

Section I - Introduction

1.0 Final Permit and Conforming Changes

The Texas Commission on Environmental Quality (Commission) issued its Final Order dated September 16, 2016, approving issuance of Water Use Permit No. 5851 (System Operation Permit) to the Brazos River Authority (BRA). On November 30, 2016, the System Operation Permit was issued by the Commission. The Final Order and Permit did not require any conforming changes to Section I of this Technical Report in Support of the Water Management Plan. All portions of Section I remain in the form considered in the 2015 hearing conducted by the State Office of Administrative Hearings (SOAH) and subsequently by the Commission.

1.1 Background about the BRA

1.1.1 Brazos River Basin Characteristics

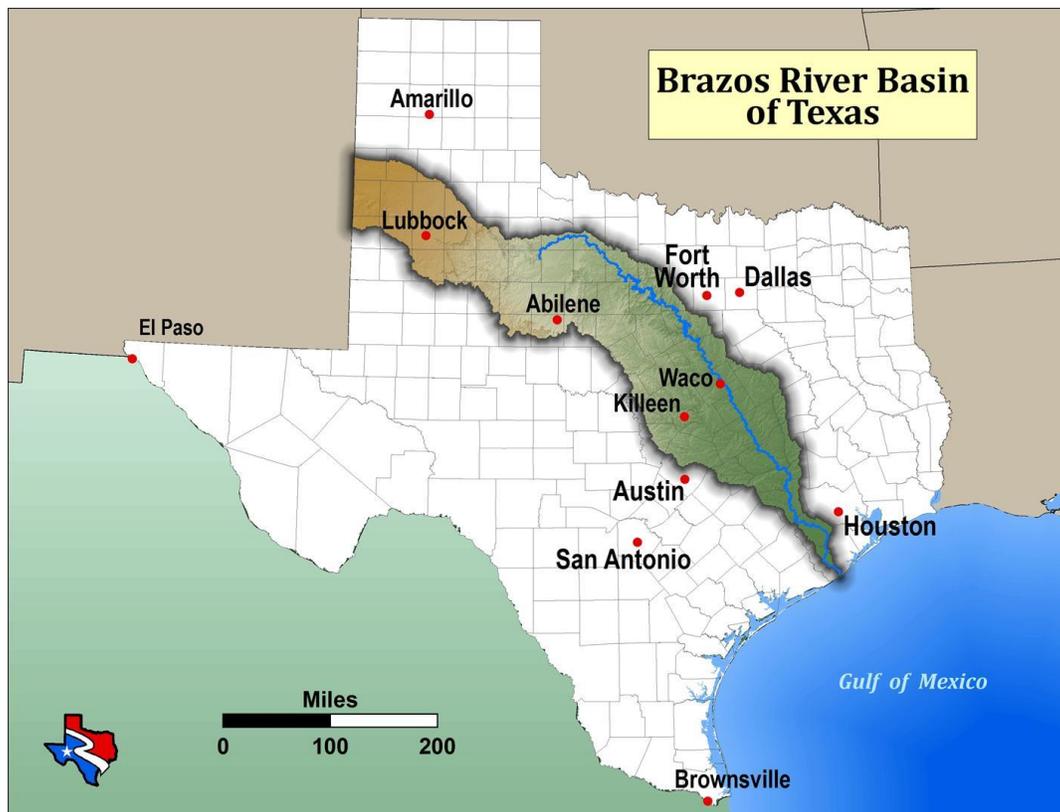
The Brazos River basin in Texas includes all or part of 70 counties. Figure 1.1 is a map identifying the Brazos River basin. It originates at the Texas-New Mexico border north and west of the city of Lubbock and travels southeasterly to its discharge point at the Gulf Coast near the city of Freeport. The basin encompasses about 16 percent of the land area of Texas, stretching across more than 42,000 square miles. It is home to more than two million people.

The Brazos River has three distinct forks in its upper reaches: the Double Mountain, the Salt, and the Clear. The main stem of the river begins just northwest of Possum Kingdom Lake at the confluence of the Double Mountain and Salt Forks. Major tributaries to the Brazos further downstream include the Bosque River, the Little River (formed by the confluence of the Leon and Lampasas Rivers), the Navasota River, and Yegua Creek.

The climate of the Brazos River basin varies greatly as the river flows toward the Gulf of Mexico. It encompasses three hydrological climatic regions with temperatures ranging from temperate to sub-tropical. Normally, winters are short and mild, and summers are

long and hot. Annual mean precipitation for the basin ranges from 16 inches in the western area to over 50 inches near the Gulf.

