

## 6 System Operations

### 6.1 BRA System Operations

#### 6.1.1 Description of Option

In 2016 the Brazos River Authority (BRA) obtained Water Use Permit No. 5851 (System Operations Permit) from the Texas Commission on Environmental Quality (TCEQ) for the diversion, impoundment, and use of (1) previously unappropriated state water in the Brazos River Basin, and (2) BRA owned return flows discharged into state watercourses not already authorized for use by other entities. The water right currently authorizes a maximum combined diversion of up to 334,345 acft/yr. Diversions are authorized in 40 individual stream segments basin-wide, with each stream segment assigned a specific maximum annual diversion amount. If the Comanche Peak Nuclear Power Plant is expanded and Allens Creek Reservoir is constructed, the authorized maximum combined diversion amount would increase to 421,177 acft/yr and the individual stream segment maximum diversion amounts would increase in accordance with the permit terms and special conditions.

#### 6.1.2 Available Yield

The BRA System Operations appropriation creates a considerable amount of supply to the Brazos River Basin for use in the Brazos G Area and in adjacent regions where the BRA supplies water, most notably Region H (Houston area).

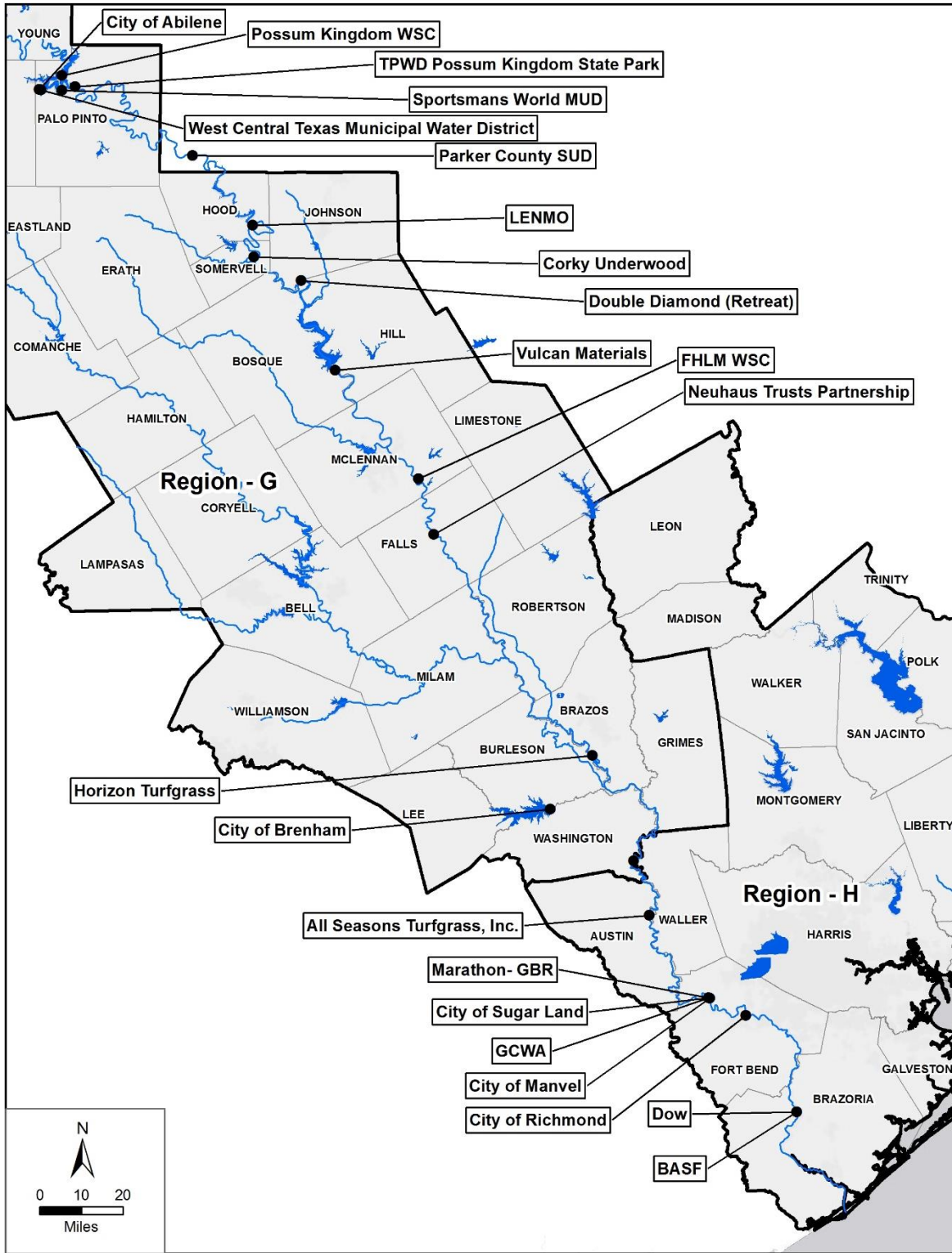
The System Operations appropriation has a priority date senior to environmental flow standards associated with Senate Bill 3 (SB3). However, permit conditions still require authorized diversions to be subject to these environmental flow requirements. As a result of the relatively junior priority of the permit and environmental flow requirements, diversions are considered non-firm and must be backed up with stored water in BRA reservoirs. Because the BRA currently holds multiple contracts to supply water to cities, districts, irrigators and industry throughout the Brazos River Basin, not every BRA reservoir can contribute storage or releases to every contractual diversion location. Because of these constraints, the BRA has determined that 106,031 acft/yr of additional diversions under the System Operations permit can be made firm through reservoir operations.

