (if applicable):** Purchased water cost, if applicable, should be shown if the alternative involves purchase of water rights.

B. Annual Costs

a) **Operations and Maintenance:** Operations and maintenance costs (O&M) (not including power costs for pumping) should be based on the quantity of water supplied. Unless project-specific data was accessible, annual O&M costs are calculated as 1.0 percent of the total estimated construction cost for pipelines, as 2.5 percent of total estimated construction costs for pump stations, and as 1.5 percent of total estimated construction costs for dams. These costs include labor and materials required to maintain the project and regular repair and/or replacement of equipment.
b) **Power Cost:** Power costs are calculated on an annual basis using calculated horsepower input and a power purchase cost of $0.06 per kWh. Power costs may be adjusted for local conditions.
c) **Purchased Water Cost (if applicable):** Purchased Water Cost, if applicable, should be shown if the alternative involves purchase of raw or treated water from an entity on an annual basis (e.g. lease of water rights).
d) **Debt Service:** Based on capital costs.

Discounted Present Value of Costs

In a separate accounting, total costs (including operating costs and debt payments) will be discounted and shown in terms of present value. Discounting reflects the time value of money. The dollar value of a cost that is incurred farther in the future is worth less in present terms than a cost incurred sooner. Thus, discounting allows a valid comparison of different projects where costs are incurred over different periods of time.

The formula for calculating the present value of costs incurred in a given future year is:

$$PV_t = Cost_t / (1 + R)^{t-2005}$$

Where:

PV_t = the present value (expressed in terms of the base year 2005) of the total annual cost incurred in a future year *t*

t = the future year in which the cost is to be incurred

$Cost_t$ = the actual value of the total annual cost to be incurred in year *t*

R = the 30-year real discount rate published annually by the U.S. Army Corps of Engineers. The rate used in calculating the present value of WMS costs will be that published in fiscal year 2004.

The total discounted present value (TDPV) for the WMS will be calculated as the sum of the present values of the total annual costs. Discounted values will be automatically calculated on the web-based database application forms and based on the annual costs for each WMS as reported by the Planning Group. Costs per acre-foot will be automatically calculated on the database forms using the reported data for costs and for acre-feet of supply realized.

Part 5: Data by Wholesale Water Providers

This form contains all information related to a Wholesale Water Provider (WWP).

5.1 Methodology

There are key differences in the Wholesale Water Provider and the Water User Group analyses. Specifically, WUGs are analyzed from the user's perspective whereas WWPs are analyzed from the provider's perspective. Additionally, the WUG analyses are based on projections of one type of water use, whereas the WWP analyses are based primarily on current water contracts.

While the WUG needs analyses are based on only one type of water use per WUG, the WWP analyses consider all types of water use. For example, a WUGs' demand is based on only one of the six categories of TWDB water use (municipal, manufacturing, steam electric power, mining, irrigation, or livestock). Conversely, the WWPs' "demands" are the contracts with the recipients that they serve, and among the recipients of a WWP, all six categories of TWDB water use may be represented. Since WWP data require tabulating contract information that is external to TWDB data sets, WWP contract/demand data for the 50-year planning horizon shall be developed by regional water planning groups.

Additionally, in the WUG needs analyses, demands are based on projected water demand. Conversely, WWPs are analyzed by first identifying each of the WWPs' current contract obligations and their amounts. Then, all other current, non-contract obligations are incorporated. WWP demands, therefore, are based on current responsibilities, contract and non-contract. This provides two separate but complementary scenarios.

Wholesale water providers do not require population projections beyond those already provided by the TWDB for WUGs.

For WWPs that have unassigned surpluses (i.e. the WWP has a surplus for which they do not have a recipient), enter the recipient as "UNASSIGNED" along with the county and/or basin where the surplus exists, if known. Also, the sources corresponding to that surplus must be listed.

The methodology used to determine supply and demand values and WMS costs are outlined below.

5.1.1 WWPs Shared Among Regions

All demand obligations (contract and non-contract) of entities supplied by a WWP, whether located within or outside of the region, shall be included in the development of the total demands assigned to the WWP. The WWP could conceivably supply water to entities located within neighboring regions. If two or more regions list a common WWP, then the Planning Groups shall communicate with each other in the development of the WWP demands to ensure accuracy in the development of those demands. Rather than duplicating research efforts the information appearing on the *Wholesale Water Providers* forms, for a given WWP *shall be identical for all regions listing the same WWP.*

5.1.2 Water Management Strategies (WMS)

The WMS section of the *Wholesale Water Providers* form provides the list of all potentially feasible WMSs and their related costs, for each WUG-county-basin. WMSs will include the amount of water supply from each current or potential source, under drought-of-record conditions, and list the recipient

with a future need. Current water rights, water contracts, and option agreements shall be protected within the WMSs, although amendments to these may be considered with consent of the owner.

If a recipient (or portion of a recipient) shows a need, even if the WWP as a whole appears to have adequate water supplies, include a WMS to address each recipient's need. The Planning Groups are not restricted to using only the WMSs listed or following the order listed in the rules or format guidelines. List and discuss in the report each WMS considered separately.

- Develop potentially feasible WMSs when future water supply needs are known to exist for individual recipients that receive water from a WWP
- Needs shall be addressed by presenting potentially feasible WMSs to meet needs within the 50-year planning period.
- Needs will be indicated in the Need/Surplus sections of the *Wholesale Water Providers* form as negative values.
- All WMS selected as recommended WMSs will be shown on the form as "Y" (yes) in the Selected field.
- Water quality must be considered when evaluating WMSs.
- Include the costs of water for each WMS considered to meet needs.

5.1.3 Cost of Strategies

Only WMSs with costs, water quantity, and quality of treated and delivered water quantified, may be used in Regional Water Plans to meet needs within the Regional Water Planning area. If Planning Groups are unable to quantify costs, quantity and water quality, for a WMS, then the appropriate cost fields will be left blank and the WMS will be discussed in the report.

Each WMS evaluation must include the cost of water delivered and treated for end user requirements, incorporating parameters used to calculate infrastructure debt payments. Total capital costs and annual costs by decade to deliver treated water to the user, which include debt service and operation and maintenance must be presented for each WMS evaluated.

Calculation of debt service shall use the same procedures as those described for WUG WMS evaluations in section 4.1.6 of this document.