Figure 1.1 – Brazos River Basin of Texas



According to the 2010 Census, there are four cities (Lubbock, Abilene, Waco, and Killeen) in the Brazos River basin with populations greater than 100,000, although there are several others within the basin which are approaching that figure. The overall economy of the basin includes municipal, manufacturing, mineral production, trades and services. In addition, almost every region of the watershed is home to extensive agricultural activity.

1.1.2 Enabling Legislation and Water Rights Description

In 1929, the Texas Legislature created the organization now known as the Brazos River Authority in an effort to address the effects of the devastating floods, like those that were seen in the early part of the century. Pursuant to the Conservation Amendment to the Texas Constitution, the legislature charged the Brazos River Conservation and

Reclamation District (District) with the statutory responsibility for conservation, development and management of the surface water resources for the Brazos River basin. The agency served as a model for future organizations of its kind throughout the state and nation. The District was established without taxing authority or the ability to receive appropriations from the state. In 1955, the District officially changed its name to the Brazos River Authority. The Authority's enabling legislation may be found in Subtitle G. River Authorities, Chapter 8502 of the *Special District Local Laws Code*.

Today, the BRA is governed by a 21-member Board of Directors. Members are appointed by the governor and confirmed by the senate. Each director serves a six-year term with one-third being appointed in odd-numbered years. The Board's presiding officer is appointed by and serves at the pleasure of the governor. The secretary and treasurer are elected by the Board members and each serve two-year terms. A general manager/chief executive officer reports to the Board of Directors and directs the daily functions of the organization.

1.1.3 Chronological History of the BRA

1930s – 1950s

In the early 1930s, the District established its headquarters in Temple, Texas and drafted a master plan for reservoir development within the Brazos River basin. The initial plan included thirteen dams; however, construction for each was contingent upon federal funding.

By the late 1930s, funding had been secured for only one project through the Works Progress Administration. Construction was completed on the Morris Sheppard Dam by 1941, creating Possum Kingdom Lake. Hydropower from this project was contracted to provide a source of revenues to the District while aiding in rural electrification and providing power for the war effort. By the end of the decade, the District's headquarters was moved to Mineral Wells, Texas.

The passage of the Flood Control Bill of 1936 by the United States Congress broadened the mandate of the USACE to include construction of multi-purpose flood control and water supply projects. As a result, a partnership was formed between the USACE and

the District, prompting a revision of the District's 1935 master plan. The partnership allowed the District to acquire conservation storage space in the federal government's nine multi-purpose reservoirs planned for construction over the next 30 years. However, events to the contrary would frustrate timely implementation. Over the next decade, the USACE would begin construction only on dams at Lakes Whitney, Belton and Waco.

In 1951, parts of the state moved into a dry period that would later be identified as the drought of record for many areas. At this time, population projections by the District estimated that by the year 2000, the state would be home to eighteen million people with 80 percent living in urban areas. This forecast revealed a 100 percent increase to water demands and prompted the District's Board of Directors to prepare a six-dam program of reservoir development including a series of reservoirs between Lakes Possum Kingdom and Whitney to be used both for water supply and hydropower generation. Reservoirs were also set to be built at South Bend above Possum Kingdom Lake and in the lower portion of the basin at Allens Creek. The expanded basin plan that now included storage in the USACE lakes also called for a 15-foot elevation rise at Possum Kingdom Lake and a desalination program in the Brazos River Valley for irrigation capabilities.

1960s

In May of 1960, the BRA established what would become the organization's permanent home in Waco, Texas. Soon after, the BRA obtained a permit from the state to begin construction on its second water supply reservoir, Lake Granbury, with funding guaranteed through a water supply agreement with Texas Power and Light Company (TP&L). By 1969, waters impounded by the De Cordova Bend Dam began supplying TP&L's steam-electric plants, located both at the lake as well as downstream at Tradinghouse Creek, and would later provide water for the two units at the Comanche Peak Nuclear Power Plant (CPNPP) near Glen Rose. During this decade, the USACE also completed Lakes Proctor, Somerville, and Stillhouse Hollow for flood control and water supply purposes.

The BRA acquired pump stations and canal systems from the American Canal Company and Briscoe Irrigation Company in Fort Bend and Brazoria Counties. The ultimate goal of these acquisitions was to provide access to municipal and industrial water markets in the lower basin, as well as to continue to meet the agricultural demands for which the canals were originally developed.