Table 6.1-1 lists the entities the BRA plans to provide additional firm water supplies to under the system operations strategy and Figure 6-1 provides the location of diversions for each of the entities. Eleven of these entities are in the Brazos G Area and are planned to receive 15,211 acft/yr of firm supply for municipal, irrigation, and mining use. Of these eleven entities, seven have existing contracts with the BRA. The Neuhaus Trust Partnership, Corky Underwood, FHLM WSC, and TPWD Possum Kingdom State Park are new contractual entities.

**Table 6.1-1. Supplies from BRA System Operations (acft/yr)**

Customer	Diversion County	Region	Use Type	Volume (acft/yr)
Double Diamond (Retreat)	Johnson	G	IRR	619
West Central Texas MWD	Palo Pinto	G	IRR	774
LENMO	Hood	G	IRR	774
TPWD Possum Kingdom State Park	Palo Pinto	G	MUN	15
Sportsman's World MUD	Palo Pinto	G	MUN	290
City of Abilene	Palo Pinto	G	MUN	7,737
Parker County SUD	Parker	G	MUN	774
Possum Kingdom WSC	Palo Pinto	G	MUN	1,934
Corky Underwood	Somervell	G	MIN	54
Neuhaus Trust Partnership	Falls	G	IRR	309
FHLM WSC	McLennan	G	MUN	1,934
Horizon Turfgrass	Brazos	G	IRR	348
City of Brenham	Washington	G	MUN	774
Vulcan Materials	Bosque/Hill	G	MIN	387
<b>Brazos G Total</b>				<b>16,723</b>
All Seasons Turfgrass, Inc.	Austin/Waller	H	IRR	90
City of Sugar Land	Fort Bend	H	MUN	10,279
City of Richmond	Fort Bend	H	MUN	2,773
City of Manvel	Fort Bend	H	MUN	3,731
Dow	Brazoria	H	IND	15,473
BASF	Brazoria	H	IND	3,868
Marathon-GBR	Fort Bend	H	IND	5,700
GCWA	Fort Bend	H	MUN, IND, IRR	36,362
<b>Region H Total</b>				<b>78,276</b>
TPWD Water Trust	–	Basin wide	–	6,035
GM Reserve	--	Basin wide	–	4,997
<b>Total System Operations Supply</b>				<b>106,031</b>

Figure 6-1. Diversion Location of Entities Receiving BRA System Operations Supplies



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### 6.1.3 Environmental Issues

Because the BRA reservoirs already exist, the BRA System Operations strategy will only require environmental permits for the infrastructure needed to divert and deliver supplies to the place of use. A summary of environmental issues for the BRA System Operations is presented in Table 6.1-2.