1970s

In 1978, the BRA completed its third water supply reservoir and its first and only lake not on the main stem of the Brazos. Sterling Robertson Dam impounds the Navasota River to create Lake Limestone in Leon and Robertson Counties, and provides cooling water for Texas Utilities (TU) power plants built to take advantage of nearby lignite reserves. Two other energy producers, NRG (successor to Houston Lighting & Power (HL&P)) and the Texas Municipal Power Agency (TMPA) also rely on water provided from Lake Limestone.

1980s

During this decade, the USACE completed Lakes Aquilla, Georgetown and Granger for flood control and water supply purposes. With the realization that industrial and municipal demands for the lower basin had not developed as expected, the BRA found that long-term contracts inherited with the canal systems would not allow for sufficient rate adjustments to cover the operational costs. This resulted in the canal systems being sold to Galveston County Water Authority (which subsequently became the Gulf Coast Water Authority (GCWA)).

The BRA contracted with the City of Lubbock to build, own and operate Lake Alan Henry to provide future water supplies for the city. As the decade progressed, the BRA entered into contracts with water users in Williamson County to construct a pipeline to transport water from Lake Stillhouse Hollow to Lake Georgetown as demand developed.

1990s

During the 1990s, the Texas Legislature passed the Clean Rivers Act. As a result, the BRA became a partner with the Texas Natural Resource Conservation Commission (TNRCC, the predecessor agency of the TCEQ) in the Texas Clean Rivers Program

(CRP), a comprehensive water quality monitoring and assessment program throughout the Brazos River basin.

The BRA completed construction of Lake Alan Henry in 1994. In 1995, the BRA and the Lower Colorado River Authority (LCRA) signed the Brazos-Colorado Water Alliance to serve the water resource needs of Williamson County.

In 1999, the Texas Legislature directed that the water right permit for the Allens Creek Reservoir, which had been allowed to expire by HL&P, be re-issued by the TNRCC. The BRA, the City of Houston, and the TWDB became partners in the reservoir.

2000s

The BRA moved into the new century with several major projects, including a nine-year refurbishment of the flood gates at Possum Kingdom Lake. In 2004, the BRA filed its System Operation Permit application with the TCEQ. Also during this time, the BRA began rehabilitation of the 16 gates at the DeCordova Bend Dam at Lake Granbury, including the installation of new electric gate hoists. In 2002, the BRA also transferred Lake Alan Henry to the City of Lubbock.

The purchase of the 57-mile Kerr-McGee pipeline complex in 2002 allowed the BRA to begin providing water for agricultural, municipal, industrial, and mining use to areas west of Possum Kingdom Lake, while the WCRRWL began transporting water from Lake Stillhouse Hollow to Lake Georgetown.

2010 - 2011

The BRA Board of Directors voted to decommission the Possum Kingdom Lake hydroelectric plant and notified the Federal Energy Regulatory Commission (FERC) of the intent to surrender the license. BRA began construction of a Controlled Outlet Conduit (COC) to serve the same water delivery purposes of the penstocks which formerly fed the two hydroelectric units and passed water for downstream purposes.

The drought of 2011 prompted the BRA to implement a System-wide Stage 1 Drought Watch as the basin endured the hottest and driest 12 months in more than 100 years. Of the BRA's 11 reservoirs, seven reached all-time low levels.

1.1.4 Financial Management

The BRA has no taxing authority and receives no state funding other than grants designated for specific projects and programs. Revenues generated to support BRA operations are primarily derived from the sale of units of raw water at wholesale rates; this water is made contractually available to water users from BRA's reservoirs.

For the first 60 years of the BRA's existence, water was sold under several different contractual agreements. In 1992, the BRA received direction to implement a uniform system for ratemaking to ensure all customers are charged a standard, equitable, and non-discriminatory rate. Since this ruling, all long-term customers have entered into contracts at the BRA System Rate.

The BRA System Rate is established annually by the BRA Board of Directors and is based on the current year's net revenue requirement. Net revenue is derived from all current year expenses, debt service, and margin requirements less revenue received from other water contracts prior to the 1992 ruling, operating agreements, and services sold. Included in the net revenue requirement is sufficient net income to generate a 1.3 times debt coverage ratio and to maintain all minimum cash reserve balances to ensure prudent fiscal management of the BRA.

System Rate contracts are "take-or-pay" and define the maximum allowable volumes that are contractually available to the System Rate customers by the BRA in any given year. The current year's net revenue requirement is divided by the total contractual System Rate units, regardless if these volumes are taken by the customer, to determine the current year's uniform System Rate. In 2005, the Board of Directors formally established an Agricultural Rate. Customers buying System Water for the purpose of agricultural productivity, whether long-term or short-term, are given a discount of 30 percent off the established System Rate.

1.2 Water Planning in Texas

1.2.1 Recent Water Planning Legislation

In 1997, the 75th Legislature passed SB1, enacted to address the state's potential drought vulnerability and the limited water supplies when compared to the forecasted population growth of the state. SB1 established a "bottom-up" approach for producing the State Water Plan. Texas is divided into 16 regions with each region producing a water plan every five years. These regional plans are compiled by the TWDB to form the State Water Plan, which is adopted by TWDB and published once every five years.

Figure 1.2 : Regional Water Planning Areas



SB1 provided a water planning approach that is based on current and projected demands of individual water users and aggregates those demands on a regional basis (Figure 1.2). These forecasted demands are compared to the available supply, and where shortages exist, new water supplies or plans for reducing demands through water conservation are recommended.

In 2001, the 77th Legislature passed SB2, which provided a funding framework for future water projects; formed the state-level Water Advisory Council; created the Joint Committee on Water Resources; established the Texas Instream Flow Program (TIFP); and strengthened the state's groundwater management procedures.

In 2007, the 80th Legislature passed SB3, which created the framework for new environmental flow standards for all river basins throughout the state in order to ensure ecological health of rivers, bays, and estuary systems. The process calls for scientific recommendations, as well as public input, so that a minimum sufficient flow regime for each major river basin and bay system can be agreed upon and protected.

Senate Bills 1, 2, and 3 reflect the Texas Legislature's continued pursuit to meet the water needs for the state's growing population in such a way that economic prosperity continues and ecological environments are protected.

1.2.2 Supply and Demand for the Brazos River Basin

The Brazos River basin is synonymous with Region G, referred to as "Brazos G," due to the fact that 90 percent of this region resides within the Brazos basin. Regions H (the areas around and including the City of Houston) and O (the high plains of the Llano Estacado centered on the City of Lubbock) are also integral parts of the Brazos basin planning process.

The 2011 Regional Water Plans and the 2012 State Water Plan identify projected demands in excess of existing supplies and quantify the amount of shortages anticipated. Specifically, the projected water supply shortages for BRA's existing customers are 140,056 acft in 2020 and 382,841 acft in 2060. Water use by BRA customers has been increasing on average from three to six percent annually since 1970. Without additional sources of supply, economic growth and business and municipal expansion stalls.

To help alleviate the projected Brazos basin water shortages, additional sources of supply must be developed. Recommended strategies included in the 2012 State Water Plan for Regions G and H amount to \$15.2 billion worth of capital investment with an

additional supply yield of 2,088,264 acft for 2060, if all recommended strategies were pursued. Specific strategies recommended for the BRA include the proposed construction of Allens Creek Reservoir, the Lake Belton to Lake Stillhouse Hollow pipeline, Lake Aquilla pool rise, groundwater and surface water conjunctive use, and the System Operation Permit.

The 2012 State Water Plan identifies the System Operation Permit as a recommended strategy to supply firm water for both the Brazos G Region and Region H. To meet the water needs in the Brazos G Region, 84,899 acft/yr of firm supply from this permit is recommended and 25,350 acft/yr is recommended to meet needs in Region H. The State Water Plan recommends that this additional supply be implemented and available prior to 2020.

1.3 System Operation Permit Application and Hearing

The availability of additional firm water supply through system efficiency has been documented since at least the 1960s; however, with the advancement of sophisticated water availability models resulting in part from the passage of SB1 in 1997, better tools are now available to estimate the quantity of additional water from system operation. In 2003, the BRA gathered a team consisting of consulting engineers, lawyers with experience in water rights permitting, and strategic communications experts, and began development of the System Operation Permit application.

In June 2004, the BRA filed its System Operation Permit application with the TCEQ and immediately embarked on a process of over a dozen meetings, basin-wide, to inform both the public and BRA's Water Supply System customers of the proposed Permit. Notification of the TCEQ's acceptance of the application as administratively complete was received on October 15, 2004 (thereby establishing the priority date of the pending water right). In May 2005, following TCEQ publication of notice of the proposed Permit, over 40 persons and entities, representing approximately 20 interest groups, submitted requests for a contested case hearing on the application.