**Table 6.1-2. Environmental Issues: BRA System Operations**

Issue	Description
Implementation Measures	Each entity receiving the supply requires a water supply contract with the BRA.
Environmental Water Needs / Instream Flows	Possible low impacts. The primary sources of water are existing stored water and unappropriated flows.
Bays and Estuaries	Possible low impact from reduced inflows to the Gulf.
Fish and Wildlife Habitat	Potential Impacts include constructing and maintaining easements for new pipelines or pump stations. Extent of impacts dependent on location and size of projects.
Cultural Resources	Possible low impact.
Threatened and Endangered Species	Potential Impacts include constructing and maintaining easements for new pipelines or pump stations. Extent of impacts dependent on location and size of projects.
Comments	Assumes infrastructure is needed to distribute purchased water to the entity in need.

### 6.1.4 Engineering and Costing

Table 6.1-3 provides a summary of costs for the entities planned to receive system operations supplies. Costs included in the BRA System Operations strategy are for the purchase of water from BRA and required infrastructure to divert, treat and deliver water to location of use.

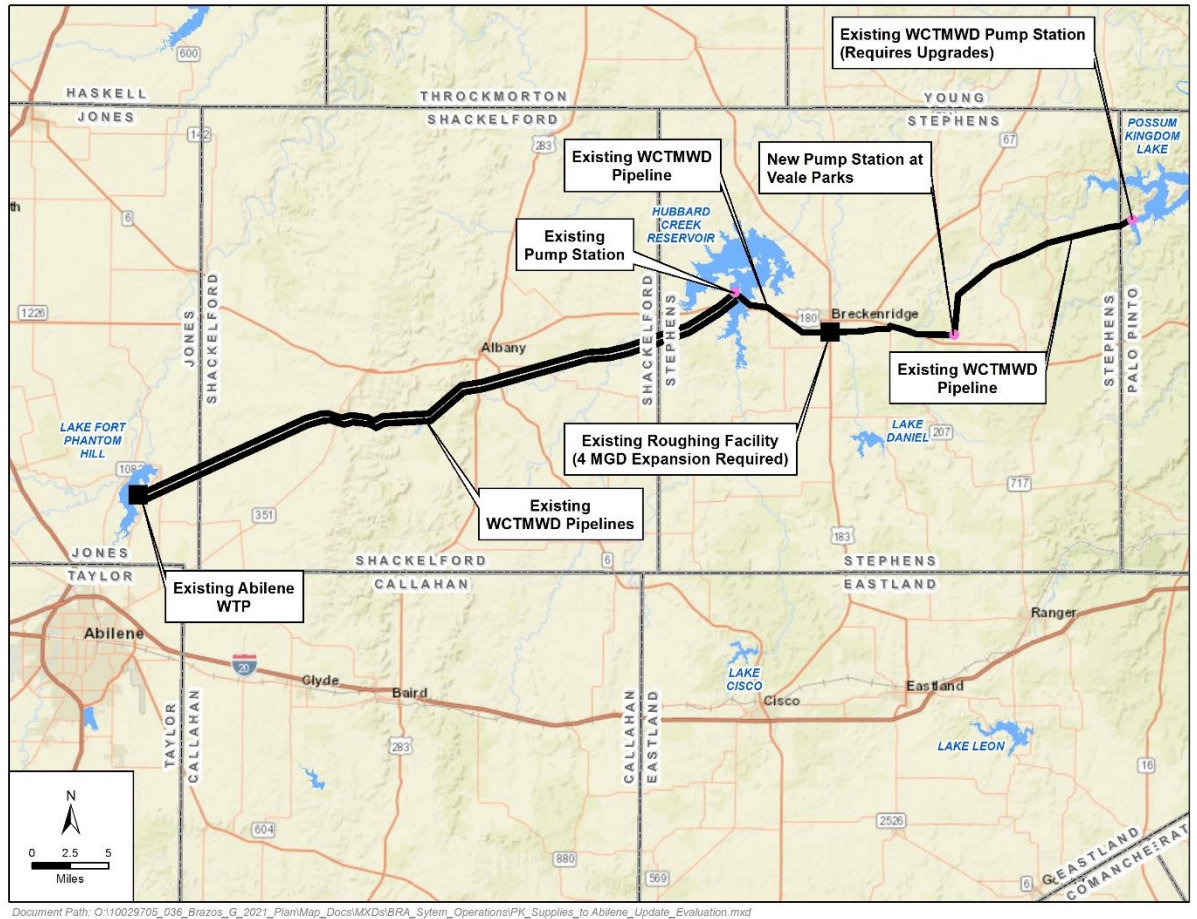
All of the entities planned to receive System Operations supplies with the exception of the FHLM WSC are able to utilize existing infrastructure or do not require large scale infrastructure investments due to the relatively small supply amounts for irrigation and mining purposes (Possum Kingdom State Park, Cork Underwood, and Neuhaus Trusts Partnership). As a result, no project costs are assumed for these entities and the annual cost of water is equal to the cost of purchasing water from BRA.

The 2016 Plan included a recommended strategy for Abilene to purchase BRA water from Possum Kingdom Reservoir. In response to the recent drought, Abilene implemented the strategy and contracted with BRA for the purchase of 11,681 acft/yr of water from Possum Kingdom Reservoir. The West Central Texas Municipal Water District (WCTMWD) purchased the intake and transmission pipeline known as the West Central Brazos Water Distribution System (formerly known as the Kerr-McGee Pipeline) from the BRA and Abilene funded improvements to the intake and the transmission system as a part of a water transportation agreement with WCTMWD. Abilene completed additional improvements to connect the transmission system to a new roughing facility located in Breckenridge and constructed a transmission pipeline from this facility to the dual Hubbard

Creek Reservoir (HCR) transmission pipelines which deliver HCR water to Abilene. Figure 6-2 shows the location of the existing pipelines and roughing facility.

As currently configured, Abilene has the capability of taking the current 11,681 acft/yr of contracted water and providing roughing treatment to reduce TDS to levels comparable with HCR supplies. The Possum Kingdom supplies can then be delivered into Abilene’s conventional water treatment plants. Accommodating the additional 7,737 acft/yr of System Operations supplies will require improvements to the pump station at Possum Kingdom Reservoir, the addition of a pump station at Veal Parks (Figure 6-2), and a 4 MGD expansion of the roughing facility to treat and blend a portion of the supplies to reduce TDS to levels comparable with HCR supplies. Estimated costs for the improvements required for roughing treatment and delivery of the System Operations supply are based on contractor pricing provided during the initial improvement phase to deliver the current 11,681 acft/yr of contracted water. These estimated costs are provided in Table 6.1-3.

**Figure 6-2. Location Map of Possum Kingdom Reservoir to Abilene Delivery System**



The FHLM WSC will require a new treatment plant, off-channel storage, and transmission pipelines to deliver treated supplies to the various entities that are participating members of FHLM WSC. Several of these entities have experienced arsenic concentration violations in their existing groundwater supplies and plan to use BRA System Operations supplies to blend with groundwater supplies to reduce arsenic concentrations. Cost estimates for the

required infrastructure were obtained from 2015 FHLM Regional Water Facility Planning Study and indexed to September 2018 dollars.