The BRA immediately began contacting each of the interested parties, and initiated negotiations to settle differences. In many cases, the issues were in reference to either

pending or planned competing water right permit applications. In others, primarily municipalities, the treatment of return flows was at issue. The BRA was able to reach settlements with many of these parties before the hearing on the merits convened before SOAH in 2011.

The BRA also spent a great deal of time and effort reaching consensus with the TPWD on an environmental flows special condition for the proposed System Operation Permit. Beginning in 2005 and continuing through 2009, both consultants and staff from the BRA, as well as staff from TPWD and TCEQ, worked diligently to begin defining environmental flows protocols which contemplated the requirements of SB3. The result of this collaborative process was a series of environmental flow criteria based on seasons, hydrological conditions, and base and pulse flow conditions at over a dozen sites throughout the basin. This methodology has served as a model for other basins within the state as they proceeded through the SB3 process.

A draft of the proposed System Operation Permit was released by TCEQ in February 2010 and the application and the proposed System Operation Permit were referred to SOAH for contested case hearing. SOAH convened the hearing on the merits in May 2011. A Proposal for Decision was prepared and distributed by the two ALJs assigned to the case in October 2011. The TCEQ Commissioners, at their January 25, 2012 meeting, determined that the proposed System Operation Permit should not be issued until after the development and approval of the BRA's WMP. The Commission required that BRA file its initial WMP within ten months of the date of that meeting, and gave its own staff seven months following that to complete technical review of the WMP.

BRA's WMP was filed with the TCEQ on November 28, 2012. Following BRA's filing, the TCEQ staff performed their technical review of the WMP, with ongoing communication with BRA's team. This process concluded in June 2013, with revisions to BRA's WMP and a revised draft Permit approved by the Executive Director. Notice was published in over 30 newspapers throughout the Brazos basin, and a public meeting was held in the Waco area to allow interested citizens another opportunity to comment on both the WMP and the draft Permit.

The hearing timeframe originally contemplated by TCEQ was extended several times, in relation to the hearing on a watermaster petition for the Brazos basin and later the admission of additional parties to the System Operation Permit case. As a result of these continuances, the Commission's SB3 environmental flow standards were proposed for adoption and would become effective prior to Commission action on BRA's WMP. The Commission issued an interim order December 11, 2013, requiring that the WMP use the SB3 standards upon adoption. The ALJs thereafter approved a revised hearing schedule, continuing the abatement of proceedings pending BRA's SB3 update of the WMP and TCEQ staff's review of that update.

1.4 Stakeholder Participation Process

1.4.1 Agency Coordination

In preparation for development of the initial WMP, BRA recognized that close coordination would be required with the three state agencies involved in water-related activities: the TCEQ, the TWDB, and the TPWD. Beginning in July 2011 (before the Commissioners' interim order in January 2012), BRA began hosting meetings with representatives from the three agencies. The goal of these meetings was to share progress on development of the WMP, solicit input from agency staff on the direction being taken by BRA, and ensure that as the WMP evolved there would be no surprises between and among the three agencies as to the content and context of the WMP. In total, eight meetings were held.

1.4.2 Stakeholder Meetings

In addition to an expedited WMP development process, to ensure that the appropriate level of public input was achieved, BRA created a plan to hold nine meetings, three in each region of the basin, beginning in June 2012 and continuing into October 2012. Figure 1.3 identifies the stakeholder meeting dates and locations.

Figure 1.3: Water Management Plan (WMP) Stakeholder Meetings



For the initial round of meetings in June, the BRA sent out nearly 1,500 letters to water right holders, BRA customers, elected officials, councils of government, and regional water planning groups throughout the basin, informing them of the first meetings and their times and locations. For the second round of meetings in August, in addition to being announced in the weekly website e-mail “blasts” for those who had registered an e-mail address with BRA, a postcard reminder was mailed to the same roughly 1,500 individuals who received the first invitations. Finally, for the October meetings, the same mail and e-mail approach was used, to both the original list expanded through participation in the August meetings, as well as anyone who had registered their e-mail address subsequent to the meetings.