**Table 6.1-3. Cost Summary for BRA System Operations Supply**

Entity	Supply (acft/yr)	Capital Cost	Total Project Cost	Annual Cost	Unit Cost	
					\$/acft	\$/kgal
City of Abilene <sup>1,2,3</sup>	6,890	\$6,483,000	\$8,993,000	\$2,391,000	\$347	\$1.06
Corky Underwood	54	–	–	\$4,131	\$76.50	\$0.23
Double Diamond (Retreat)	619	–	–	\$47,354	\$76.50	\$0.23
FHLM WSC <sup>4</sup>	1,934	\$68,481,000	\$95,792,000	\$8,696,000	\$4,496	\$13.80
LENMO	774	–	–	\$59,211	\$76.50	\$0.23
Neuhaus Trust Partnership	309	–	–	\$23,639	\$76.50	\$0.23
Parker County SUD	774	–	–	\$59,211	\$76.50	\$0.23
Possum Kingdom WSC	1,934	–	–	\$147,951	\$76.50	\$0.23
Sportsman’s World MUD	290	–	–	\$22,185	\$76.50	\$0.23
TPWD Possum Kingdom State Park	12	–	–	\$918	\$76.50	\$0.23
West Central Texas MWD	774	–	–	\$59,211	\$76.50	\$0.23

<sup>1</sup>Abilene anticipates 11% of the BRA System Operations supply of 7,737 acft/yr will be lost to brine reject during the treatment process, resulting in a usable supply of 6,890 acft/yr in 2020. This supply is expected to be further reduced to 5,230 acft/yr beginning in 2050.

<sup>2</sup> Consistent with the City of Abilene’s Purpose and Need memorandum, BRA supplies to Abilene are assumed to be reduced by 24% in 2050 to 5,230 acft/yr to account for reductions in supply due to future more severe droughts.

<sup>3</sup>Estimated costs based on contractor pricing provided during the initial improvement phase to deliver the current 11,681 acft/yr of contracted water to Abilene.

<sup>4</sup>Costs obtained from 2015 FHLM Regional Water Facility Planning Study.

### 6.1.5 Implementation Issues

Because the BRA has already obtained the necessary water right permits and will not need to construct any new facilities, there are no implementation issues for BRA. However, it may be necessary for one or more of the contract entities receiving System Operations supplies to obtain these permits for the construction of facilities to divert and transmit water.



- U.S. Army Corps of Engineers Sections 10 and 404 dredge and fill permits for reservoirs and pipelines impacting wetlands or navigable waters of the U.S;
- TPWD Sand, Gravel, and Marl Permit for construction in state owned streambeds;
- Aquatic Resource Relocation Plan (ARRP) and a relocation permit may be required from TPWD if a dewatering event is required during construction.
- NPDES Storm Water Pollution Prevention Plan;
- GLO easement for use of the state-owned streambed; and
- Section 404 certification from the TCEQ related to the Clean Water Act.

Permitting, at a minimum, will require these studies:

- Habitat mitigation plan;
- Environmental studies of potential impact on endangered species; and
- Cultural resource studies and mitigation.

Land will need to be acquired through either negotiations or condemnation for pipeline and other facilities.

This water supply option has been compared to the plan development criteria, as shown in Table 6.1-4, and the option meets each criterion.

**Table 6.1-4. Comparison of BRA System Operations to Plan Development Criteria**

Impact Category	Comment(s)
A. Water Supply	
1. Quantity	1. Sufficient to meet needs
2. Reliability	2. High reliability
3. Cost	3. Low
B. Environmental factors	
1. Environmental Water Needs	1. Low impact
2. Habitat	2. Low impact
3. Cultural Resources	3. Low impact
4. Bays and Estuaries	4. Low impact due to distance from coast
5. Threatened and Endangered Species	5. Low impact
6. Wetlands	6. Low impact
C. Impact on Other State Water Resources	No apparent negative impacts on state water resources; no effect on navigation
D. Threats to Agriculture and Natural Resources	None
E. Equitable Comparison of Strategies Deemed Feasible	Option is considered to meet municipal, irrigation, and mining shortages
F. Requirements for Interbasin Transfers	None
G. Third Party Social and Economic Impacts from Voluntary Redistribution	None

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