Each meeting was videotaped, and those recordings (except for the June 6th meeting held in Temple in which there were technical difficulties with the recording) were posted to BRA’s WMP website, along with a copy of a PowerPoint presentation made at the meetings (Figure 1.4). Sign-in sheets for each meeting were also posted to the WMP website. Those sign-in sheets (as well as comment cards that were available at each meeting site) allowed individuals to request that their e-mail address be added to the WMP e-mail registry.

Figure 1.4 – PowerPoint Presentation Slide



For August, draft portions of the WMP were posted to the website prior to the meetings, and the presentations were centered around the progress to date on instream and reservoir environmental surveys, as well as initial results of water availability modeling. The October meetings were similar. A presentation was made on progress to date, with background information for those who were not familiar with the process.

Table 1.1 indicates the number of people that attended each of the stakeholder meetings:

Table 1.1- Attendance at Regional Stakeholder Meetings	
June	Attendance
Bryan	39
Temple	44
Granbury	136
August	
Possum Kingdom	485 ¹
Taylor	25
Brenham	47
October	
Glen Rose	89
Temple	16
Lake Jackson	29
Total	910
¹ Due to conditions at the meeting site, this number is an estimate.	

1.4.3 Dedicated WMP Website

The stakeholder process also included development of a special section or mini-site within the BRA website, dedicated solely to the WMP. The mini-site was developed with a unique ability for the public not only to view documents, but also to post comments/questions and receive answers about the WMP. The site is accessible by clicking the WMP icon/logo posted on the BRA home page (Figure 1.5) and went live on May 18, 2012.

Figure 1.5 – Dedicated WMP Website Access

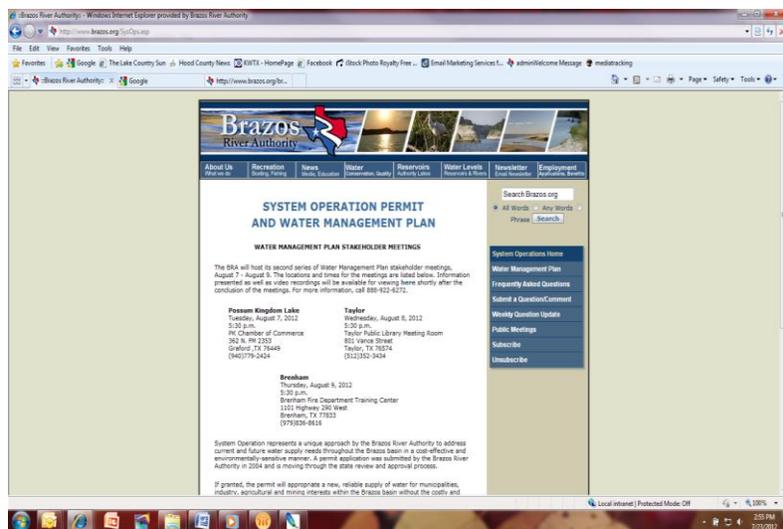


The mini-site (Figure 1.5) included:

- A System Operation and WMP description page, including background documents on the proposed System Operation Permit;
- A frequently asked questions page;
- A page listing public meeting dates and locations;
- A page where interested parties can submit a question or comment (Figure 1.6);
- A page for postings of weekly questions/answers and comments; and
- A “subscribe” page where interested parties may complete a request form to receive an e-mail each time additional information is posted to the mini-site.

During the 23 weeks prior to the submittal of BRA's initial WMP to TCEQ, the mini-site was available to provide stakeholder information, and there were over 9,000 hits (visits). The weekly question page received approximately 18 comments, which the BRA posted, and 79 questions the BRA answered. A copy of the final WMP as filed with TCEQ will be posted to the website.

Figure 1.6 – System Operation Permit and Water Management Plan Mini-site



1.4.4 Issues Raised During Stakeholder Process

At each of the meetings, issues were raised during the follow-up comment/question and answer sessions. Generally, the topics can be categorized as those dealing directly with the proposed System Operation Permit or the WMP and those dealing with issues not related to the proposed System Operation Permit or the WMP. For the most part, comments sought clarification of the sources of water for the permit.

In terms of comments and questions that did not relate directly to the proposed System Operation Permit and WMP, most were related to the fluctuation of lake levels, especially for lakes where there has been residential and commercial development immediately adjacent to the water's edge. Additionally, during the last round of meetings, due to their proximity to TCEQ review of a proposed watermaster for the Brazos River basin, questions were raised regarding BRA's position relative to the creation of a watermaster.